4-12-2013

Hope College Abstracts: 12th Annual Celebration of Undergraduate Research and Creative Performance

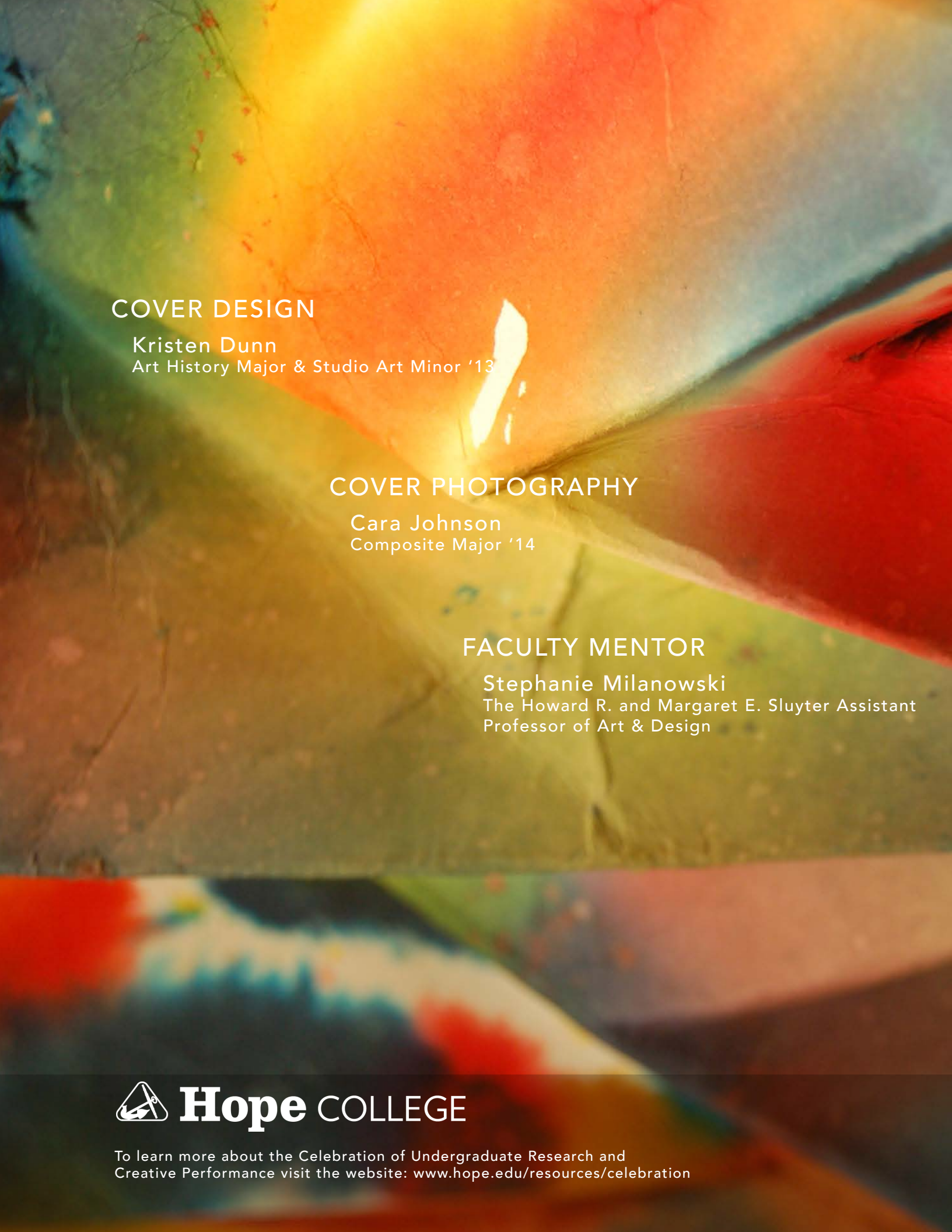
Hope College

Hope College

ABSTRACTS

2012–2013

12th Annual
Celebration of Undergraduate
Research & Creative Performance



COVER DESIGN

Kristen Dunn
Art History Major & Studio Art Minor '13

COVER PHOTOGRAPHY

Cara Johnson
Composite Major '14

FACULTY MENTOR

Stephanie Milanowski
The Howard R. and Margaret E. Sluyter Assistant Professor of Art & Design

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To learn more about the Celebration of Undergraduate Research and Creative Performance visit the website: www.hope.edu/resources/celebration

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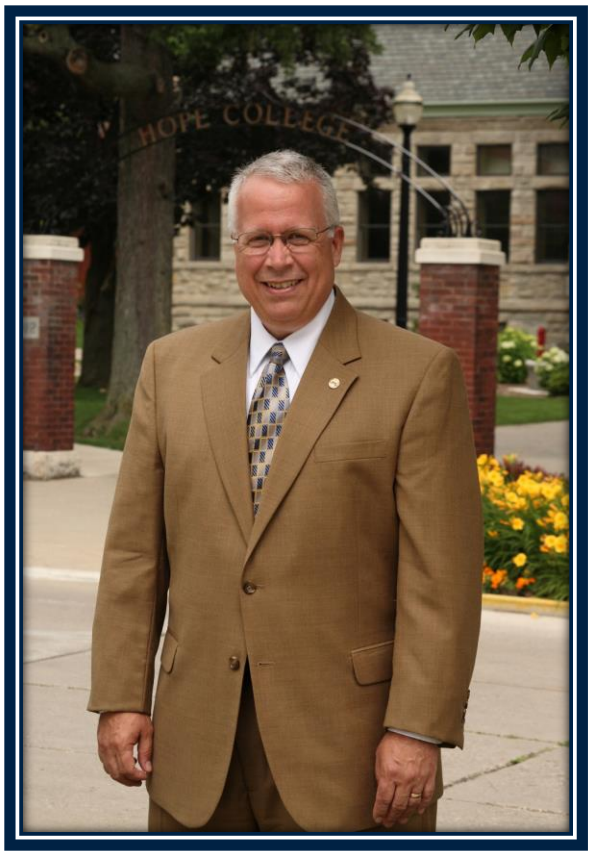

Dear Friends,

We were pleased to welcome more than 300 students and many, many guests to the 12th annual Celebration of Undergraduate Research and Creative Performance at Hope College on Friday, April 12th. Each year I come to this event with such excitement because it highlights the accomplishments of so many students who have carried out ambitious research projects under the careful mentoring of our exceptional faculty and staff. Again this year, as I talked with students about their projects, I was impressed by their enthusiasm and depth of knowledge.

This book of abstracts is another record of the imaginative and rigorous projects that were carried out during 2012 and 2013. Each abstract describes a collaborative project between the present and the next generation of scholars—a teamed effort that brings the classroom to life and inspires the kind of learning that lasts a lifetime. For those who are not steeped in the community of Hope College, the high-quality of the research and the polished presentations may be surprising. Reading through this book of abstracts is one way to help those not familiar with Hope to appreciate how Hope is different from other colleges and universities in this regard.

For each student, staff member and faculty mentor who contributed to the work described in this impressive book, please accept my sincere congratulations and thanks! Each of you testify to the very best qualities of a Hope education and we are proud of your creative and meaningful accomplishments.

If you are interested in knowing more about the distinctive qualities of a Hope College education, including learning by doing, please visit www.hope.edu. Thank you for your participation and support for the Celebration.

Sincerely,

Richard Ray

Richard Ray
Provost

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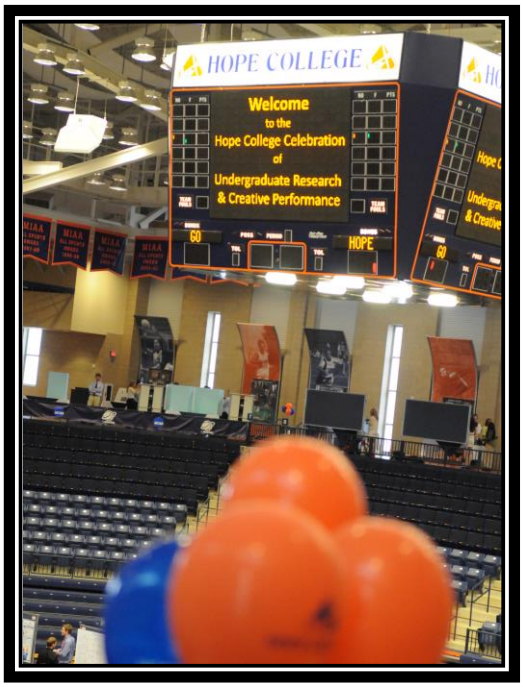
STUDENT PRESENTERS

DANCE



emily d.

Lydia Blickley
Mentor: Professor Steven Iannacone
Department of Dance

emily d., originally choreographed for Steven Iannacone's Dance Composition II class, premiered in the Student Dance Concert on the Knickerbocker stage on December 2nd, 2012. This solo was inspired by a term paper written for William Pannapacker's American Literature I class in the Fall of 2011. Developed as a character study, this piece explores the life of the famed writer and recluse Emily Dickinson. The myths surrounding Emily Dickinson portray a quaint and defenseless creature when, in fact, she was acutely aware of her unparalleled talent. However, she did keep her prolific poetic life private. Wholly unconcerned with societal norms, Dickinson chose to remain tucked away in her Amherst, Massachusetts home where she wrote nearly eighteen hundred poems before her death in 1886. This piece explores her writing's dark sentiments, her societal struggles, and her inner conflict. It is Dickinson and poetry in motion.

Technology and Movement; Teaching Learners with Autism

Adrianne Brown
Mentor: Professor Nicole Flinn
Department of Dance Education

Over the past decade, the use of technology has rapidly spread throughout classrooms with the hope of enhancing a child's ability to learn, specifically in the area of special education. Students with special needs, such as autism, have shown signs of increased attentiveness and growth with the use of technology. It is known that students with autism have special challenges due to decreased social skills and the inability to stay focused and attentive for extended periods of time. In this research project, learning through the use of technology acts as a replacement for social interaction. It was hypothesized that the use of technology in the classroom would increase attentive behavior in students with autism. A technological teaching method, video-modeling, was chosen to observe and determine whether or not students with autism displayed more attentive behavior watching a video lesson versus a lesson presented face-to-face by an instructor. The study provided evidence that students with autism were more engaged and attentive through the use of video-modeling lessons as opposed to a live presentation by an instructor.

Machismo in the Homily: Why do Historic Influences in Latin America make Machismo Construct Difficult to Wane?

Shelly Arnold
Mentor: Dr. Jonathan Hagood
Department of History

Machismo is viewed as a problem in today's Latin America and amid Latinos living elsewhere. Some researchers lay blame on a unique form of Roman Catholicism found in Latin America. If the Church in Latin America is solely responsible for machismo, reconciling Church history to change the machismo construct may prove challenging. This paper explores where gender constructs in Latin America originated in the region and how social constructs defined machismo. Some research argues the female counter balance to machismo, marianismo, reinforces the machismo. Historic analysis of machismo origins allows for greater understanding of how this construct gained strong roots across Latin America and why change is difficult.

The Psychological Effects of the London Blitz

Claire Barrett
Mentor: Dr. Marc Baer
Department of History

In May 1940, Britain stood alone as the sole Western power engaged in battle with the German war machine. Against the near continuous blitz attack on London, its citizens persisted. This research will demonstrate how the mental fortitude of the London citizens, spurred on by the royal family and prime minister, helped them endure the crucible of war at the hands of the German Luftwaffe and deliver Hitler's first defeat in WWII. Hitler sought to weaken the British infrastructure and distract the government by producing mass hysteria among its citizens to make way for Operation SEALION, Hitler's battle plan for a land invasion of Britain. In effect however, the Blitz on London during 1940-1941 solidified the idea of the British identity. The innate characteristic of the British people is one of stoicism and steadfastness. Hitler had underestimated the resolve of the citizens of London. Furthermore, the residents of London were a part of a new and modern war in which the battlefront was the city itself. National survival hinged upon Britain's ability to withstand the German onslaught. The bombardment aroused the quiet fury of the Londoners, and in turn they refused to yield to the German Leviathan.

Francis Xavier: Understanding the Sixteenth-Century Missionary Through His Letters

Eric Dawson
Mentor: Professor Janis Gibbs
Department of History

Through an analysis of the letters of St. Francis Xavier, this research investigates his religious and political influence in Europe and Asia during the sixteenth century. Throughout his letters, Xavier's zeal for the conversion of non-Christian souls was evident. He listened to confessions, gave communion, helped the sick die with dignity and had little time to rest. Even after long voyages, he often began praying with others and listening to confessions immediately. Furthermore, his religious influence on the people was coupled with a political influence. Throughout his missionary work he stayed in close contact with King John III of Portugal, writing him letters every three months. King John III trusted and supported Xavier, and often did what Xavier suggested. In 1544 Xavier sent twenty-four letters to the Fishery Coast in India, giving orders and advice to a fellow Jesuit on how to handle the warring tribes in the area. After the conflict was resolved, Xavier reportedly baptized 10,000 Indians. Lastly, the research notes Xavier's observation of the Japanese. Initially he was excited about Japanese character and behavior, but when they were not interested in Christianity, his opinions turned sour. Xavier's lack of sympathy toward Japanese practices and his expectations of quick conversions, along with the inability to translate properly, pushed many Japanese away from Christianity.

HISTORY

The Inheritance of Morality: The Theological Debate on Eugenics in Early Twentieth Century Britain

Samuel Fishman
Mentor: Dr. Marc Baer
Department of History

Eugenics, the use of regulated breeding practices to improve a population, became widely accepted in the twentieth century as a scientific theory and potential method for improving society. Despite the implementation of eugenics in many western countries, it never gained a strong foothold in Britain. One of the most important aspects of the British eugenics debate revolved around religion. Francis Galton, the founder of eugenics, and Caleb Saleeby, a prominent physician, were two secular empiricists who argued that the theory could serve as the basis for a scientific religion. Many Anglican clergy, such as Dean William Inge and Bishop E. W. Barnes, proposed that eugenics complemented Christianity. Nevertheless, some British Christians did speak out against the eugenic movement. Catholic priest Thomas J. Gerrard and journalist G. K. Chesterton critiqued eugenics theologically, asserting that it violated Christian ethics. The efforts of these two men likely played a significant role in restraining the British eugenic movement.

Charles Dickens and Henry Mayhew: An Image of the London Poor (1830-1870)

Rebecca Fox
Mentor: Dr. Marc Baer
Department of History

Many readers have enjoyed the compelling novels of Victorian author Charles Dickens (1812-1870). His characters are lively, memorable, and imaginative, sometimes to the extent that they seem implausible. Despite the seeming sensationalism of the novels, it is often their characters that come to mind when Victorian London is mentioned. This research uses the in-depth study of the London poor done by Victorian social researcher and journalist Henry Mayhew (1812-1887) as a standard by which the accuracy of Dickens's poor can be measured. By comparing the engaging characters of Dickens's Oliver Twist (1838) with the poor studied in Mayhew's four volume series of articles *London Labour and the London Poor* (1849-1850), this research reveals the extent to which Dickens's pickpockets, prostitutes, and pawn-brokers can be accepted as authentic.

The 1745 Scottish Rebellion—Interpreting the Reality of a Romanticized Rebellion

Victoria Henry
Mentor: Dr. Janis Gibbs
Department of History

The remembrance of battles throughout history is often left to the devices of the winner of the war. In many instances the history is skewed or romanticized to amplify the accomplishments of the winning party or to create a woeful story of the defeated. During the 1745 Scottish Rebellion, the English defeated the Scottish at the final battle of Culloden. This battle has been romanticized over time through various media and propaganda and has created an image that is skewed into a version that is not a historically accurate representation of the battle.

My research shows various types of media and propaganda that support this romanticized view over time. Particular attention to current propaganda and media shows the misinterpreted reality of the rebellion. Such current propaganda includes films, paintings, press coverage of monarchial attention to the highlands, poetry, and even novels. It is through the interpretation of the Scottish rebellion by these forms of media and propaganda that the truth of the rebellion has been masked behind the romanticized description, which has become the reality.

Paris and Shanghai: A Tale of Two Cities

Rebekah Llorens, Kelli VanDyke, Reginald Duncan, Whitney McCloe, Tyler Peterson, and Benjamin Smith
Mentor: Dr. Gloria Tseng
Department of History

This exhibit displays the dramatic changes experienced in two distant cities: Paris, France, and Shanghai, China. Paris in the early twentieth century was the center of French culture and politics. The same period in Shanghai was distinguished by the city's status as a treaty port, resulting in an international but divided environment. Despite differences in culture and location, Paris and Shanghai each represented modernity in the West and the East, respectively. Yet, this progress did not help close the gap between the rich and poor in either city. In Paris, the gap in economic and social classes caused this divide. In Shanghai, the divide was often characterized by nationality. Foreigners were commonly successful businessmen and bankers, while native Chinese often lived in poverty. Historical images and a timeline are used to bring the stories of these two cities to life in this exhibit.

A Woman Among Men: The Influence of Gender Ideologies in the Trial of Mary Surratt

Sarah Manke
Mentor: Dr. Jeanne Petit
Department of History

In the United States, women receive the death penalty in significantly lower rates than men. From 1608 to the present, women have accounted for only 2.8 percent of the total number of executions in both the English colonies and the United States. Because of the low proportion of women executed, issues of gender can influence trials of women when the death penalty is a factor. Therefore, it is no shock that the trial of the first legally executed woman in the United States, Mary Surratt, became an entanglement of gender ideologies. Mary Surratt was pronounced guilty on June 30, 1865, for aiding in the assassination of President Lincoln, and she was later hung for her crimes. This research analyzes Mary Surratt's trial transcripts and examines how the nineteenth-century gender ideologies of piety, *feme covert*, and domesticity were part of the trial's dynamics. Both the prosecution and defense used interpretations of gender roles, albeit in different ways, to make their case for Mary Surratt's innocence or guilt. By resorting to these ideologies, however, the lawyers failed to accurately portray Mary Surratt because of the embedded contradictions in their understanding of "true womanhood."

Servant of Which Master? The Sixteenth-Century Spanish Inquisition

Alex Mouw
Mentor: Dr. Janis Gibbs
Department of History

In 1477 a preacher named Alonso de Hojeda warned King Ferdinand and Queen Isabella of Spain that heretics were undermining the Christian Church in their kingdoms and something had to be done. In 1478, Pope Sixtus IV gave the monarchs the right to name inquisitors, and in 1480, the first inquisitors named by the monarchs began their work. While the Inquisition initially investigated Jewish converts to Christianity suspected of backsliding, the scope of the Inquisition's inquiry expanded over time. Historians have debated the true purpose of the Inquisition. Since the tribunal was authorized by the pope but administered by the Spanish monarchy, its purpose is difficult to ascertain and has been widely debated. While the Inquisition theoretically functioned on behalf of both the church and the monarchy to punish heresy, sources reveal that in practice the Inquisition functioned as more than a weapon to combat heresy. Its seemingly inconsistent treatment of two cases reveals the Inquisition as less systematic and more self-serving than its creators may have intended. I use the cases of Maria Gonzalez, tried in 1513, and Maria de Cazalla, brought to the Inquisition court in 1532, to investigate the inquisitors' motives. Inconsistencies in the judicial process of each case illustrate the complex nature of the Inquisition as an institution with dual allegiance to the church and state. They also reveal a paradox: The Inquisition may have been more concerned with its own authority than with heresy, yet it needed heresy, or at least a perception of heresy, in order to sustain its own authority.

HISTORY

Tainted Images: Attitudes Toward Women During the Thirty Years' War

Julie Oosterink
Mentor: Dr. Janis Gibbs
Department of History

This project examines primary visual and textual documents representing women during the sixteenth and seventeenth centuries in Europe in order to reveal changing attitudes toward women. Many pamphlets and broadsheets portrayed women in cartoons and propaganda. Women cast as temptresses, warriors, rulers, angels, demons, and peasants visually reflected the fears and attitudes of Europeans. Sometimes printers presented women as allegorical figures representing peace or victory or as comedic figures who upset gender conventions. Before the Thirty Years' War, many of these female figures were not representatives of any particular religion. However, during the Thirty Years' War, both Catholics and Protestants used violent or sinful images of women not of their confession to undercut the virtue of religious groups different from their own. Therefore, Catholic and Protestant attitudes toward women became increasingly negative during the war. These attitudes, revealed through propaganda, shaped women's lives as guilds, camp communities, and individual cities increased restrictions on them. The most significant changes for women during this period were limitations to economic opportunities, restrictions of cooking and trading roles in the army, and an increased stress on women's virtue as representative of a virtuous Protestant or Catholic society. The image of morally weak women in broadsheets and woodcuts sheds new light on changing gender roles within and between the contending religious groups of the Thirty Years' War. It reflects the complex relationship between propaganda and social change.

MODERN AND CLASSICAL LANGUAGES

"Le Voile Noir" by Anny Duperey: The Use of Photography as a Legitimate Autobiographical Means and Facilitator of the Mourning Process

Athina Alvarez
Mentor: Dr. Isabelle Chapuis-Alvarez
Department of Modern and Classical Languages

In 1995, when she was merely eight years old, Anny Duperey's parents died accidentally and disastrously, asphyxiated by carbon dioxide in their bathroom. Having been the first to arrive on the scene and discover the bodies of her mother and father, Anny Duperey would later be incapable of recalling any other memory than this of her parents, for a "black veil" would proceed to cover her former life and everything that she had known and lived prior to the accident. Feeling anger and a lack of comprehension, Duperey spent several years tormented and depressed. Twenty years later, Duperey decided to develop some of her father's photographic film that she had found in a drawer at her house. Her father was an amateur photographer of great talent, known to the art world as Lucien Legras. Although developed, Anny Duperey refused to actually look at the photographs and could not bring herself, once again, to come to terms with her parents' fate. A few years later, upon encountering the prints again, Anny felt a strong desire to comment on these works and this reflection is what leads her to question a variety of aspects of her own personal life. The main focus of my research, then, is to explore the fundamental relationship between written text and the photographic image in an author's literary and creative approaches. Through this discussion, I will also investigate how contemplating aged photographs can surpass memory in some ways and subsequently push Duperey to question her numerous years of internal struggle based on the emptiness and suffering that followed her in life ever since the disappearance of her parents. These photographs serve as a tool for mourning to Duperey; they allow her to accept her parent's death, to grieve, and to live her present life successfully.

When Theater Becomes an Art: A Study of the Multi-faceted Nature of Absurd Theater in Eugene Ionesco's Didactic Play "Rhinoceros"

Athina Alvarez
Mentor: Dr. Anne Larsen
Department of Modern and Classical Languages

By writing "anti-plays," "comedic-dramas," "pseudo-dramas," and " tragic-farces," Eugene Ionesco emerges as a master of what can be referred to as the "anti-theater" movement of the nineteen-fifties. In the nineteen-sixties, however, Ionesco's works announced a sort of evolution in his creative process in the sense that his plays privileged and highlighted the much more serious theme of absurdity, as portrayed by his most utilized character, Béranger. In *Rhinocéros* (1959), Ionesco proposes a theater that not only reflects society's daily quotidian life, but rather focuses on shocking his spectator in order to force him or her to contemplate the human condition. This didactic play remains relevant to the contemporary world, as exhibited by the numerous representations and mises-en-scènes of *Rhinocéros* that have taken place since its creation in 1959, leading up to its most recent interpretation by the Théâtre de la Ville de Paris in Ann Arbor, Michigan, in November 2012. The quantity and variety of the representations testify to the universality of the play as well as to its timeless nature, since, in his play, Ionesco proposes a reflection on the comportment of men in the face of dictators rising to power in the twentieth century. He not only denounces political fascism, but also condemns all forms of totalitarianism that were developing most often through the intermediary of language. *Rhinocéros* reveals not only the exceptional qualities of Ionesco's capacities as a writer and humanist observer of our society, but also, and most importantly, it re-actualizes the genius-creator of the post-war dramatist that he was.

MODERN AND CLASSICAL LANGUAGES

Une Vie D'Esprit Immuable: Le Marquis de Lafayette/ Le Marquis de Lafayette: A Life of Immutable Spirit

Hannah Gingrich
Mentor : Dr. Brigitte Hamon-Porter
Department of Modern and Classical Languages

Although most know Le Marquis de Lafayette because of his part in the American Revolution, that war was only the beginning of a life and career dedicated to the cause of liberty. Lafayette's political rise was due more to own impulsiveness and tenacity than any real military skill, a fact which also directly influenced his fall from glory and led to subsequent years of prison and exile. His naïveté, social ineptitude, and frequent military blunderings have made Lafayette the target of much historic criticism and many have dismissed him as a derisory failure. However, his idealism and staunch dedication to American ideas of liberty set him apart as truly remarkable. This study, based on both English and French texts, seeks to examine Lafayette's life through his personality and motivations. His impressive military lineage and his father's death in England left Lafayette with no father figure and the idea that adventure and heroism must be his destiny. Though he originally worked solely for that purpose, this research shows how Lafayette eventually began to understand the values of his American mentors without needing the adulation he had previously wanted.

Constancia de la Mora: Vida y obra de una heroína controvertida/ Constancia de la Mora: The Life and Work of a Controversial Hero

Lauren Janness
Mentor: Professor Liliana Dorado
Department of Modern and Classical Languages

Prior to the declaration of the Second Republic in 1931, Spain was a nation marked by social, cultural, and intellectual repression of women. The progressive Second Republic and the growing feminist movement introduced many reforms that improved the quality of life for the Spanish woman. Thus, when Franco and the nationalist forces threatened these newly gained freedoms with the initiation of the Civil War in 1936, many women dedicated themselves to fighting for the Republican cause. The majority of these women came from the working and middle classes. However, one of the most passionate – and unlikely – champions of the Republican cause came from an upper-class family: Constancia de la Mora. In contrast to her wealthy upbringing, de la Mora's support for the cause of the working class of the Second Republic was highly controversial. During the Spanish Civil War, de la Mora served as the director of the Republican Foreign Press Office. In 1939, she moved to the United States to begin lobbying for the cause of the Spanish refugees. Later that year, to amplify those efforts, she published her perspective of the war and the refugee crisis in her autobiography, *In Place of Splendor*. Her work garnered attention for her cause, but it also stands out as one of the first autobiographies published by a Spanish woman. Although some have questioned the absolute truthfulness of the facts de la Mora reports in her book, her dedication to and actions on behalf of her people are undeniable. Today, in Spain and throughout the world, the concluding sentiment of her book continues to serve as a reminder of the essential nature of freedom: "¡Viva la República!"

Metaphysics and Sabotage: A Thematic Study of Amélie Nothomb's Autobiographies

Charles Patchak
Mentor: Dr. Isabelle Chapuis-Alvarez
Department of Modern and Classical Languages

Belgian born author Amélie Nothomb provides a unique and comprehensive perspective in her autobiographies, *Métaphysique des tubes*, *Le sabotage amoureux*, and *Stupeur et tremblements*. Within her autobiographies, Nothomb touches on a variety of themes in which my research focused on: life after death, suicide, religion, love, racism, feminism, absurdity in the world of adults, and cultural differences between the Western World and the Orient. Despite being an autobiographical account of her life experience, Nothomb uses this literary medium to make critiques on society through her use of different and broad themes. Playing on the Japanese cultural perspective that children are born gods who become humans around the age of three, Nothomb found an early fixation on Christ, his crucifixion, and the biblical creation account at the time of her birth. Her intrigue of parallels between Christianity and her own life experiences suggests an individualistic and internal approach to

religion, which continues further in her later autobiographies. Nothomb also highlights the importance of women within society, romantic relationships, and family life. The author depicts racism in war and in particular the connectedness in pain between an aggressor and a victim with references to World War II and anti-Semitism. Overall, Amélie Nothomb uniquely carries out her diversified themes by encompassing her thoughts throughout the accounts of her life.

Alfred Dreyfus: Traître ou Victime?

Marie Schrampfer
Mentor: Dr. Brigitte Hamon-Porter
Department of Modern and Classical Languages

In the late 19th century, false accusations of treason leveled against Captain Alfred Dreyfus launched France into a twelve-year struggle against anti-Semitism. Dreyfus, a Jew, was accused of passing valuable information regarding French military initiatives to the German Army. Despite the lack of concrete evidence, he was arrested and condemned in 1894, stripped of his rank, and exiled from his country. Finally, in 1906, he was officially pardoned and his honor restored. The affair deeply divided France. Some believed Dreyfus had truly committed a crime and received the punishments he deserved. Others harbored suspicions that it was a case of religious persecution, since many of his accusers were known for their anti-Semitic beliefs. As this research shows, this debate of motives is still being investigated today. Furthermore, the research examines not only the affair itself, but also the repercussions the event holds for the modern world. It demonstrates, in addition to questions of religious liberty, the tendencies for those in authority to abuse their power, an issue that continues to plague our governments to this day.

Is the French Language in Quebec in Danger of Extinction?

Lauren Wade
Mentor: Dr. Isabelle Chapuis-Alvarez
Department of Modern and Classical Languages

In a world that depends more and more on the English language, French speaking citizens of Quebec make efforts to protect their native language with laws and changes to the official French language. Even if there are many differences between the French spoken in Quebec and the French spoken in France, those are on differences of different dialects, not entirely different languages. However, if the French language in the world in general isn't in danger, the dialect spoke in Quebec is in danger of extinction. Since the Second World War, English speaking immigrants have surrounded the area of Quebec, making it increasingly more difficult for them to retain their French roots. Over the years, the *Québécois* have begun to create words in French to replace English sounding words, resulting in a dialect very different from the official French language spoken in hexagonal France. However, these efforts have not been completely effective in keeping the French language, even the Quebec dialect completely vibrant. As a result of this, Law 101 was passed to preserve the French language in Quebec in commerce, advertisements, and in official documents. It has been extremely controversial in Quebec and parts of it have been repealed since it was passed. As Quebec elects new officials, Law 101 is revisited time and again as Quebec tries to keep French the official language and the language taught in schools. Quebec is a French province in a largely English speaking country and though there are striking differences to the official French language, it is not an entirely different language. The French language is growing quickly in Africa, but in Quebec, it is in danger of becoming just a part of history.

Unveiling Camille Claudel's Identity through Biographical and Autobiographical Sources: "Une Femme," by Anne Delbée and "Correspondence," by Camille Claudel

Natalie Woodberry
Mentor: Dr. Isabelle Chapuis-Alvarez
Department of Modern and Classical Languages

Camille Claudel: sculptor, Paul Claudel's sister, Rodin's mistress, madwoman. Throughout her life, Camille's relationships with others forged her identity. Her own voice comes through in her personal correspondence, which author Anne Delbée uses to create the identity Camille never could make for herself, posthumously, through biographical and autobiographical techniques in "Une Femme." Although her book is technically a biography, by creating her identity, Delbée writes Camille's

autobiography for her. The author portrays her as a victim of her relationships with powerful people: her family who reduced her to a lunatic in an insane asylum, her love for Rodin who exploited her talent, and her brother, a famous writer, who delivered her into captivity in the asylum. Delbée focuses on Camille's thirty years of creativity and genius work rather than the last half of her life spent in an asylum. She notes the paradox that Camille could coax meaning and identity out of a piece of marble or stone to create a beautiful sculpture, but could not create her own identity. In order to accomplish this in her book, Delbée uses three voices: the narrator, who knows the full story and reveals it bit by bit; Camille through her surviving letters; and the author herself by presenting her reactions and the personal significance of her journey to free Camille's true identity from its imprisonment. She uses several other writing techniques, including straying from the chronological order of Camille's life to emphasize certain points, as well as taking artistic liberty to recreate a dramatic and moving story based on limited factual information about Camille's life. The result is a combination of Camille's voice crying out to be freed in her letters and Delbée's creation of Camille's identity to free her story after her death.

The Realization of 19th Century Czech Nationalism: Folk Music Elements in Dvorak's "Dumky"

Alec Norkey
Mentor: Dr. Julia Randel
Department of Music

Much of Antonin Dvorak's music has historically been associated with Slavic folk music and Czech nationalistic sentiment. The nationalistic fervor of the 19th century drove Dvorak to create memorable and distinctive works representative of his native land. Many of his works feature Bohemian and Moravian folk elements. This research addresses the relationship between Dvorak's "Dumky" Piano Trio in E minor, Op. 90 and musical folk elements of Dvorak's native land. Specifically, it examines traits of Bohemian and Moravian folk music, as well as traits of the Ukrainian epic poem song genre called the Duma. The historical backgrounds of these influences shed light on the development of musical form, the selection of subject material, and other general musical characteristics. When analyzing Dvorak's piano trio, one finds an abundance of characteristics that can be related to the three potential influences previously mentioned. Indeed, the "Dumky" Piano Trio seems to exhibit many musical influences from Dvorak's homeland, as well as from the Duma. Yet at the same time, Dvorak creates and reinforces a new genre of music, one that has been traditionally associated with the Czech identity: the Dumka. Dvorak's use of Bohemian and Moravian folk music elements, his evocation of the dramatic subject content of the Duma, and his own musical innovations have propelled the Dumka into its present form.

RELIGION

Courage and Hope as Imperative Ecological Virtues in Appalachia: A Case Study Approach

Lauren Madison
Mentor: Dr. Steven Bouma-Prediger
Department of Religion

America's Appalachian Mountains are marred by the presence of devastating poverty and wounded by ecological wrongdoing, both arguably symptoms of a pervasive culture of coal that has its roots in over one hundred years of mining. Coal culture prevents Appalachia from thriving economically, evident in the region's perpetual state of poverty. But what is also becoming obvious is the harm being done to the ecosystems of Appalachia and to public health because of the practice of mountaintop removal (MTR). In the face of such challenges as a polarized political process, the power of the coal industry, and widespread cultural support in favor of this strip mining, it is not easy to oppose MTR. Those individuals who choose to take action against MTR are in most need of possessing the ecological virtues of courage and hope. Such audacity on the part of politicians and activists implies the belief that there is some better future worth fighting for. In this way, the virtue of courage implies the presence of the virtue of hope as well. To those looking to end the practice of MTR, hope is recognizing the difficulty of the task at hand, but rather than despairing at its overwhelming magnitude, taking heart in the possibility of justice in Appalachia.

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Explorations in Surrealism: Myth, the Occult, and Experimental Writing in the Works of Mexican and European Surrealist Women Artists (1930's to 1960's): An Analysis of the Life and Works of Tina Modotti, Kati Horna, and Bridget Bate Tichenor

Athina Alvarez
Mentors: Drs. María Claudia André and Anne Heath
Andrew W. Mellon Scholars Program and Departments of Modern and Classical Languages, and Art and Art History

There has been very little scholarly research and writing done in regards to the writings and artwork of female surrealist artists, who were often overshadowed by their male counterparts and contemporaries. With this in mind, a group of six students under the supervision and mentoring of Professor María André have worked together to create a digital archive, which will shed light upon the significant role that these women played in the Surrealist movement in twentieth century Mexico. The objective of this research is to create a digital archive on the lives and works of female Surrealist artists and to examine their contributions to Surrealist art and literature in Europe, the United States, and Mexico. My research began in the summer of 2012 in Paris and Provence, where I researched the lives and works of Tina Modotti, Bridget Bate Tichenor, and Kati Horna. Tina Modotti was an actress, model, and photographer who used the camera as an instrument of inquiry and political communication during the Mexican Revolution. Kati Horna was a Mexican photographer by adoption who produced several political documentary series and whose photography resembled that of a political reporter. Bridget Bate Tichenor was a model, painter, and fashion editor for Vogue Magazine. The archive includes a biography, artistic influences, analysis, and a literary analysis for each artist, which can be viewed online. Each artist's page also includes an interactive feature, videos, as well as a bibliography of critical sources. A link to the archive can be found at *http://faculty.hope.edu/andre/hompage.html*.

This project is funded by the Jack Nyenhuis Faculty Summer Grant (Hope College), the New Directions Initiative of the Great Lakes Colleges Association and by the Andrew W. Mellon Scholars Foundation.

Myth, the Occult, and Experimental Writing: The Letters of Remedios Varo

Tessa Angell
Mentor: Dr. María Claudia André
Andew W. Mellon Scholars Program and Department of Modern and Classical Languages

This research focuses on the Spanish-born Surrealist artist, Remedios Varo, who lived and worked in Mexico for the majority of her life. Although Varo is best known for her paintings, she also experimented with various forms of writing. Inspired by modern science, Gothic architecture, and esoteric doctrines, such as the Tarot, alchemy and Kabbalah, her artistic productions reflect these surreal interests. Her writing includes various letters, short essays, personal accounts of her dreams, and a play she wrote in conjunction with fellow artist Leonora Carrington. Unfortunately, Varo's writing was not published until the 1990s, and then, only in Spanish. By translating her eight published letters from Spanish to English, and making them available online, more people can study her writing in conjunction with her paintings. Through studying Varo's written work, one can realize a greater appreciation and understanding of her visual art. This research is part of the project *Explorations in Surrealism: Myth, the Occult, and Experimental Writing in the Works of Mexican and European Surrealist Women Artists (1930's to 1960's)*, headed by Dr. María Claudia André. The objective is to make further discoveries and connections in the field of women and surrealism, and to make this information more accessible to scholars and the public through dissemination on the web.

This project is funded by the Jack Nyenhuis Faculty Summer Grant (Hope College), the New Directions Initiative of the Great Lakes Colleges Association, and the Andrew W. Mellon Scholars Foundation.

MELLON SCHOLARS

Defining Arthur: Morgan le Fay's Influence on King Arthur's Unexamined Moral Code in Malory and Zimmer-Bradley

Elizabeth Badovinac
Mentor: Dr. William Reynolds
Andrew W. Mellon Scholars Program and Department of English

In the late 15th century, Sir Thomas Malory, the accepted author of what would later be printed as *Le Morte d'Arthur*, penned the words that would haunt the legend of King Arthur forever: HIC IACET ARTHURUS, REX QUONDAM REXQUE FUTURUS. In 1958, writer T.H. White would provide a succinct translation of that famous phrase in the title of his own novel, *The Once and Future King*. These words, said to have been inscribed on Arthur's tomb, would soon become synonymous with his character. Despite popular belief, however, Arthur's moral obligations as a monarch tend to overshadow his true, personal moral code. Even contemporary literature like Marion Zimmer-Bradley's *The Mists of Avalon*, while certainly attempting to deduce the character of Arthur from his actions and decisions, fails to examine Arthur's moral code in conjunction with his position as king.

Yet by combining Malory's compilation of Arthurian tradition in *Morte* and the relationship between Arthur and his half-sister in *Mists*, the character of the universal Arthur becomes clear. While commonly considered the perfect Christian king, Arthur's complex character, created through his interactions with Morgan le Fay, further reveals his connection to and consideration of the paganism present in his origin, life, and death. This project focuses on this unexamined, personal moral code of King Arthur, seeking to dispel the stereotypes around Arthur's seemingly flawless, primarily Christian character while at the same time examining his personal commitment to paganism.

This project was funded by the Andrew W. Mellon Scholars Foundation.

Cognitive Dissonance in Stowe's *Uncle Tom's Cabin*: An Evaluation of Rhetorical Technique and Cultural Impact

Anthony Bednarz
Mentor: Dr. William Pannapacker
Andrew W. Mellon Scholars Program and Department of English

Throughout its history, the United States has seen itself as an exemplary nation, a paragon of democracy, and an example that others should follow. The United States have also been characterized by a persistent division. Possibly the greatest example of such a division came in 1861 with the Civil War. The dissonance—the conflict of identity—of the nation was uniquely expressed by Harriet Beecher Stowe in her 1852 novel, *Uncle Tom's Cabin*. By examining the methods through which Stowe created dissonance in her reader and comparing them to the reactions of both Northern and Southern critics, it becomes possible to evaluate the impact *Uncle Tom's Cabin* had on American culture. Examining *Uncle Tom's Cabin* in a psychological framework provides a common ground upon which to discuss Stowe's rhetorical and literary technique, as well as examine its effectiveness.

This project was funded by the Andrew W. Mellon Scholars Foundation.

"A Warm Welcome and a Pleasant Evening": Clara Kathleen Rogers and Boston's Private Musicales, 1880-1900

Katie Callam
Mentor: Dr. Julia Randel
Andrew W. Mellon Scholars Program and Department of Music

At the turn of the twentieth century, Boston boasted an astonishing number of classical music performances: one critic complained of being overwhelmed by the "cyclone of concerts." The public concerts of the Boston Symphony, Handel and Haydn Society, and numerous smaller organizations are well-documented, but an equally vibrant private music scene

flourished alongside them, led by musicales in the homes of Boston's wealthy citizens. One hostess of such gatherings was Clara Kathleen Rogers (1844-1931), a soprano and composer whose guests included some of the leading musical figures of her day. Considering the individuals and circumstances surrounding her musicales provides a window into Boston's elegant music rooms: spaces where compositions – starting to sound more "American" than "European" – could be heard and discussed for the first time.

In order to reconstruct the world of in-home concerts, this project draws from the unpublished correspondence and scrapbooks which comprise the Clara Kathleen Rogers Papers (Houghton Library). Music composed for these events reveals not only the soundscape of musicales, but also the aesthetic values of those in attendance. Rogers's unpublished *Fantasia* for viola d'amore and harp, for example, was carefully composed so that an audience of both untrained and professional music-lovers could enjoy the piece.

This project was funded by the Andrew W. Mellon Scholars Foundation.

What is Solitude for in these Postmodern Times?

Dorothy Dickinson
Mentor: Dr. Andrew Dell'Olio
Andrew W. Mellon Scholars Program and Department of Philosophy

In today's world, solitude is becoming more and more difficult to find. As the focus continues to shift onto being connected and maintaining relationships, people are beginning to overlook the importance and necessity of being alone. Therefore, in order to rectify this problem and to add to the current conversation on solitude, this project will highlight the importance of solitude, particularly for the creative thinker and writer. It will do so by examining and comparing what the philosophers Friedrich Nietzsche and Martin Heidegger and the poet Rainer Maria Rilke said about it in their works and then by applying these thoughts to the role of solitude in the lives of creative writers today. The main goal of this paper is to show how a balance between solitude and encounter, between being alone and being with others, is necessary for people to truly experience the depths of life in all its beauty and radiance.

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Exploring the Graphic Novel: An Example of Multi-Media Education and the Importance of Visual Literacy

Stephanie Emanuele
Mentor: Dr. Elizabeth Trembley
Andrew W. Mellon Scholars Program and Department of English

Though educators have historically denounced the comics medium as detrimental to literacy development, recent research suggests this is not the case. In fact, educators can use comic art to enhance the visual literacy levels of students in all stages of development. This project exposes readers and scholars alike to the benefits of utilizing such a medium. Specifically, the work provides an example of its ability to inform an audience by use of multi-media images and text. This endeavor particularly focused on enlightening the reader on the culture and current events in Afghanistan. The scope of the work included writing an original script and completing illustrations for a graphic novel that communicates the effects of war on a soldier's mental and emotional state. Research for this project included studying the memoirs of soldiers from the current war in the Middle East, specifically in events pertaining to Kabul, Afghanistan. Digital components of this project involved the use of a Wacom Tablet for completing the artwork and an illustration program used to colorize the pages. The accompanying research paper about the creative project outlines the process and sources used in developing a script. First, it outlines the history of the graphic novel and the conversation surrounding its purpose. The paper then continues to specifically detail the research that influenced the style, context, cultural, social, and political references of my work.

This project was funded by the Andrew W. Mellon Scholars Foundation.

MELLON SCHOLARS

The Leap of Faith: Authentic Greek in the King James Bible

Bill Getschman
Mentor: Dr. Curtis Gruenler
Andrew W. Mellon Scholars Program and Department of English

Until the Harry Potter series, the Holy Bible was the bestselling book since the invention of the printing press. Among the 4.7 billion copies of different translations and variations, why is the King James Version still celebrated as the Book of Books even after 400 years? At the time of the King James' publication in the 17th century, the English language was being pushed, molded, and compounded in many different directions. It was a malleable hybrid, taking hits, downsizing; borrowing and expanding; receding and maturing into what we know today. The King James Bible managed to transcend Puritan/Bishop relations, it managed to overshadow the most popular bibles of the time and win over the hearts and the language of the country and, in turn, the world. Through verse-by-verse analysis and comparisons with other translations of the Bible, I will prove that the King James Bible best captures the meaning of the original Hebrew and Greek texts with a proper tone of authority that is part of the King James Bible's colossal impact on the English language.

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Rape and Reconciliation in Sierra Leone

Mary Kate Hart
Mentor: Dr. Ernest Cole
Andrew W. Mellon Scholars Program and Department of English

Sierra Leone was engaged in a brutal civil war, which lasted from 1991 to 2002. The conflict was characterized by atrocities including amputation and systematic rape. The victims of rape in Sierra Leone endured great suffering and many continue to suffer from the effects. Exacerbating the situation, the Special Court for Sierra Leone and The Sierra Leone Truth and Reconciliation Commission proved to be inadequate for rape victims. This project will use the narratives of sexual violence in Sierra Leone as a basis from which to explore reconciliation. It will make the case that, because the victim experiences profound trauma as a result of rape, forgiveness and reconciliation are deeply needed by both the individual affected and the larger community. This article will argue that, given the nature of the crime, the victim of rape should not reconcile with her victimizer on an individual level. Nonetheless, a greater reconciliation can occur for the victim who is broken physically, spiritually, and psychologically by rape: reconciliation that is internally directed, reconciliation between the victim and the community, and reconciliation between the victim and God.

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The Inadequacy of AP English Literature and Composition Exams as Substitutes for College Writing Courses

Allyson Hoffman
Mentors: Drs. Ernest Cole and Peter Schakel
Andrew W. Mellon Scholars Program and Department of English

While the College Board promotes the benefits of taking Advanced Placement (AP) exams, it neglects to inform students that the AP English Literature and Composition exam does not reflect a typical college writing class assessment. The goal of this research project is to demonstrate the need for student enrollment in a college writing course and the consequences of exemption after passing the AP English Literature and Composition Exam. Even if students pass the AP test, they likely have not fully mastered writing skills that would warrant an exemption from a college writing class. Unfortunately, college students are usually required to take only one college writing course, which can be substituted with AP credit. After analyzing studies conducted by the College Board and other institutions, it is obvious that students who take more writing courses will have better writing skills. I argue that all college students, regardless of their intended major, should take two college writing courses and that only one of these courses may be substituted with an AP English Literature and Composition Exam score of 4 or 5. The second writing course will be departmentally oriented and give students the opportunity to improve their writing

skills in the discipline they are pursuing. By taking an additional writing course, students will improve their writing skills and be more fully prepared for further academic and occupational tasks.

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Role of Music in the Korean and English Language

In Hyuk Hwang
Mentor: Dr. Sonja Trent-Brown
Andrew W. Mellon Scholars Program and Department of Psychology

"An-nyung" is the standard Korean term of greeting; it is also the standard Korean term of farewell, distinguished only by the the inflections of pitch. Such differences may contribute to the challenges Korean speakers face in learning the spoken English language. This study investigated the role musical elements, such as personal musical history of participants and musical factors found in the speech of Korean and English, plays both in the speaking of the two languages, and also in the learning of English as a second language for Korean speakers. Through techniques such as questionnaires, and analysis of recordings of the participants, this experiment has aimed to improve the quality of life of Korean students with English as a second language by providing insight to the role of music in the Korean and English language.

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Echoes from the Archive: How Oral History, Radio, and the Archive Intersect

Madalyn Muncy
Mentor: Dr. Natalie Dykstra
Andrew W. Mellon Scholars Program and the Department of English

Stories are how we understand the world around us. Every day we read stories in newspapers or magazines, watch them on television, or listen to them on the radio. We tell stories amongst ourselves over dinner or coffee or the phone. We are constantly sharing bits and pieces of our lives with those around us. It is easy for these stories to be lost forever, especially with the twenty-four hour news cycle. Moreover, there seems to be little focus on the stories of the past as we jump from one subject to the next without pausing to let each story sink in. Some stories remain untold and forgotten, buried within archives. But the past can provide us with an understanding of the present: what's past is prologue. What if we were to bring new life to these forgotten stories of the archive through new digital media? Can we see the lives of ordinary people in a different and revelatory way? Can they help us understand the past or present better? In this project, I study how stories shape how we view ourselves and our past. Inspired by NPR's "This American Life," I explore the theme of escape with linked stories of a Laotian immigrant, a former slave, and a young fugitive, which help me to understand how stories can intersect in new and interesting ways. My analysis applies theories of oral history and radio broadcasting to archival materials in order to further comprehend what it means to tell a story and to trace out the impact stories have on our culture.

This project is funded by the Andrew W. Mellon Scholars Foundation.

Contextualizing Ellen H. Richards: America's Forgotten First Lady of Science and Nutrition

Madalyn Northuis
Mentors: Drs. Jeanne Petit and Anne Heath, and Professor Priscilla Atkins
Andrew W. Mellon Scholars Program and Departments of History, Art and Art History, and Kinesiology

Food industry practices have been under increasing scrutiny over the past fifteen years. Unsavory relationships between government and food industry officials have led to instances of lax policies and poor practices. Ultimately, the consumers pay for these "private pacts" with their health. Today's heightened attention to food production, nutrition, and public health has a notable antecedent in the work of Progressive Era activist, Ellen H. Richards (1842-1911), the most prominent female chemist of the Progressive Era (1890-1920). While attending MIT (1870-1873), Richards's interest in nutrition developed into a vocational calling. After graduation, she set out to save society from their nutritional ignorance one book and one meal at a time. Because her attempts were numerous, this project and exhibit focuses on her efforts to raise awareness about adulterated food products

and to improve the dietary habits of children through school lunch programs. Although Richards's contribution to the field of nutrition was substantial, scholars have focused on the accomplishments of her male contemporaries, such as Edward Atkinson, Robert Hunter, and Upton Sinclair. The goal of this project and exhibition is to reinsert Richards into the history of Progressive Era nutrition reforms. Reexamining this topic will not only provide a better understanding of the comprehensive effort to prevent food adulterations and improve people's nutritional habits throughout the Progressive Era, but it may also provide a better understanding of America's current nutrition movements and laws.

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Post-Conflict Peace-building: What Role for Historical Accounting?

Daniel Owens
Mentors: Drs. Virginia Beard and Fred Johnson
Andrew W. Mellon Scholars Program and Departments of Political Science and History

There has been considerable discussion among scholars in the past two decades regarding the efficacy of transitional justice mechanisms such as truth commissions and tribunals. These methods, which aim to advance peace, justice, and reconciliation in post-conflict societies, have been applied in a variety of capacities around the world, particularly in Africa. This paper focuses on two cases using transitional justice processes to build reconciliation across their nations - the South African Truth and Reconciliation Commission (TRC) and Rwanda's gacaca courts as well as the International Criminal Tribunal for Rwanda (ICTR). Grounded in the transitional justice literature—multi-disciplinary scholarly monographs and articles—it draws heavily on material obtained during fieldwork in Rwanda, including personal interviews, a focus group, and participant observation. It also utilizes material gathered during participant observation in South Africa. Specifically, the paper explores how historical accounting impacts peace-building in a post-conflict society. It then places the lessons gathered within the context of other reconciliation processes such as those initiated in Northern Ireland, the Balkans, and Sierra Leone. It concludes an inclusive, transparent historical accounting process offers a more effective and robust foundation for reconciliation than a restrictive, top-down approach.

This research was supported by the Andrew W. Mellon Scholars Foundation.

"A New Song": Music and Theology in the Ambrosian Hymns

Amanda Palomino
Mentors: Drs. Huw Lewis and Jared Ortiz
Andrew W. Mellon Scholars Program and Departments of Music and Religion

For younger and newer generations of Christians, the Church hymn might be considered an outdated or obscure form of worship. However, I believe that hymns represent an enduring model of Christian music that is still pertinent in contemporary churches. To understand its significance, we must look into the early days of the Church, specifically the fourth century. During this time, the first Latin hymns appeared in the Western Church, composed first by St. Hilary of Poiters and St. Ambrose of Milan. Ambrose's hymns enjoyed much greater popularity than Hilary's for their simple and beautiful language, earning him the name, "The Father of Hymnody." According to scholars of the field, Ambrose wrote as many as fourteen hymns, each organized in eight, four-line, antiphonal stanzas, and many more were dedicated to his example, constituting the Ambrosian rite. Of that extensive repertory, four have remained textually preserved and validated as truly "Ambrosian" songs by hymnody experts: *Deus creator omnium, Aeterne rerum conditor, Jam surgit hora tertia,* and *Jam Christus astra ascendante*. The lack of musical notation from this era leaves the melodies a mystery. I propose that the Ambrosian hymns are still valuable to the modern Church because studying them may inform us of the cultural importance of foundational Christian music, that is, the role and perception of music in early Christian worship. By analyzing the literary structure of these hymns, as well as Ambrose's own writings on music, I explore how and why Ambrose wrote these hymns as well as the principles of Christian worship which guided him. Ultimately, from this picture of worship in the early Church, I hope to form a clearer understanding of the relationship between music and theology, a subject which continues to be a crucial issue in the Church today.

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This is the Hope: Digital Poetics as a New Form for a New Age

Taylor Rebhan
Mentor: Dr. Pablo Peschiera
Andrew W. Mellon Scholars Program and Department of English

Major advances in technology have a unique and intense ability to change the way a society expresses itself. From the invention of the printing press to the advent of the World Wide Web, new technology has shown its capacity to shape the arts, literature, and society in ways that were previously unthinkable. Poetry reflects this phenomenon through its history of experimentation with visual form. From the early days of Greek Pattern-Poetry to today's constantly evolving digital poetics, technology has challenged poets to reconsider the architecture of their textual presentation. However, within this challenge lies another difficulty: how to strike the proper balance between modernity and quality. This is the task that poets have encountered in the past, and it remains highly relevant for the digital poet today. In this paper, I show how the advent of digital poetry is parallel to the surge of previous trends in visual poetry, particularly that of Brazilian Concrete Poetry in the 1950's. From there, I assert that digital poetics should be viewed as a new poetic form, separate from its predecessors, and that it should be taken into consideration by the poetry community. I illustrate this by revealing the process of making my own digital poem, as well as by analyzing important works in digital poetry. By weaving a thread between past and present forms of visual poetry, I show that much can be learned about the future direction of digital poetics by looking at the challenges and breakthroughs of the past.

This project was funded by the Andrew W. Mellon Scholars Foundation.

MELLON SCHOLARS

Constructing a Novel: Jane Austen's Literary Technique from a Creative Writing Perspective

Kara Robart
Mentors: Drs. Peter Schakel and William Reynolds
Andrew W. Mellon Scholars Program and Department of English

Jane Austen wrote six novels during the late 18th and early 19th century. As this was a time before creative writing programs existed, how did authors such as Austen learn to execute various literary elements? Which novels did Austen turn to for inspiration? Which authors influenced her writing style? Specifically, how did Austen handle characterization in her writing? Like most good works of fiction, not all of Austen's characters change during the course of the novels—some are static while others are dynamic. This paper examines the different methods by which Austen shapes the various characters in her novels. It also addresses the question of how the static characters function to balance and incite the protagonists, as well as how Austen depicts the development of some of her most dynamic characters.

This project was funded by the Andrew W. Mellon Scholars Foundation.

"Does Liberalism Need Modernity?": A Critical Analysis of Early Modern Political Theology

Chikara Saito
Mentors: Drs. Mark Husbands and Jeffrey Polet
Andrew W. Mellon Scholars Program and Departments of Religion and Political Science

The shifts in political thought in the late sixteenth and early seventeenth century are widely regarded as the historical stage for the rise of modern liberal political order. Further, the names of those from Jean Bodin and Thomas Hobbes are seen as the conceptual architects for modern political liberalism. Within this history, it is assumed that political liberalism and modernity are inextricably linked concepts. This symbiotic relationship between modern metaphysical presuppositions and the liberal state has, among other consequences, turned the notion of the separation of Church and State into a political maxim. If one is to enter into the public square and debate public policies, this set of reasoning loudly suggests, one must leave all theological concerns behind the veil of personal preference. This maxim and general consensus, however, rests on several flawed premises that this research has labored to charitably show and set a respectful disagreement. Upon investigating the nature of political liberalism, this study begins by outlining a means of evaluating the nature of a political system to see how one's metaphysical presuppositions interact with the concrete expression of governance. Since a legitimate political system is founded on its claim to being the rightful arbiter of justice, the nature and interplay of law and natural rights define the extent and content of the nature of a political system. This analytical standard is applied to a hermeneutical analysis of the works of the modern political giants of Thomas Hobbes and Jean Bodin. The study concludes on the note that while modernity and political liberalism can be congruently held, as is evident in these thinkers' major works, it is far from clear that one can establish that political liberalism, as a political disposition, is contingent on modernity's metaphysical claims. In turn, this argument hopes to articulate why explicit theological discourse is necessary in the public square.

This research was supported by the Andrew W. Mellon Scholars Foundation.

Strokes, Flashes, and Jottings: The Lives and Work of Alice Rahon and Lola Alvarez Bravo

Sara Sanchez
Mentor: Dr. María Claudia André
Andrew W. Mellon Scholars Program and Department of Modern and Classical Languages

Lola Alvarez Bravo, the Mexican photographer, and Alice Rahon, the French writer and painter, developed as artists in post-revolutionary Mexico. Both stand as two influential characters in the group of female surrealist artists who settled in Mexico in the 1930s and 1940s. This presentation explores the lives and the artistic production of Bravo and Rahon. Introduced and influenced by their husbands, these two talented women were catapulted into the art world gaining worldwide recognition. Although they both divorced their husbands, these men—Manuel Alvarez Bravo and Wolfgang Paalen— figure, arguably, as

the most influential men through out their artistic lives. Even though they never met, an invisible thread unites them through their common friendship with Frida Kahlo and their struggling journey to gain respect as female artists in their own right. Alice Rahon's writings and paintings portray the prehistoric mysticism that she sought and admired through her many trips; Lola Alvarez Bravo's black and white photographs expose the simple but cultural, daily life of Mexico. Overcoming many obstacles since their childhood, these women created their niche in the creative world, taking advantage of Mexico as their backdrop.

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Student Literary Magazines Face and Embrace the Digital Reality

Katie Sauer
Mentor: Dr. Curtis Gruenler
Andrew W. Mellon Scholars Program and Department of English

When I was hired for the position of co-editor for OPUS, Hope College's bi-annual student literary magazine, I began to consider how I could work to further the mission of this print publication: to represent the creative work of the student body. I sensed the need to somehow reinvigorate the periodical and catalyze its evolution into a medium that can aptly reflect the range of skills and interests of today's Hope students. By asking questions like, "What is the purpose of a print or digital literary magazine?" "How can a digital format best meet the objectives of a literary magazine?" and "What would the process of transitioning from print to digital publication look like?" the possibilities became more clear. OPUS could benefit from the opportunities offered by digital literary magazines, which are able to showcase new kinds of creative expression such as multimedia projects, projects including animation, and audio and video creations. Online access also increases a publication's capacity to disseminate every type of student work, deepening the impact of being published in a private school's literary magazine. This project follows my search for answers to the aforementioned questions. I have conducted scholarly research on the various components and aims of the digital literary magazine as a genre and have sought to extract what supports their survival and success. Additionally, I investigated other digital literary magazines, both undergraduate and professional, to look for possible models and potential obstacles. This knowledge, derived from a combination of theoretical research and analysis of existing publications, can be applied to other aspiring literary journals. The culmination of my project is the creation of a specific, practical plan to digitize OPUS, which I hope to enact in the future. This transformation could serve to bring OPUS to the forefront of the digital literary world.

This project was funded by the Andrew W. Mellon Scholars Foundation.

Save the Indian, Save the (Wo)man: The Boarding School Poetry of Elsie Fuller, Maude Cooke, and Agnes Hatch

Alicia Schubert
Mentor: Dr. Jesus Montaño
Andrew W. Mellon Scholars Program and Department of English

From the years during the Civil War until the mid-1930s, one of the United States' main objectives was to assimilate as many Native Americans into civilized society as possible. One way the American government set out to accomplish this was through the passing of the Dawes Allotment Act in 1887, which broke apart tribal lands into individual plots. The act forced Native Americans to learn farming, a culturally acceptable occupation, and sell their surplus crops to the government for widespread distribution. Another method of assimilating the Native Americans was sending their children to boarding schools, where white teachers instructed them in the ways of civilized life. Elsie Fuller, Maude Cooke, and Agnes Hatch were three young Native American women who attended boarding schools during the assimilation years and wrote about their experiences. This project analyzes their poems, namely "A New Citizen," which praises the Dawes Act, and "Our Cottage," which subtly defies assimilation. An analysis of these poems has never before been undertaken. Thus, this project endeavors to fill a significant gap, providing a glimpse into the lives of three women striving to come to terms with what it means to be Native American in a land that is no longer their own.

This project was funded by the Andrew W. Mellon Scholars Foundation.

MELLON SCHOLARS

The Quiet Feminist: Feminist Themes in the Work of Erma Bombeck

Megan Stevens
Mentor: Dr. Jeanne Petit
Andrew W. Mellon Scholars Program and Department of History

During her most productive years in the 1970s and '80s, humorist Erma Bombeck brought laughter to millions of readers across America with her newspaper columns, Good Morning America segments, and bestselling books. Although she is best remembered for her writing, Bombeck was also active in feminism. She served on the Presidential Advisory Committee for Women during the time of the Equal Rights Amendment of 1978 and, through her writing, encouraged women everywhere to follow their dreams, even if they felt "too old to change." In spite of this, very little has been written on Bombeck as a feminist. Therefore this research hopes to analyze feminist themes, such as equal employment and commentary on idealized portrayals of motherhood, in her published books, and argue that through these themes Bombeck brought feminism to her mostly moderate Christian audience.

This project was funded by the Andrew W. Mellon Scholars Foundation.

Feminist Perspectives of the Eames Legacy

Katelyn Szmurlo
Mentor: Professor Stephanie Milanowski
Andrew W. Melon Scholars Program and Department of Art and Art History

I will expose a feminist cultural perspective of one of the most influential designers of the 20th century. After reading, Why Have There Been No Great Women Artists? by Linda Nochlin, I became concerned with the lack of acknowledgement for women artists and designers, particularly the work of Ray Eames. The partnership of Charles and Ray Eames has been perceived as an equal collaboration of creativity and ideas throughout their work. Their marriage created one of the world's most innovative designs, which conceived the infamous "Eames Lounge Chair", constructed out of molded plywood and distributed to Herman Miller companies. Because they were a husband and wife team in the mid-twentieth century, many feminists and scholars have debated whether Ray Eames' efforts have lacked acknowledgment because of her position as a woman. For my project, I hope to uncloak the truth about the Eames team collaboration. In order to do this, I will begin to introduce Ray Eames' life before Charles, analyze cultural feminism problems in the art world, and highlight Ray's major contributions to the Eames Legacy.

This project was funded by the Andrew W. Mellon Scholars Foundation.

Campus Christians: A Candid Exposé

Lindsay Timmerman
Mentors: Drs. Kathleen Verduin and William Pannapacker
Andrew W. Mellon Scholars Program and Department of English

My research juxtaposes analysis of Hope College satires such as *The Ranchor, Boos from Hope,* and *The Millstone* with authoritative research on student expression, religious satire, and satire as a genre in order to create an argument that religious satire should be nurtured rather than discouraged here at Hope. While some may feel uncomfortable with the provocative nature of satirical works, it is important to recognize the value in allowing one's beliefs to be questioned. Religious satire is particularly apt at using humor to bring religious issues to a level where they may be analyzed. As satire scholars Terry Ray Clark and Dustin Griffin note, satire often works to broaden the perspective of the reader. While hypocrisies and damaging stereotypes may be revealed, religious satire also provides an opportunity for personal positions to be defended and beliefs to be solidified.

This research was funded by the Andrew W. Mellon Scholars Foundation.

His Skin was Pale and His Eye was Odd: The Dynamic Visual History of Sweeney Todd

Mary Elizabeth Winther
Mentor: Professor Michelle Bombe
Andrew W. Mellon Scholars Program and Department of Theatre

Since Sweeney Todd's first appearance as a character in the Victorian penny dreadful *A String of Pearls*, the story of this murderous barber and his baker accomplice Mrs. Lovett has inspired numerous theatrical adaptations, at least 5 films, a Tony Award winning musical, and several books devoted to the character and the story. Scholars have found in this story, and in it's profusion of re-tellings, countless aspects to analyze. The leading scholar on Sweeney, Robert L. Mack, has written two books on the tale. He recounts the history of the story, other urban legends that inspired or were inspired by this one, and other tales of cannibalism. He analyzes the historical context of the story, and draws comparisons between the early versions and other pieces of literature from the same period. Another writer, Peter Haining, claims to have discovered that Sweeney Todd was indeed a real person. He has scoured London for evidence, and has written an entire book about his theory. Although his work is completely unsubstantiated, he has devoted his entire life to the search for Sweeney. Musical scholars have written about the genius of Sondheim's musical version, and many have analyzed how the music adds to the complexity of the characters and the story. However, despite the vast body of work surrounding Sweeney, there is currently no cohesive work on the visual development of the tale. With each re-telling, the look of the characters and of the world they inhabit has evolved to fit the new tale. The visual history of the story is equally as rich as it's literary and theatrical development.

This project was funded by the Andrew W. Mellon Scholars Foundation.

A New Form of Struggle: Betty Ford and Breast Cancer in the 1970s

Kevin Wonch
Mentor: Dr. Jonathan Hagood
Andrew W. Mellon Scholars Program and Department of History

In the 1970s, the nature of how Americans perceived breast cancer changed. Instead of being a taboo topic, as it was previously, people began to discuss breast cancer and its various impacts openly. This is due in part to the role of First Lady Betty Ford, wife of President Gerald R. Ford, who went public about her diagnosis of breast cancer in 1974. While most research on Ford consists of her role in establishing the Betty Ford clinic for substance abuse or how her breast cancer discussions impacted the public, little has been written on how her role regarding breast cancer affected the doctor-patient relationship. This project analyzes First Lady Betty Ford's 1974 public declaration of her breast cancer diagnosis and primary sources based on its response from both the scientific and public community provides insight into how Ford changed the relationship between the medical community and the public, and breast cancer awareness as a whole. Sources show that while Ford cannot be credited with the entire change in the doctor patient relationship, which was primarily based on the period as a whole, she helped the public realize that the way they needed to interact with doctors needed to change. She accomplished this through making the war on cancer an external struggle on a personal level, rather than on a national level. Furthermore, evidence shows that doctors, who were not connected intimately with the public, were not the ones to initiate that change. This project adds nuance to important themes in the history of science, such as the disconnect between patients and doctors, and doctor's reluctance to include patient responses and attitudes in their practices.

This project was funded by the Andrew W. Mellon Scholars Foundation.

PHELPS SCHOLARS

What If You Were One Out of 404,151?

Briana Armand and Courtney Kachlik
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

The Chicago public school system (CPS) is the third-largest school system in the United States, but CPS has received a lot of national scrutiny recently. Research shows that the large number of selective enrollment high schools is a strength of CPS. They offer a rigorous curriculum, a large number of Advanced Placement courses, and other pathways to higher education. The weaknesses of the Chicago schools are large class sizes, limited access to arts and music education, a shortage of social workers, an absence of school libraries, and lack of free transportation to and from school. If CPS committed itself to the five essentials for school success identified by the University of Chicago (effective leadership, collaborative teachings, involved families, supportive environment, and ambitious instruction), all of its schools would be more successful and all of its students would receive an excellent education, not just those in the selective enrollment high schools.

Why Are There Disparities in HIV/AIDS Between the United States and South Africa?

Emily Beckering, Madeline Brochu, and Vivian Liu
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

While health programs have made vast improvements in treating HIV and AIDS, the epidemic persists and is prevalent in many areas. In a study of HIV/AIDS treatments in the United States and South Africa, we found many disparities that resulted from socio-economic, educational, and demographic differences between Americans and South Africans. Though HIV was discovered at about the same time in both countries, the United States had the resources to do research on the disease and the means to educate the public about it. The drastic difference in the standard of living between these two countries also gives many Americans access to expensive HIV/AIDS treatments, while many South Africans are left with poor health care. However, HIV/AIDS remains a significant issue in both countries. If people in both the United States and South Africa are to receive better treatment, it is necessary to educate everyone about the disease and expand the health care system to include a larger number of people.

The Dream Act

Jocabed Garduño, Amanda Napier, and Laura Zavala
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

Is the "American dream" really possible for everyone? Valedictorian of his class, Rishi was a high-school senior with an interest in studying medicine. He had moved to the United States eight years prior with his parents. Due to his legal status, college did not seem possible because there was no way for him to receive financial aid. Rishi's story is just one of many. The Dream Act is a bill that would allow people brought to the U.S. as children to pursue education, or enlist in the military, as a means of working toward permanent legal residency. Our research focused on the benefits of the Dream Act for young people here without documentation, as well as the arguments for and against the legislation. Some people strongly believe that this bill should not be passed, while others only pray that it does. What is your opinion?

Over the Border: What are the Myths, Misconceptions, and Controversies Surrounding U.S.-Mexico Illegal Immigration?

Jordan Hill, Israel Hipólito, Francisco Mendez, and Jacqueline Salgado
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

In recent years, the issue of immigration between the United States and Mexico has been a political hot topic. While many

people have strong opinions about this matter, not many understand the issue as a whole, which has led to many different myths and controversies. Our research aims to dispel these misconceptions and look at the truth behind the issue. We focus on multiple topics, such as the current legal immigration system, reasons for illegal immigration, and the prejudice faced by both legal and illegal immigrants and their descendants. Our presentation also features the story of an individual we interviewed who immigrated illegally into the states and has since become a legal citizen. Two of our group members also traveled to the U.S.-Mexico border on a Hope College immersion trip, learning about the issue of immigration first-hand.

The Variability of Women's Rights Across the Middle East

Siyang Hu, Ohanes Khacherian, and Natalie Polanco
Mentors: Profesors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

Many Westerners believe that women are mistreated throughout the Middle East. However, women's rights differ across the Middle East in various ways. In some countries, women have gained more rights in the last fifty years, but in others they have not. It is useful to compare Jordan and Saudi Arabia, which are in the extremes in the role of women in religion, the economy and society in general. In Jordan, for example, women are allowed to drive without limitations; however, in Saudi Arabia, if a women is seen driving, she is automatically imprisoned. Unfortunately, the policies of countries such as Saudi Arabia lead many people to believe that all Arab nations treat women in that way. The mass media have encouraged that stereotype as well. The reality is that across the Middle East, each country has different practices and policies, and women's rights are expanding at different rates. Lebanon, for example, is closer to Jordan in terms of women's rights, while Algeria is more conservative and closer to Saudi Arabia. It is a mistake for the world to generalize about Arab women when in reality there is significant variability in women's rights across the Middle East.

French Language and Culture in Crisis?

Ivy Keen, Kayla Schipper, and Yiran Zhi
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholar Program

All people value their native tongue to some extent. French speakers are especially attached to their language, and many of them believe that linguistic changes threaten their culture. This linguistic pride is partially due to the history of the French language and its historical influence on Europe as a whole. The French have long made attempts to preserve their language and prevent it from changing. They are even more concerned currently by what they see as threats from two sources: The increasing prevalence of English and of technology. This concern prompted the passage of an even stricter language law in 1994. However, language change is inevitable and impossible to prevent. Furthermore, it is important to remember that cultural change is not the same thing as cultural threat. The French language must adapt itself to modern society if it hopes to continue to thrive. The best way for the French to foster their language tradition is to promote multilingualism and multiculturalism. This would allow future generations to balance the near-necessity of speaking English along with their national language.

Misconceptions of Islam: Shari'a Law and Immigration in the U.S.

Anna Kremer, Nathan Pace, and Evan Rodgers
Mentors: Professors Wayne Brouwer, Charles Green, Amy Otis – De Grau, Yolanda Vega, and John Yelding
Phelps Scholars Program

The Quran (3:110) tells Muslims that they "are the best people evolved for mankind." Muslims are both proud of and sensitive about their religion. An impending threat to this pride is the continuing spread of globalization, or in some Muslim perspectives, the spread of "Americanization." Islam is not only a faith but a law—or as they describe it, a Shari'a—that regulates all aspects of their lives, including economic transactions, marriage and divorce, and matters of the state. Shari'a law is commonly referred to by Muslims as *the way*. In a broad sense, it is the Islamic code that guides Muslim beliefs and actions. Some countries follow Shari'a very strictly, while others interpret it more loosely. Many Americans are worried about the effect Islamic influence in the U.S. Government could bring, finding it easier to demonize the religion and its followers than to accept

the challenge to understand it. However, there is no one kind of Muslim American; with a variety of backgrounds and practices, Muslims differ from each other in many ways, and they have come to the U.S. for many different reasons. There is no reason to believe that Shari'a is more of a threat to the U.S. than are the religious beliefs and practices of people of other faiths.

Post-translational Modification of a Key Transcription Factor for HSV-1 Infection

Jamie Grit
Mentor: Dr. Steve Triezenberg
Laboratory of Transcriptional Regulation, Van Andel Institute

Herpes simplex virus type 1 (HSV-1) is a highly prevalent virus that causes cold sores. The HSV-1 virion contains VP16, an important multifunctional protein. VP16 is a potent transcriptional activator that recruits host cell proteins, including Oct-1, to initiate immediate early (IE) viral gene expression and therefore the lytic cycle. The VP16 amino acid residue serine 375 resides in a consensus casein kinase II (CKII) site and lies within the region which interacts with Oct-1. We hypothesize that phosphorylation by CKII at serine 375 upon infection activates VP16 to initiate complex formation with Oct-1 and induce IE gene expression. Pharmacological inhibition of CKII with TBCA resulted in an 80% decrease in IE mRNA levels at 2 hours post infection (hpi) as quantified using qRTPCR. However, phosphorylation at serine 375 could not be detected in infected cell lysates 2-8 hpi using western blotting. In contrast, significant phosphorylation at serine 375 was detected at 20 hpi. Preliminary data suggests that phosphorylated VP16 may be preferentially packaged into the tegument of infectious virions. These data support an alternative mechanism by which late synthesized VP16 is phosphorylated at serine 375, packaged into infectious virions and delivered to the next cell pre-modified for Oct-1 complex formation and IE transcription activation.

This research was supported by the Frederik and Lena Meijer Student Internship Program.

BIOLOGY

Regulation of Seam Cell Function by the Non-Receptor Tyrosine Kinase, FRK-1, in *C. elegans*

Caroline Askonas, Ronald Ellis, Danielle Mila, and McLane Watson
Mentor: Dr. Aaron Putzke
Department of Biology

We are characterizing the role of a non-receptor tyrosine kinase, FRK-1, during post-embryonic development using the nematode, *Caenorhabditis elegans*. To determine the role of FRK-1 in development, the effects of the absence of *frk-1* were analyzed in stem cell-like seam cells. In the absence of FRK-1 function we have observed the loss of asymmetric division in the seam cells and subsequent loss of progression to adulthood. We have begun to analyze how FRK-1 depleted larval seam cells behave compared to differentiated adult seam cells, thereby preventing further development. Using the *frk-1* knockout (ok760) VC558 line of *C. elegans*, the identity of seam cells and the signaling involved can be further studied with the use of an optimized antibody staining protocol to assess the identity of the mutant seam cells and hypodermal cells present and through crosses with worm lines that contain florescent protein promoters. Establishing the function of FRK-1 in *C. elegans* would allow for not only a better understanding of development, but could help assess the role of Fer in humans. Fer has previously been shown to be over expressed in prostate cancer and deleted in acute myeloid leukemia (Rubinfeld et al., 1997; Munemitsu et al., 1995), so the determination of the function of FRK-1 could thereby potentially provide insight into more fully understanding and preventing cancer. Thus, having a more complete awareness of how cells adhere and signal to one another and respond to their environment will not only allow the intricacies involved in development to be further comprehended, but could ultimately have greater implications to stem cells and cancer (Reya et al. 2001).

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The Effect of Intermittent Heat Acclimation on Thirst and Body Water Status in Rats

Amanda Beck, Jacob Johnson, and Ellen Ray
Mentor: Dr. Christopher Barney
Department of Biology

Heat exposure can lead to thermal dehydration in rats, as they use saliva spreading for evaporative cooling. The effects of heat acclimation in rats on thermal dehydration and subsequent water intake are not well understood. In this study, male Sprague-Dawley rats were subjected to 4 hours of heat stress (37.5°C) a day, with or without water, for seven days. Control rats were subjected to 4 hours at 25°C with water. On the eighth day the acclimation was tested by exposing all rats to 4 hours at 37.5°C without water, or 4 hours at 25°C with water. Water intake, urine output, and plasma parameters were measured. Plasma parameters consisted of plasma sodium concentration, hematocrit, hemoglobin and plasma protein measurements. There was a significant decrease in evaporative water loss and total water intake from day one to seven and higher percent rehydration and sodium excretion in the heat acclimated groups as compared to a control. There were no significant effects on plasma parameters, or urine output. These data indicate during intermittent heat acclimation plasma volume is conserved at the expense of cellular volume and that the change in water intake with heat acclimation is not the result of alterations in either cellular dehydration or blood volume.

This research was supported by NSF REU grant DBI-0754293.

Dissecting the Regulation of the *OLE1* Gene in *Saccharomyces Cerevisiae*: Examining the Role of Fatty Acid Species and Concentration

Lauren Bedard, Matthew Ochs and Marshall Willey
Mentor: Dr. Virginia McDonough
Department of Biology

The *OLE1* gene product, the delta-9 desaturase, inserts a double bond in saturated fatty acids to create unsaturated fatty acids (UFAs). *OLE1* expression is controlled in part through the transcription factors Mga2p and Spt23p in response to the supply of UFAs. These proteins reside in the endoplasmic reticulum, and when insufficient supply of UFAs is detected, they are proteolytically cleaved and translocated into the nucleus, where they activate *OLE1* expression. Recently our lab has isolated a mutant that is deficient in regulation of *OLE1*, called *nro1* (*n*o *r*egulation of *OLE1*). The mechanism for the *NRO1* protein's action is unknown. In this study, growth tests and enzyme assays using reporter genes controlled by the *OLE1* promoter region suggest that Nro1p responds more strongly to the fatty acids 16:1 Δ9 and 18:2 Δ9, 12, than 18:1 Δ9 and 17:1 Δ9. When wild type cells are fed 16:1 Δ9 and 18:2 Δ9, 12, fatty acid profiles revealed them present at a higher percentage than when fed other UFAs, probably because endogenous UFA production is more severely curtailed. The concentration of the fed fatty acid also impacted the regulation of *OLE1,* with higher concentrations bringing about more robust regulation. However, in *nro1* cells, there was diminished regulation of expression in response to feeding certain UFAs as compared to wild type cells. Western blot analysis showed no evidence that Mga2p and Spt23p regulate *OLE1* through the *NRO1* signaling system. We conclude that the expression of *OLE1* is dependent on properties of the fed fatty acid, the amount in the cell, and that the *NRO1* gene product may be working through other regulatory networks besides Mga2p/Spt23p.

This research was supported by an award from the National Science Foundation-Research Experiences for Undergraduates.

Fer Kinase is Required for Proper Vasculogenesis in Zebrafish

Elizabeth Billquist
Mentor: Dr. Aaron Putzke
Department of Biology

Fer kinase, a protein involved in the regulation of cell-cell adhesion and proliferation, has been implicated in leukemia, gastric cancer, and liver cancer. However, the role Fer plays in the molecular mechanisms of these diseases remains largely unknown. By studying Fer during development, we hope to obtain a better understanding of its involvement in human carcinogenesis. Our lab has shown that FRK-1, a Fer kinase homologue in C. elegans, is involved in regulating a stem cell-like population during development. In this study, we begin to bridge the gap between the invertebrate and vertebrate realms by elucidating the role that Fer kinase plays during zebrafish embryogenesis. Our data indicate that not only is a Fer homologue expressed in zebrafish, but that it is required for normal vaculogenesis and hematopoiesis. Fer mRNA is expressed in the early hematopoietic stem cell lineage by 24 hpf, peaks at 48 hpf and is absent by 72 hpf. Morpholino knock-down of Fer results in disorganized vasculature and reduced sprouting of intersegmental vessels, which ultimately leads to improper circulation. Finally, we have performed quantitative gene expression and embryonic rescue experiments implicating Fer regulation of the Wnt-Notch pathway, which directs the ratio of vascular/blood cells as well as angiogenesis during development. This unique regulatory function for Fer kinase would provide valuable information not only to the field of developmental biology, but could also lead to novel therapies in a variety of cancers in which expression of Fer kinase is either misregulated or deleted, such as in myeloid leukemia.

A Toxic Ride Through the Pumpkin Patch: Identification of Cytotoxic Genes in Mycobacteriophage Pumpkin

Eric Cox
Mentors: Drs. Joseph Stukey and Virginia McDonough
Department of Biology

Mycobacteriophages are viruses that infect mycobacterium host cells. With more than 200 mycobacteriophage genomes

sequenced and available in GenBank, they represent the largest collection of sequenced phages that infect a single host (*Mycobacterium smegmatis*). Surprisingly however, they are genetically diverse and contain many genes of unknown function. This fact begs the question of how the different mycobacteriophages accomplish the host-cell takeover that supports infection and phage propagation. One way to tackle this problem is to first identify phage genes that are cytotoxic when expressed individually in the host cell. We hypothesize that cytotoxic phage genes will encode proteins that interact with and affect the function of critical host cell proteins. We are using this approach on a mycobacteriophage called Pumpkin, which was isolated at Hope College in 2008. We have identified a small genomic region, encompassing genes gp115-120 that is cytotoxic to *M. smegmatis*. Subsequent division of this region further identified gp115 and the region gp117-120, possibly centered on gp119, as possessing cytotoxic activity. Neither gp115 nor gp119 from mycobacteriophage Pumpkin have assigned functions and appear to only match other mycobacteriophage proteins. Future work will include further testing of individual genes in this region.

Physiological, Behavioral and Biochemical Effects of a Cafeteria Diet in Male and Female Rats

Cassondra Cramer, Johanna Forst, Katelyn Kleinheksel, Abigail Koning, Laura McKeel, Sierra Opper, Therese Sammarco, and Lauren White
Mentor: Dr. Christopher Barney
Department of Biology and Neuroscience Program

High-fat, high-sugar cafeteria diets and their association with obesity lead to increases in metabolic syndrome and decreased lifespan in humans. As a growing health epidemic, the effects of obesity are taxing the quality of life as well as the healthcare system. In this study sixteen (M=8, F=8) Sprague-Dawley rats were given standard rat chow (SC) while sixteen (M=7, F=9) were provided an energy-dense cafeteria (CAF) diet for 10 weeks. We aimed to evaluate how the CAF diet impacts the physiological make up and behavioral responses in relation to metabolic changes and obesity and any interaction with the sex of the animal. Dopamine (D2) and leptin receptor concentrations were analyzed using Western blot to determine biochemical influences contributing to physiological and behavioral responses. Body weight increased over time at a significantly greater rate in the CAF diet group resulting in diet-induced obesity with significant differences between male and female rats. Female rats were shown to drink significantly more water and saccharine solution than male rats, consistent with prior findings. SC rats also drank significantly more saccharine solution suggesting a reduced pleasure response due to a CAF diet. CAF diet rats showed a significantly greater metabolic rate and significantly more brown fat as previously reported. In addition, the CAF diet was associated with alterations in pre-pulse inhibition and exploratory behavior. These results indicate that in addition to physiological responses CAF diet may alter behavior in male and female rats.

Isolation of 20 Mycobacteriophages and Genomic Analysis of the Novel Mycobacteriophage, Inventum

Thomas D'Addario, Allie Day, Carl Deeg, Laura Johnson, Matthew Karssen, Brittany Leonard, Drake Neilands, Nicholas Owens, Julia Schuman, Mark Stukel, Lucas Tans, Miriam Thomas, Miranda Ulmer, Cassie VanWynen, Daniel Vessells, Victoria Viveen, and Matthew Weiss
Mentors: Drs. Aaron Best and Joseph Stukey
Department of Biology

Twenty new mycobacteriophages were isolated from soil samples collected on or nearby Hope College in Holland, Michigan. All were capable of infecting *Mycobacterium smegmatis* and produced a variety of plaque morphologies based on size, shape, and clarity, consistent with the isolation of an assortment of different phages. Both lytic and temperate phages appear represented in this collection. Nineteen purified phage stocks were used to prepare genomic DNA samples for restriction digest analysis. A comparison of those 19 digest results revealed few similarities among the group, further supporting our interpretation that most of the new phage isolates were distinct. One mycobacteriophage, Inventum, was chosen for complete genome sequencing using the Ion Torrent Personal Genome Machine system platform and comparative genomic analysis. The predominant plaque produced by Inventum was 3-4 mm in diameter and displayed a clear center surrounded by a turbid ring after 24 hours of growth at 37°C. Comparison of the restriction digest pattern for Inventum with more than 200 known mycobacteriophage genomes did not yield an exact match, suggesting Inventum was a novel mycobacteriophage. Genome sequence data for Inventum supported that prediction but also revealed a relationship to large group of mycobacteriophages. The genome of Inventum is 57 Kb, 61.4% GC, and contains 106 genes in agreement with the genome characteristics of closely

related phage. A detailed analysis of the complete genome sequence and comparison with sequenced members of this small and unique group of mycobacteriophages is the subject of the second semester of this yearlong course and is presented.

This work was supported in part by the Department of Biology at Hope College and the Howard Hughes Medical Institute's Phage Genomics Research Program.

Fatty Acid Uptake in the *Saccharomyces cerevisiae* Mutant *mon2Δ*

Anthony Gasparotto, Mona Soni, and Brittany Gasper
Mentor: Dr. Virginia-McDonough
Department of Biology

The yeast *MON2* gene product is a scaffolding protein involved in vesicular budding on the trans-Golgi membrane. We have found that the *mon2Δ* mutant shows increased growth sensitivity to undecylenic acid (11:1Δ10), a medium chain unsaturated fatty acid (UFA), compared to wild type cells under the same growth conditions. In order to better understand this effect, we examined wild type and mutant *mon2Δ* responses in unsupplemented, 18:2Δ9,12, and 11:1Δ10 fed conditions. We have found that when Mon2p is absent, it results in altered molecular responses to 11:1Δ10 supplementation: the *mon2* deletion results in small but significant changes in the fatty acid profile; differential localization of BODIPY 500/510 C1, C12, a fluorescent fatty acid analog; decreased expression of *OLE1,* which encodes the delta-9-desaturase; and, altered rates of fatty acid uptake. These changes result in decreased synthesis of endogenous UFAs, which may be responsible for the 11:1Δ10 toxicity. These findings suggest a role for Mon2p in the uptake and trafficking of exogenous medium chain fatty acids, possibly through vesicle transport.

This research was supported by awards from the National Science Foundation-Research Experiences for Undergraduates and a Research Scholar Award from Howard Hughes Medical Institute.

Long Term Population Trends of *Tsuga canadensis* in a West Michigan Dune Forest

Andrew Gomez-Seoane, Adam McVey and Eric Hederstedt
Mentor: Dr. K. Greg Murray
Department of Biology

Size or age distributions of trees often yield valuable clues about changing environmental conditions and the responses of populations to them. In a recent study, we measured the size distribution of Eastern Hemlocks in a forest near Lake Michigan (the Hope College Nature Preserve) to determine whether active recruitment into the population is taking place at a similar rate as in the past. Increment cores were collected from 37 of the trees across the entire size range to establish the relationship between trunk diameter and age. Further analysis found that the size distribution was strongly skewed toward the intermediate and larger tree size classes, suggesting a failure of recent recruitment relative to that in the past. Age data collected from increment cores suggests that Eastern Hemlocks on this site take approximately 41 years to reach just 10 cm dbh (diameter at breast height), and coupled with the size distribution these data suggest that recruitment into the population has been virtually zero since the early 1970's. Potential reasons for this decline in recruitment include, but are not limited to, herbivory by deer and possibly climatic changes in the last few decades (increasing temperatures and decreasing precipitation). Regardless of the reason, Eastern Hemlock will decline in density in this forest over the long term if the observed trend continues into the future. Our group plans to extend data collection to similar forest sites in West Michigan, both north and south of the Hope College Nature Preserve.

Weapons of Cellular Destruction: Investigating the Cytotoxic Effects of Mycobacteriophage Vix Gene 80

Danielle Goodman, Drew Krum, Megan Ludwig, and Daniel Obregon
Mentors: Drs. Joseph Stukey and Virginia McDonough
Department of Biology

A bacteriophage, or phage, is a virus that infects and reproduces in bacteria. During productive infections – those that result in

construction and release of infectious phage particles – key host cell metabolic processes are often modified by the infecting phage and redirected toward making new phage particles. Protein-protein interactions are likely involved in this process. Identifying the relevant phage and host gene products and understanding how phage exploit their host's weaknesses could lead to new therapeutic options for many bacterial illnesses. In this work, mycobacteriophage Vix, gene 80, a gene cytotoxic to host strain *Mycobacterium smegmatis*, was studied. Our hypothesis was that an interaction between the Vix80 gene product and a host cell protein, possibly MSMEG_3532, affects host cell metabolism and causes growth inhibition. Vix80 protein shares 68% amino acid identity with the product of gene 77 of mycobacteriophage L5, a gene that has been previously shown to exhibit cytotoxic properties and interacts with MSMEG_3532, a L-serine dehydratase. Both Vix80 and L5_77 gene products contain a conserved domain of unknown function near the N-terminus. The Vix80 gene was dissected and the N-terminal conserved domain was tested separately for cytotoxic activity. The N-terminal 66 residues, encompassing the entire conserved domain of unknown function, was found to be cytotoxic to *M. smegmatis*. Efforts to express and purify both the Vix80 and MSMEG_3532 proteins in *Escherichia coli* and show a physical interaction in vitro have not succeeded due to extremely low solubility of our T7-antigen tagged MSMEG_3532 protein. We continue to explore this approach with modifications, including the removal of the T7-antigen tag on MSMEG_3532. Expression of the Vix80 protein in *E.coli* was also cytotoxic indicating existence of a conserved host target in this species, or, that Vix80 cytotoxicity does not require an interaction with a specific host protein. Finally, to examine whether the Vix80 gene is required for phage Vix infection of *M. smegmatis*, we are in the process of removing the genomic copy of Vix80 in phage Vix.

This work was supported by Hope College Biology Department, an ASBMB undergraduate summer research award and a Research Scholar Award from Howard Hughes Medical Institute to Danielle Goodman, and a National Science Foundation REU award to Daniel Obregon.

Investigating Fer Kinase Regulation of Gene Transcription During Development

Matt Harder
Mentor: Dr. Aaron Putzke
Department of Biology

The *Caenorhabditis elegans* protein FRK-1, an ortholog to Zebrafish (*Danio rerio*) and mammalian Fer kinase, is critical to the proper embryonic and larval development. In humans, aberrant Fer kinase levels have also been implicated in the progression of leukemia and prostate cancer. In addition to roles in the formation of the hypodermis in *C. elegans*, FRK-1 has been shown to localize to the nucleus in a cell-cycle dependent manner (Putzke et al, 2005.). This localization has led us to hypothesize that FRK-1, and its ortholog Fer kinase, are involved in the regulation of transcription factors during development. To discover potential gene targets regulated by Fer kinase activity, we aim to perform microarray analysis in nematodes, Zebrafish and human cells in the absence of Fer/FRK-1. Our microarray results, thus far, indicate that many genes with abnormal levels of transcription at 24 and 48 hours post fertilization in *Danio rerio* are associated with proper neurogenesis and vasculogenesis of the Zebrafish. We are currently pursuing microarray data in *C. elegans* (genomic knockout ok760) and as well as a human cell line utilizing with Fer knock-down (via siRNA). The aim of this research is to determine more about the development of *C. elegans* and *Danio rerio*, and to identify potential therapeutic gene targets for treatment in human cancers.

This research was funded by the Howard Hughes Medical Institute.

The Production of Monoclonal Antibodies to VACM-1/Cullin 5

David Hayes
Mentor: Dr. Vicki Isola
Department of Biology

Vasopressin-activated calcium mobilizing receptor 1 (VACM-1/Cullin 5) is a 780-amino acid membrane protein that inhibits cellular proliferation and has been suggested to be a tumor suppressor. We propose to produce monoclonal antibodies to VACM-1/cul5. We will immunize Balb/c mice with purified VACM-1 and a KLH-conjugated peptide corresponding to the amino-terminal sequence of the protein. Spleen cells from mice expressing antibody titers over 1:30,000 will be fused with mouse myeloma cells, and hybrids will be screened for monoclonal antibody secretion using an ELISA assay. To date we have purified VACM-1 protein, prepared the conjugated peptide, and optimized the ELISA assay. Production of monoclonal antibody against VACM-1/cul5 will provide us with a novel tool to better characterize its expression in cancer cell lines and in tumor samples.

Evaluation of the Antibacterial Properties of a Newly Developed Liquid Soap

Kayla Howard
Mentor: Dr. Vicki Isola
Department of Biology

A great deal of evidence suggests that widespread use of antibacterial soap containing triclosan may be harmful to humans and the environment. Thus, the development of new soaps not containing triclosan with antibacterial properties would be of interest. We compared a novel soap, Old Post Road, to Meijer Antibacterial, Soft Soap, and hand sanitizer in several different assays for antibacterial properties. In all cases, the soap containing triclosan was more effective at killing a wide range of bacteria. Old Post was at least as effective as Soft Soap, and more effective than hand sanitizer in the assays we performed. Evidence suggesting that Old Post Road soap may have activity against *Mycobacteria* species warrants further investigation.

Effects of a Fungal Endophyte on Resource Allocation in the Grass *Lolium arundinaceum* and *Elymus Canadensis*

Brennan Sieck
Mentor: Dr. Thomas Bultman
Department of Biology

Neotyphodium is a fungus that grows in above ground tissues, also known as tillers, of grasses such as *Lolium arundaceum* and *Elymus Canadensis*. The fungus reproduces by growing into the seeds of the plant. This sort of symbiont reproduction is called vertical transmission, as it is transmitted to the next generation of the plant. The relationship between the fungus and these plants has been thought to be a defensive mutualism, but an alternative relationship known as sexual parasitism has been proposed. I measured the relative sizes of the reproductive tissues from within the flowers, as well as counted the amount of pollen produced by infected versus uninfected plants to test between these two hypotheses. I found that infection status tends to affect male function but not female function along with the trend for infected plants to allocated more resources to female function, particularly in *Elymus* plants.

This research was supported by a grant from the National Science Foundation REU (IOS-1119775).

Heterophil/Lymphocyte Ratio: Stress-Related Environmental Factors in Tree Swallow (*Tachycineta bicolor*) and Eastern Bluebird (*Sialia sialis*) Nestlings

Matthew Smith
Mentor: Dr. Kathy Winnett-Murray
Department of Biology

We used heterophil/lymphocyte (H/L) ratios from nestlings inhabiting artificial nest boxes to investigate the relationship between nestling attributes and stress. We hoped to understand how the (H/L) ratio responds to various environmental factors that could result in elevated stress levels. Dreyer (*unpubl. ms.* 2005) determined that nestlings of Tree Swallows (*Tachycineta bicolor*) are more likely to be infected with ectoparasites (mites, lice, ticks and fleas) than are the young of Eastern Bluebirds (*Sialia sialis*). Similarly, swallow nests usually contain a greater abundance and variety of arthropods, including potential avian ectoparasites, than do bluebird nests. In a variety of birds, an increased H/L ratio is associated with natural stressors; we hypothesized that nestlings that were hatched later in the season, had a greater number of siblings, weighed less and/or had parasites in their nest or were infected themselves would exhibit higher H/L ratios. Similarly, we predicted that swallows would have more infected nests and be more infected directly with parasites than bluebirds, also resulting in higher H/L ratios. We analyzed stained blood smears previously collected in 2005 from nestlings at Consumer's Energy J.H. Campbell Complex, MI. A leukocyte profile was determined and H/L ratios were calculated based on at least 100 total observed leukocytes for each bird. We will be exploring the association of the previously mentioned nestling attributes on H/L ratios to identify the most important correlates of this widely used indicator of physiological stress.

BIOLOGY

Influence of Fungal Endophytes on Insect Herbivore Defense in Canada Wildrye *(Elymus canadensis)*

Jonathan Turkus
Mentor: Dr. Thomas Bultman
Department of Biology

In the past few decades, the relationship between *Epichloë* and *Neotyphodium* fungal endophytes and cool season grasses has gained increasing attention from botanists, mycologists, and ecologists alike. With hosts displaying traits that increase their competitive abilities and fitness when infected but occasionally suffering from the taxing fungal reproductive structures, an interesting relationship that is both mutualistic and parasitic can be observed. To determine how this dynamic association affects the variation of *Epichloë* infection frequency in *Elymus canadensis* populations across North America, seed samples from multiple populations were taken and tested for endophyte presence via PCR and gel-electrophoresis. Despite predictions, no significant relationship between infection frequency and latitude or longitude could be found, perhaps due to differences in biotic and abiotic factors between tested populations. *Rhopalosiphum padi* and *Spodoptera frugiperda* larvae were utilized to test how a diet of *Epichloë elymi* infected *E. canadensis* blade tissue affected insect herbivore performance. It was believed that since the *E. elymi* endophytes were capable of producing peramine and an intermediate ergot alkaloid that both insect species would suffer negative effects. While the *S. frugiperda* larvae showed less accumulation of dry weight when fed infected tissue, *R. padi* reproduction was not affected by such a diet. The reason for these results may be due to differences in sensitivity to peramine by the insect species.

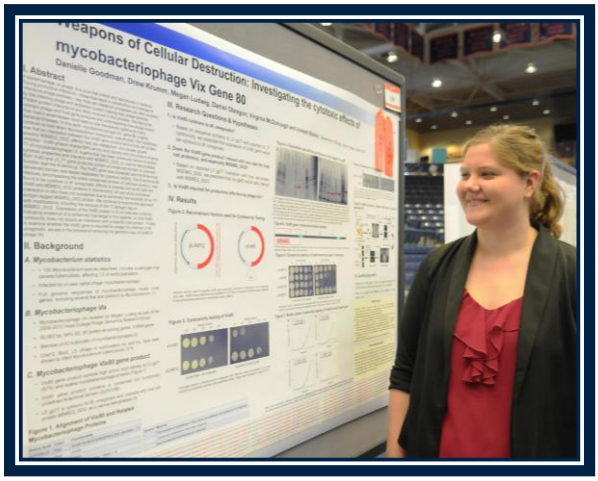
This material is based upon work supported by the National Science Foundation under grant No. NSF-RUI IOS-1119775.

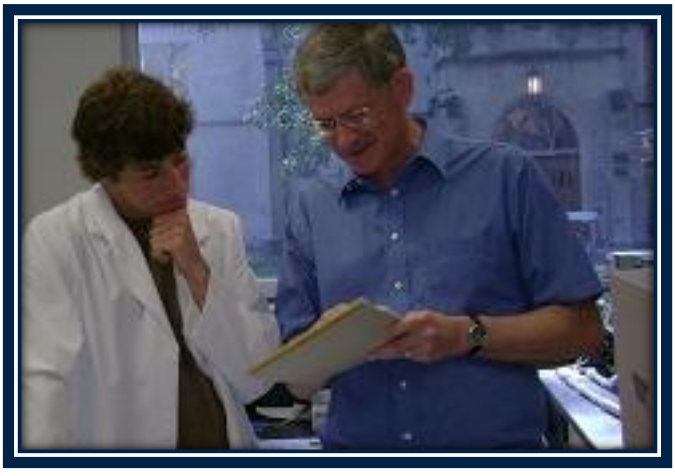
Phylogenetic and Phytochemical Studies of *Apios* (Fabaceae)

Holly Vander Stel, Jeffrey Corajod, Austin Homkes, and James Tufts
Mentors: Drs. Jianhua Li and Kenneth Brown
Departments of Biology and Chemistry

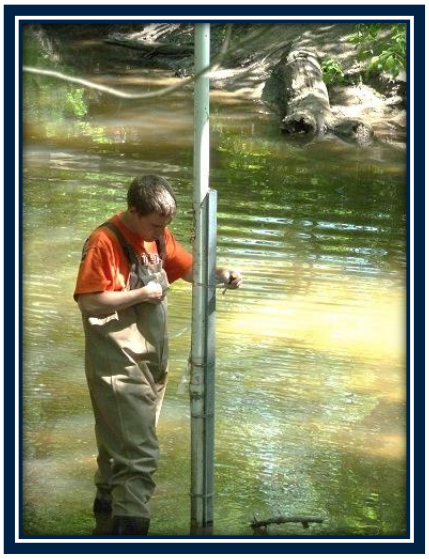
Apios is a perennial herbaceous plant genus of 6-10 species, all of which have pinnately compound leaves with milky sap in the petioles and young shoots. Some species have edible tubers that contain high level of protein and isoflavones (e.g., genistein) that may be beneficial to human health and cancer treatment. Geographically, *Apios* shows a disjunct distribution between eastern North America and eastern Asia. In this study we aimed at examining interspecific relationships of *Apios*, estimating the time of formation of the intercontinental disjunction, and determining whether genistein occurs in all species of *Apios*. Our results suggest that the two North American species are more closely related to each other than either is to the Asian species, and their ancestral populations may have migrated from Asia. All species tested produce genistein, which occurs mostly in the tubers.

This study was funded through a Hope College HHMI faculty research grant.





Elemental Analysis of Lake Macatawa Sediment



Kyle Alexander
Mentor: Dr. Graham Peaslee
Department of Chemistry

The historical settlement and development of the Holland/Zeeland area has ultimately led to excess soil erosion, which contributes to the current hypereutrophic state of Lake Macatawa. As part of the Macatawa Watershed Project, suspended sediment samples were collected throughout the watershed during periods of significant rainfall. After a significant rainfall has occurred, the sediment samples collected in these traps are retrieved, dried and hydraulically pressed into a solid target. An elemental analysis technique has been developed to routinely analyze these sediment samples via Particle Induced X-Ray Emission (PIXE) spectrometry. Preliminary results from the PIXE analyses demonstrate that there is elemental variation between sites, as well as between sample collections; these results are reproducible and have been supported by analysis of sediment phosphate content. The goal of this project is to develop a signature that is characteristic of specific sediment sources within the watershed, so that nonpoint source sedimentation can be traced to its origins.

Research funded by the National Science Foundation, the State of Michigan Department of Environmental Quality, and the Outdoor Discovery Center/Macatawa Greenway, and Macatawa Area Coordinating Council.

Using Color Analysis for Fingerprinting Macatawa Sediment

Michael Atwell, Catherine Gammon, Amanda Gernentz, and Lauren Zandstra
Mentor: Dr. Graham Peaslee
Department of Chemistry

Lake Macatawa is hypereutrophic, meaning that its environmental health is characterized by an abundance of nutrients within the surrounding watershed. Too many nutrients enter the lake from surrounding areas to maintain a healthy ecosystem. Suspended sediment samples were collected after significant rain events over the past year. These dried sediment samples were analyzed as a larger part of a sediment fingerprinting effort to pinpoint specific areas of nonpoint source pollution for potential remediation. Color analysis has shown promise in differentiating subtle differences between areas of the watershed. Varying characteristics of sediment contribute to each site's unique sediment color fingerprint, allowing us to use red, green, and blue values from digital images of sediment to quantify color contrast. Using Principle Component Analysis, the statistical variations in sediment color can be shown to differentiate several sub-watersheds within the Macatawa watershed. When combined with other measurable sediment characteristics such as phosphate content and elemental analysis, this fingerprinting technique can be used to identify the geographical sources of sediment within the watershed.

Research funded by the National Science Foundation, the State of Michigan Department of Environmental Quality, and the Outdoor Discovery Center/Macatawa Greenway, and Macatawa Area Coordinating Council.

Steric and Electronic Effects Influencing Beta-Aryl Elimination in the Pd-Catalyzed Carbon-Carbon Single Bond Activation of Triarylmethanols

James Bour and Jacob Green
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Due to their inert nature, carbon-carbon δ-bonds are typically unutilized in synthetic processes. However, metal catalysts such as palladium and rhodium have been shown to catalytically activate these bonds in limited but promising systems. One such example is the palladium-catalyzed β-arylative elimination of triarylmethanols (Miura et. al. *J. Org. Chem.*, 2003, *68*, 5236). This project involves investigation into electronic and steric factors affecting the aryl elimination in the aforementioned reaction.

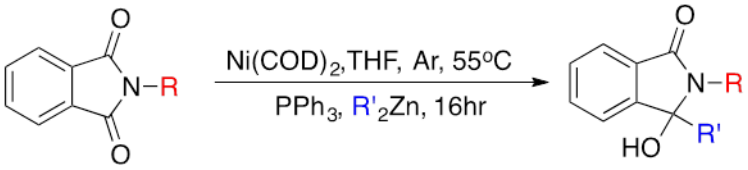
Product analysis of electronically disparate aryl halides and aryldiphenylmethanols has shown that the aryl halide participates in the reaction before the elimination and that it alters the electronic nature of the metal center enough to provide elimination selectivity. These data represent significant progress towards elucidation of the metal center's electronic character for the ultimate purpose of hypothesis driven methodology development.

This research was generously supported by ACS-PRF and the Beckman Foundation.

Synthesis of γ-Lactams via Nickel Catalyzed Addition of Diorganozinc Nucleophiles to Imides

Catherine Calyore and Joseph Dennis
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

The direct addition of diorganozinc nucleophiles to a range of *N*-substituted phthalimides has been observed when a catalytic amount of $Ni(COD)_2$ and triphenylphosphine ligand are used in the reaction. Results have shown that aryl substituted *N*-phthalimides with alkyl and electron deficient groups consistently produce yields around 80%.



Diorganozinc reagents used in the reaction include commercially available diethyl zinc, as well as reagents prepared from a wide range of substituted aryl bromides that are utilized without purification. Twelve diarylzinc nucleophiles have been successfully used in the reaction, while seven different N-substituted phthalimides have been used. Current work is being done to further expand the complexity of substituents, as well as incorporating saturated backbones into the reaction.

This research was generously supported by ACS-PRF, the Dean of the Natural and Applied Sciences, the Chemistry Department, the Towsley Foundation, and the Camille & Henry Dreyfus Foundation, Inc.

DNA Sequence Specific Recognition by Building Block Hx Polyamides

Graham Carlson, Karalyne Cousins, and Katherine VanDenburgh
Mentors: Drs. Moses Lee, Pravin Patil, and Kimberly Brien
Department of Chemistry

Analogs of the naturally occurring product distamycin bind DNA in stacked anti-parallel dimers with a high affinity and specificity towards their target sequences. Novel polyamides containing Hx moieties exhibit fluorescence, which allows these molecules to be tracked in cells. Hx behaves as two consecutive pyrrole units and is A/T sequence specific. In an effort to optimize the curvature of our compounds we have developed the "Building Block" model in which we have altered the location of the Hx moiety within the molecule to determine the order that produces the most ideal curvature. The present phase of the model involves placing the Hx moiety in the middle of the triamide preceded by a phenyl group and followed by either a pyrrole or imidazole unit. The focus of this research is directed toward the development of Hx polyamides designed to target specific DNA sequences found in the promoters of genes.

This research was supported by the NSF.

Extending the AMBER Force Field to Describe Fluorescent Probes

Andrew Cook, Arcelia Ortega, Alyssa Stevenson, Derek Summers, Alyssa Cassabaum, Christine Gobrogge, Bryan Leland, David Paul, and Amy Speelman
Mentor: Dr. Brent Krueger
Departments of Chemistry and Biochemistry

We are developing a method for studying the structural dynamics of biomolecules, which couples fluorescence spectroscopy and computational modeling, providing a more complete understanding than is possible with either technique alone. The computational modeling will be based primarily on molecular dynamics (MD) simulation. Before running MD, dye parameters were determined that are consistent with the Cornell et al. force field (1995, *J. Am. Chem. Soc.*) and the generalized AMBER force field (GAFF; Wang et al., 2004, *J. Comput Chem.*) commonly used in AMBER. Parameterization was carried out by using quantum mechanical calculations to determine low-energy conformers of the dyes and to calculate electrostatic potentials for these conformers. The RESP charge fitting procedure was then used to derive atomic charges. All other parameters were assigned by analogy to pre-existing force field parameters. Several DNA- and RNA-fluorescent probe systems will be explicitly solvated in water and equilibrated before beginning production MD simulations. These simulations will be used to generate simulated fluorescence data for direct comparison to experimental bulk and single-molecule FRET data.

This research was supported by the National Science Foundation (RUI, MRI, REU, & CIEG programs), Howard Hughes Medical Institute, ACS-Petroleum Research Fund, and Midwest Undergraduate Computation Chemistry Consortium.

Single-Molecule Florescence Spectroscopy at Hope College

Andrew Cutshall, Christopher Davis, and Derek Summers
Mentor: Dr. Brent Krueger
Department of Chemistry

This research involves the design and construction of a confocal microscope for single-molecule fluorescence-detected resonance energy transfer experiments. Single-molecule FRET is useful for determining structural characteristics and structural dynamics of systems under study. Donor and acceptor dyes will be attached to small biologically important molecules such as RNA, DNA, or protein. These samples will be used at very small (picomolar) concentrations, such that either zero or one will be in the focal volume of the microscope at any given time. As the system passes through the focal volume, it will be excited by the laser light, and the detection of the corresponding fluorescence originating from either the donor or acceptor will allow calculation of FRET efficiency. Experimentally determined FRET efficiencies will be compared to simulated FRET data calculated using MD simulation experiments. This comparison will lead to a better understanding of FRET and will eventually refine the process of extracting structural information from the raw FRET data.

Research funded by the National Science Foundation Research at Undergraduate Institutions Program

Nickel Mediated Decarbonylative Cross Coupling of Cyclic Imides and Diorganozinc Reagents

Thomas Endean and Valerie Winton
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Recent studies have demonstrated a nickel-mediated decarbonylative cross coupling of cyclic imides with diorganozinc reagents. This process proceeds using stoichiometric Ni^0 in the presence of bipyridine. Decarbonylation and subsequent alkylation by diethyl zinc has been demonstrated in good yield on a range of *N*-substituted phthalimides. In order to further investigate the electronics of the reaction 3 and 4 substituted phthalimides were synthesized. The resulting imides were subjected to the parent reaction conditions and the constitutional isomers were analyzed through GC and NOESY NMR.

This work was supported by the Camille & Henry Dreyfus Foundation, Towsley Foundation, and the Hope College Department of Chemistry.

CHEMISTRY

Preparing to Harvest Radioisotopes from FRIB

Scott Essenmacher, Kelly Petrasky, and Dr. Aranh Pen
Mentors: Drs. Graham Peaslee and Paul DeYoung
Departments of Chemistry and Physics

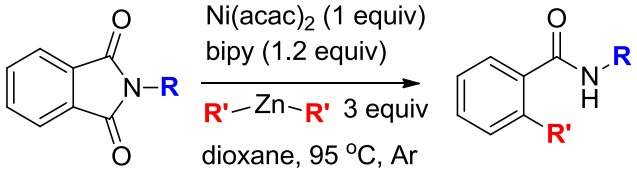
The Facility for Rare Isotope Beams (FRIB) will be a new national user facility at Michigan State University (MSU) and funded by the Department of Energy Office of Science Office of Nuclear Physics (DOE-SC). FRIB will have the ability to accelerate uranium to 200 MeV/nucleon and light ions with even more energy. A host of new isotopes will be generated by FRIB that could be harvested for off-line use. A study to harvest six of these useful radioisotopes from FRIB is being conducted. This study will use current conditions at the National Superconducting Cyclotron Laboratory (NSCL) to determine the production and extraction yields of six important radioisotopes. These six radioisotopes are ^{24}Na, ^{67}Cu, ^{48}V, ^{85}Kr, ^{44}Ti, and ^{32}Si, and will be collected in an aqueous beam dump at FRIB. Modeling of the nuclear reactions present at NSCL was done using two programs, LISE++ and Nucleonica. The information from these programs is being used to streamline the isolating and extracting procedures for the radioisotopes of interest from the aqueous beam dump at FRIB. These procedures are first being developed on "cold", non-radioactive, species. These procedures will then be applied to "hot", radioactive, species before being implemented at NSCL and, eventually, FRIB.

This material is based on work supported by the Department of Energy under grant No. DE-FOA-000448.

Exploring the Decarbonylation of Cyclic Imides Utilizing a Nickel Catalyst

Sarah Fodor and Jessica Simmons
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Previous research established that a decarbonylative nickel-mediated cross coupling reaction of *N*-substituted cyclic imides with diorganozinc reagents is possible with many different functional groups in the R position of the cyclic imide. The scope of the reaction was further expanded with a wide variety of diorganozinc reagents (R_1). (*J. Org. Chem.*, 2011, *76*, 3588).



All of the previous reactions were successful using an unsaturated backbone. The focus of this particular research is to expand scope of the reaction by exploring the possibility of a saturated imide backbone. To determine the ideal reaction conditions to promote the decarbonylation it was tried under a variety of solvents and ligands.

This research was supported by the National Science Foundation.

Macatawa Watershed Project: Fecal Contamination and Microbial Source Tracking

Katherine Genzink and Hannah Reynolds
Mentor: Dr. Michael Pikkart
Department of Chemistry

Beach closures have become a recurring problem in Ottawa County and the surrounding areas. The State of Michigan monitors water quality by measuring viable E. coli levels. However, current methods require at least 18-24 hours to yield results, delaying decision making regarding beach closures; this potentially increases public health risks. These methods also do not

differentiate between various sources of fecal contamination. Microbial source tracking methods using molecular tools have recently been developed to give information regarding the source of the contamination. This project, involving the Lake Macatawa Watershed, uses dye-based and probe-based qPCR to test for host specificmarkers within the unidentified fecal contamination. Human-specific assays quantitatively revealed significant levels of human fecal contamination at DuntonPark and the surrounding areas. Further tracking of the source of contamination has been initiated for Dunton Park. Cow specific markers have also been used to qualitatively identify bovine fecal contamination. These results are to be investigated through further sampling and microbial source tracking.

Lake Macatawa Sediment Analysis

Eric Greve, Dan Tobert, and Julissa Pabon
Mentor: Dr. Graham Peaslee
Department of Chemistry

An EPA-funded toxicological study of Lake Macatawa sediment was performed jointly by Hope College and Grand Valley State University in 2003-2004. Fourteen of the fifteen sites studied showed no macroinvertebrate toxicity and were well within EPA acceptable limits for both organics and heavy metals. However, one site showed elevated levels of lead and polycyclic aromatic hydrocarbons (PAHs) – both above the EPA probable effect limits. This initially indicated a leaking underground gasoline storage tank or just a long history of fuel spills. An extensive study in 2005-2006 by Dan Tobert and Julissa Pabon at Hope College further examined the geographical extent of the lead and PAH sediment contamination. Now six years later, the same location was revisited to determine if the PAH and lead contamination has grown, decreased, or remained the same. A modified EPA solid-liquid extraction procedure for PAHs was employed and a Gas Chromatograph/Mass Spectrometer was used to identify and quantify PAHs extracted from sediment samples. Microwave assisted acid digestions and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) were used to determine lead and other heavy metal concentrations in the sediment samples. By comparing these results to the data collected six years earlier along with the ratio between various PAHs, it was possibly to identify the source of pollutants to be pyrogenic and not petrogenic in origin.

Quantitative Analysis of Cardiac Glycosides in Digitalis *purpurea* and Digitalis *lanata* with HPLC

David Grossens
Mentor: Dr. Kenneth Brown
Department of Chemistry

Cardiac glycosides have a successful track record in the treatment of heart failure. The glycosides digoxin and digitoxin are extracted from the plant species Digitalis *purpurea* and Digitalis *lanata* and increase cardiac function and circulation. These

glycosides act by binding cellular membranes and inhibiting the Na^+/K^+ pump**.** There is a substantial body of knowledge surrounding blood serum levels of these compounds but little is known about their concentrations in Digitalis and the factors that affect these concentrations. The purpose of this work was to establish an optimized protocol for quantification of both digoxin and digitoxin within Digitalis. The compounds were extracted from leaf samples with water and methanol and characterized by HPLC at a wavelength of 220 nm using a three part mobile phase consisting of 10% acetonitrile, 60% methanol, and 30% water. Future work involves cultivation of Digitalis species under various conditions to determine the factors that affect digoxin and digitoxin concentration and in vivo testing of these compounds.

This work was supported by the National Science Foundation.

Sediment Runoff Fingerprinting Using Pollen

Austin Homkes
Mentor: Dr. Graham Peaslee
Department of Chemistry

Lake Macatawa is a hypereutrophic flooded river mouth in southwest Michigan. The lake has very high amounts of nutrient-rich sediment from non-point sources throughout the watershed. The Macatawa watershed project seeks to identify where the non-point sediment sources are and manage those areas of the watershed that produce the most runoff sediment. Forty-six sediment collectors were placed in rivers, creeks and ditches throughout the watershed. In this way sediment was collected in peak runoff periods when a high amount of sediment was being washed off of the surrounding land. As a part of the sediment fingerprinting analysis, the project seeks to identify the non-point sediment sources with biologicals, specifically pollen grains. Pollen is extracted from sediment collected throughout the watershed. Using a scanning electron microscope, the pollen is identified by plant type, plant genus, or plant species. Proportions of pollen grain type are compared to vegetation proportions upstream of the sediment collector to identify source locations.

Research funded by the National Science Foundation, the State of Michigan Department of Environmental Quality, and the Outdoor Discovery Center/Macatawa Greenway, and Macatawa Area Coordinating Council.

Development and Implementation of a Low-Background Radiodating Facility at Hope College

Nick Hubley, Kelly Petrasky, and Tim Nagi
Mentors: Drs. Paul DeYoung and Graham Peaslee
Departments of Chemistry and Physics

Measurement of γ rays produced by radioactive isotopes within sediment can be used to determine the rate of sedimentation or to track sediment transport through the watershed. To accurately measure the type and abundance of radioactive isotopes within sediment samples, a low-background γ-ray counting facility is needed. This requires detectors encased in multi-layer shielding (plastic, copper, and lead layers) to block natural ambient radiation. Such a facility at Hope College has been developed with four high-purity Germanium detectors that detect a wide range of environmental radioisotopes in sediment samples with high precision and low background. Examples of their use in environmental measurements of sediment fingerprinting of radioisotopes such as 137Cs and 210Pb in the Lake Macatawa watershed will also be shown.

This material is based upon work supported by the National Science Foundation under RUI 0651627 and RUI 0969058.

A Building Block Approach: A New Way of Thinking about Polyamides and Their Impact on DNA Sequence Recognition

Michelle Irvin and Kevin Olson
Mentors: Drs. Moses Lee, Kim Brien, and Pravin Patil
Department of Chemistry

Polyamides bind strongly to DNA sequences, including gene sequences involved in DNA replication and transcription of

cancerous cells. The pyrrole and imidazole units in the polyamides bind to Adenine/Thymine and Guanine/Cytosine base pairs, respectively. Hx units, derived from Hoechst 33258 behave like two consecutive pyrrole units and bind A/T base pairs. The purpose of this study is to extend the DNA sequence recognition capability of Hx polyamides by incorporating the Hx unit close to the C-terminus end of the molecules. The goal in designing such "building block" Hx polyamides is to optimize the curvature and position of Hx with respect to sequence selectivity and binding affinity. The synthesis and DNA binding properties of two of such Hx polyamides will be described.

This research was supported by the NSF.

Photometric Analysis of Phosphates in Lake Macatawa Watershed Sediment

Rachel Kreb, Kristen Hasbrouck, and Adam Maley
Mentor: Dr. Graham Peaslee
Department of Chemistry

High levels of phosphorous in the Lake Macatawa watershed contribute to its hypereutrophic state resulting in harmful algal blooms, which decrease the overall water quality. Phosphates are transported in the watershed after heavy rainfall by adhering to clay particles suspended in water. Determining concentrations of these phosphates is critical for monitoring sediment erosion and runoff contributing to the eutrophic state of the watershed. After heavy precipitation, sediment samples were collected from 46 sediment samplers distributed throughout the watershed. From the dried sediment samples, water-soluble, iron-bound, and calcium-bound phosphates were extracted separately and measured using an AutoAnalyzer III™ continuous flow colorimetric analysis. The AutoAnalyzer III™ uses a molybdo-phosphate complexation reaction and a colorimeter to quantitatively determine the concentration of phosphates. Concentrations from the three different extractions were recorded and summed to get a total bioavailable inorganic phosphate value at each site. These results will be used to help pinpoint the origins of the non-point-source pollution and to characterize the baseline phosphate load entering Lake Macatawa before remediation efforts are performed.

This material is based upon work supported by the National Science Foundation, the Macatawa Area Coordinating Council, the Outdoor Discovery Center, and the Michigan Department of Environmental Quality.

Ion Beam Irradiation of Nanodiamonds

Adam Maley
Mentor: Dr. Graham Peaslee
Department of Chemistry

Nanodiamonds, which are nano-sized diamond crystals, have potential biomedical applications due to their fluorescent properties. In order for the nanodiamonds to fluoresce, however, permanent defects must be added to the crystalline sample. One way in which this can be done is to induce lattice defects with irradiation with an accelerated ion beam. A method has been developed using the Hope College Ion Beam Analysis Lab (HIBAL) to irradiate nanodiamonds. An accelerated beam of protons incident on the nanodiamond samples creates vacancies in the diamond structure. Annealing of these irradiated samples causes the vacancies to migrate towards natural nitrogen impurities in the diamond, making the vacancies permanent. Using cathodoluminescence, the fluorescent properties of irradiated nanodiamonds can be measured. Preliminary data show that irradiated nanodiamonds fluoresce around 625 nm, whereas non-irradiated nanodiamonds fluoresce around 520 nm. Future work will include refinement of a robust method to irradiate larger quantities of nanodiamonds and writing a grant proposal to fund this novel initiative.

This research was supported by the National Science Foundation and Columbus Nanoworks, Inc.

Investigation of Drug-Nanoparticle Interactions by Isothermal Titration Calorimetry

Alec Norkey and Lydia Rau
Mentors: Drs. Michael Seymour and Jonathan Peterson
Departments of Chemistry and Geological and Environmental Sciences

CHEMISTRY

The widespread use of antibiotics and other drugs for human medicine and in animal agriculture has resulted in the contamination of soils and natural waters by these compounds. The adverse effects of antibiotic contaminants on indigenous microbial communities have generated interest in the fate and transport of these pharmaceuticals in natural soil-water systems. The role of mineral oxide nanoparticles, with their high surface area to volume ratio, could have significant impact on drug transport and removal mechanisms in groundwater environments. This study uses isothermal titration calorimetry (ITC) to evaluate the strength of binding between selected drugs and nanoparticles over a range of pH levels. Through careful control of the stoichiometry and reaction conditions, it will be possible to quantitatively evaluate the nature of these nanoparticle – drug interactions.

Probing the Effects of Various Rhodium Catalysts on the Carbon-Carbon Activation of Quinolinyl Ketones

Samantha Pahls
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

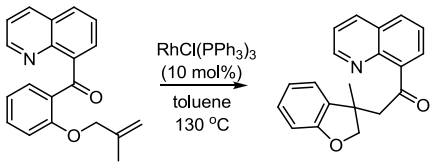
Though the carbon-carbon single bond is thought to be exceptionally stable because of a lack of polarization and steric inaccessibility, it is shown to be functionalizable in the rhodium-catalyzed intramolecular insertion of an alkene into a quinolinyl ketone (Douglas, *et. al. J. Am. Chem. Soc.* 2009, *131*, 412). This reaction was studied kinetically with the use of seven different rhodium(I) catalysts in order to determine the relative rates of the reactions. The procedure was conducted using resealable NMR tubes and the relative amount of product to starting material was tracked with NMR spectroscopy throughout the reactions. Further investigation was done using bis(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate because of the high rate of reaction discovered in the preliminary experiments. The kinetics of this catalyst were explored by varying the concentration of the starting quinolinyl ketone while holding all other factors constant. The new catalysts researched here could help to increase the rate of these carbon-carbon single bond activating reactions as well as lead to an expansion of the substrate scope.

This research was supported by the.ACS-Petroleum Research Fund and the Bultman Summer Research Award.

C-C Bond Activation: Functionalizing Quinolinyl Ketones for Rhodium Catalysis

Michael Pietrangelo
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Being able to utilize carbon-carbon single bonds can allow for numerous new pathways in organic synthesis. These pathways can be more efficient, faster, and more reliable than their counterparts. Rhodium catalysis is the process utilized to conduct C-C bond activation in quinolinyl ketones(Douglas, *et. al. J. Am. Chem. Soc.* 2009, *131*, 412). In the literature quinolinyl ketones have been limited to only one substrate during rhodium catalysis:



A new parent compound was synthesized with a phenol in place of the alkene tail in order to conduct Williamson ether syntheses to form different Quinolinyl substrates. Different alkyne and ketone substituted groups have been successfully added. Those new substrates were found to react in the presence of Wilkinson's catalyst using the exact same conditions as the parent reaction (above).

This research was supported by the National Science Foundation.

Investigation of Differential Photochemical and Electrochemical Isomerizations of Quinazolinespirohexadienone Photochromes

Benjamin Pollock
Mentors: Drs. William Polik and Jason Gillmore
Department of Chemistry

It has been observed that quinazolinespirohexadienone (QSHD) photochromes form two distinct long-wavelength (LW) products upon photochemical- and electrochemical-induced isomerization from the common short-wavelength (SW) form. It has been proposed that the electrochemical path (forming "eLW") proceeds through the one-electron-reduced doublet intermediate state (D0) of SW while the photochemical path (forming "pLW") proceeds through an excited intermediate state (S1 or T0) of SW. Using computational methods, geometry optimization, molecular orbital, bond order, and bond length calculations were performed on the proposed intermediate states of these two pathways to explain the experimental observation. Additionally, while S1 is likely to be the relevant photochemical excited state, we use T0 as the model. This is justified because ignoring spin-orbit coupling is assumed to introduce far less error than would comparison of data obtained from ground-state vs. excited-state computational methods. Computational results show that smaller bond orders and longer bond lengths have been calculated for the bonds that must be broken in order to yield the observed eLW and pLW products from their respective intermediates.

This material is based upon work supported by the National Science Foundation (CAREER: CHE -0952768, MRI: CHE-0520704 & CHE-1039925), Camille & Henry Dreyfus Foundation, and Research Corporation.

VPT2+K Spectroscopic Constants and Matrix Elements of the Transformed Vibrational Hamiltonian of a Polyatomic Molecule with Resonances Using Van Vleck Perturbation Theory

Andreana Rosnik
Mentor: Dr. William Polik
Department of Chemistry

Vibrational levels of polyatomic molecules are analyzed with Van Vleck perturbation theory to connect experimental energy levels to computed molecular potential energy surfaces. Vibrational matrix elements are calculated from a quartic potential function via second order Van Vleck perturbation theory, a procedure that treats both weak and strong interactions among vibrational states by approximately block-diagonalizing the vibrational Hamiltonian. A clear and complete derivation of anharmonic and resonance constants as well as general expressions for both on- and off-diagonal matrix elements of the transformed Hamiltonian is presented. The equations are written in partial fraction form and as a constant multiplied by a harmonic oscillator matrix element to facilitate removing the effect of strongly interacting resonant states both in analytical formulae and in computer code. The derived equations are validated numerically, and results for formaldehyde are included. The VPT2+K method is defined by these results for use in fitting and calculating vibrational energy levels.

This research was supported by the Howard Hughes Medical Institute and by the National Science Foundation.

Complete Analysis on the Two Base Pair Sequence Recognition by Hx (p-Anisylbenzimidazole)•Pyrrole and Hx•Imidazole Pairings

Samuel Tzou, Kevin Olson, Matt Gregory, Michael Bowerman, Mia Savagian, and Megan Lee
Mentors: Drs. Vijay Satam, Kimberly Brien, Pravin Patil, Balaji Babu, and Moses Lee
Department of Chemistry, Hope College
Collaborators: Drs. Yang Liu[1], Joseph Ramos[1], W. David Wilson[1], Drs. Shicai Lin[2], Kostantinos Kiakos[2], and John A. Hartley[2]
[1]Department of Chemistry, Georgia State University and [2]Cancer Research UK Drug-DNA Interactions Research Group, UCL Cancer Institute, London

Pyrrole (Py) and Imidazole (Im) polyamide analogs of distamycin are small molecules that bind in the minor groove at specific

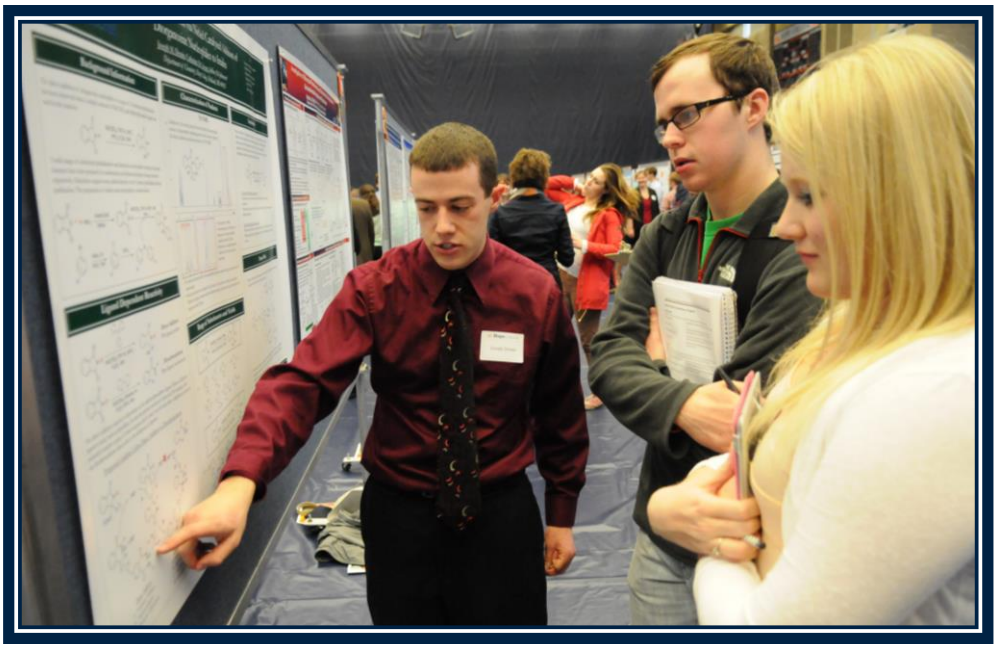
sequences of DNA and regulate gene function. Despite their potential in drug discovery or as tools in molecular and cell biology, their usefulness is limited by their ability to enter cells and concentrate in the nucleus. There is thus an effort to develop polyamides that are trackable in cells. Thus there is an immediate need for the design of novel heterocyclic DNA sequence cognitive units that exhibit all the positive qualities as Py and Im, and be inherently fluorescent. Our group has recently published a novel class of hybrid Hx-amides, which contain a fluorescent p-anisylbenzimidazole or Hx group. Pairing of Hx with PI, PP and IP provided evidence that it mimics "PyPy" in recognizing two contiguous base pairs in a similar way as polyamides. To complete our examination of the Hx functionality, the remaining molecule in this series, HxII, was successfully synthesized. The DNA binding properties of HxII will be reported along with a discussion on sequence recognition by Hx/polyamide pairings and gene control.

Controlling the Radical 5-*exo*-*trig* Cyclization Reaction in the Synthesis of Duocarmycin Analogs

Sarah Wieskamp, Mallory Smith, and Karalyne Cousins
Mentors: Drs. Pravin Patil and Moses Lee
Department of Chemistry

CC-1065 and the duocarmycins are natural products that contain the cyclopyrroloindolone (or CPI) subunit. These compounds and their analogs bind in the minor groove of AT-rich sequences of DNA and they covalent bond with adenine-N3. This leads to potent cytotoxicity against the growth of cancer cells in vitro and in vivo. One efficient approach for synthesizing the CPI moiety is through the 5-*exo*-*trig* radical cyclization of a free radical and an adjacent 3-chloro-2-allylic moiety. Recently we reported that the cyclization proceeded via a benzofurano radical. The reaction yielded an unpredictable mixture of 6-benzyloxy-*N*-*t*-butoxycarbonyl-3-(chloromethyl)furano[*e*]indoline and 7-benzyloxy-*N*-*t*-butoxycarbonyl-3-chloro-1,2,3,4-tetrahydrofurano[*f*]quinoline. The purpose of this study is to gain a deeper understanding of the mechanism of the cyclization reaction, therefore allowing researchers to devise a practical way to control the reaction. Also, in this study thiophene and benzo derivatives will be studied to investigate the structure-reactivity relationship of the radical cyclization process. Computational modeling using DFT calculations of the radical reaction will provide further insight into the molecular electrostatic and dipole moment of the intermediates. This will enable us to have a better understanding of how electronic factors can affect reactivity. Results from these studies will be presented.

This research was supported by the Spirogen Ltd.



The JanDY Online Survey System

Nicholas DeJongh, Michael Henley, and Matthew Johnson
Mentor: Dr. Ryan McFall
Department of Computer Science

The JanDY Survey System is a continuation of an ongoing project started by Dr. McFall. This project aims at enhancing the capabilities of the existing online survey system used at Hope College. Over the course of the summer, the existing creation wizard was edited and improved, allowing the survey creator a wide range of possibilities. The survey display was also enhanced with a whole new layout including the relocation of the next and previous buttons, the addition of progress bars, the displaying of survey and page titles, and a number of refinements. Extensive work was done to test survey interactions. This test broke down into load testing and navigation testing. Load testing involved simulating hundreds and thousands of users loading, taking, or submitting a survey at once. Navigation testing involved automating a user taking a survey and making sure that the proper pages were displayed, that the correct information was displayed on each page, and that the pages were displayed in the correct order. Work on this project continued into the school year where new features started to be added to system while parts already implemented were improved.

This research was supported by the National Science Foundation under NSF grant No.0851293

Comparative Analysis of *Mycoplasma* Bacteria Models Using the CytoSEED Plugin for Metabolic Model Visualization

Andrea Houg, Joshua Kammeraad, and Shinnosuke Kondo
Mentor: Dr. Matthew DeJongh
Department of Computer Science

We created digital metabolic models for 4 species of Mycoplasma bacteria using the Model SEED pipeline. We then refined these models based on available experimental data for the 4 species found in various literature sources. The four models are relatively similar, but 217 reactions exist in at least 1 of the 4 models but not in all 4. We also created software tools to both automate parts of the model optimization process as well as to assist us and other scientists in visualizing models. Our CytoSEED plugin for Cytoscape allows dynamic viewing, manipulating, and analyzing of metabolic models created using the Model SEED. Extensions this summer include increased support for viewing gene expression data, the ability to quickly synchronize the visualization of a model when it has been modified, and the ability to import and display the results of flux balance analysis experiments. Additional software tools were built into the Model SEED for model optimization and analysis using gene expression data.

This material is based upon work supported by the National Science Foundation.

Pebbling in Planar Graphs

Timothy Lewis
Mentor: Dr. Charles Cusack
Department of Computer Science

Given a simple connected graph, a pebbling configuration is a function from its vertex set to the nonnegative integers. A pebbling move between adjacent vertices removes two pebbles from one vertex and adds one pebble to the other. A vertex r is said to be reachable from a configuration if there exists a sequence of pebbling moves that places at least one pebble on r. A configuration is solvable if every vertex is reachable. We prove that determining reachability of a vertex is NP-complete, even in graphs that are planar. We also prove that reachability of a vertex can be determined in $O(n^6)$ time in planar graphs of diameter two.

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ENGINEERING

Design and Implementation of an 8-TET Robot

Joshua Swett
Mentor: Dr. Miguel Abrahantes
Department of Engineering

TET robot is short for tetrahedral robot. The name reflects the fact that a tetrahedral robot uses a tetrahedron as its structural basis. The simplest TET robot consists of a single tetrahedron while more complex configurations can be built with multiple tetrahedra. An 8-TET robot is built from eight tetrahedra. TET robots are currently an interest to NASA because TET robots are capable of a unique method of movement not attainable with standard wheel-based rovers. A tetrahedral robot moves by expanding and contracting parts of its tetrahedral structure in choreographed ways. This allows for a varying number of gaits depending on the robot's structural complexity. The purpose of this particular research project was to design and implement a new system to control our 8-TET prototype. The old system worked, but there was a lot of wiring on the robot and the communication was slow. Every strut was wired to a centralized controller and all communication was carried out with a single radio. In order to remedy these faults, each strut of the robot was redesigned so that each is independently controlled by a dedicated microcontroller. Each strut was also redesigned to independently communicate with the computer program that controls the robot. This eliminated wiring between struts and allowed for faster communication. Ultimately, this research will help us gain further insight into how TET robots should be controlled. Once we develop a very successful prototype, we will be able to gain further insight into the full capabilities of TET robots.

The Effect of Ambient Pressure on Blast Reflected Impulse and Over Pressure

Brigid Toner
Mentor: Dr. Roger Veldman
Department of Engineering

The goal of this project was to create a numerical model to predict the reflected blast pressure and impulse from a spherical charge of the high explosive C4 under varying atmospheric pressure conditions. For this study, a two dimensional Arbitrary Lagrangian Eulerian analysis was conducted using the commercial finite element analysis program LS-Dyna. Numerical predictions were carried out at a standoff distance of 24 inches and compared to measured pressure and impulse data. Based on the good correlation observed between the numerical predictions and experimental results at a 24 inch standoff, the computer model was then used for standoff distances in the range of 5 to 24 inches. The numerical predictions indicate that the normally reflected peak pressures were not significantly affected by varying ambient air pressure. In contrast, the reflected impulses values were predicted to increase with increasing ambient air pressure. The effect of ambient pressure on impulse was shown to decrease as the standoff distance decreases. In summary, at small standoff distances, the ambient pressure surrounding the high explosive charge has little effect on reflected blast impulse. For larger standoff distances, however, the reflected blast impulse increases with increasing ambient air pressure.

This research was supported by a grant from the U.S. Department of Homeland Security.

Referred Sensation Using Surface Electrical Stimulation

Derek Blok, Johanna Forst, and Julia Slopsema
Mentor: Dr. Katharine Polasek
Department of Engineering

Phantom limb pain is a post-amputation phenomenon resulting in pain and/or extreme discomfort in the *missing* limb of amputees. Since it is hypothesized that new or strengthened connections from adjacent sensory regions in the brain may prompt neurons to fire pain signals[1], the stimulation of these target sensory regions may reduce or eliminate the painful sensations. When electrical stimulation is used threshold values can be described using a stimulus amplitude and duration relationship called a strength-duration curve. This study examined the ability of the strength-duration curve to describe threshold values for referred sensation through surface electrical stimulation. The median and ulnar nerves in the left arm of able-bodied adults were stimulated. An optically isolated biostimulator and MATLAB software were used to provide voltage

controlled non-symmetric square wave pulse trains. Threshold values for hand sensation were determined using the adaptive procedure Parameter Estimation by Sequential Testing (PEST)[2]. Strength-duration curves were determined using Weiss's formula[3]. Curve characteristics were compared across and between subjects. All 25 participants achieved distal sensation as a result of surface electrical stimulation at the elbow. Variability found between subjects did not allow for generalizations to be made. Location and type of sensation achieved also varied based on stimulation parameters and arm position. However, a subject specific strength-duration curve provided reliable predictions regarding stimulation parameters that will elicit distal sensation. An analysis of the decrease in error with each additional point suggested two repetitions of five points would allow for adequate recreation of the strength-duration curve in less than five minutes. Activation threshold for referred sensation can be found quickly and reliably for each subject using ten points. These results will be used in a future study to determine the location and specific type of sensation that can be obtained using surface stimulation with the overall goal aiming to reduce the occurrence of phantom limb pain.

This material is based upon work supported by the Hope College Dean of Natural and Applied Sciences' Research Fund, and the Howard Hughes Medical Institute.

GEOLOGICAL & ENVIRONMENTAL SCIENCES

Mapping Movement of Coastal Sand Dunes on Lake Michigan Using GigaPan Photo Technology

Scott Cathey
Mentor: Dr. Brian Bodenbender
Department of Geological and Environmental Sciences

Dunes along Lake Michigan are one of the most dynamic environments on our planet. This means that they are one of the most exciting areas to do research in. These dunes have been monitored and mapped in the past, but the process of mapping and tracking their motion is both time inefficient, and destructive to the environment itself. Like in our project, most people track the motion of the sand dunes by placing pins out in the sand, and measuring the height of the sand in relation to the pin, which shows how the sand has shifted in that area. However, this needs to be done by hand for each pin, which can take hours. Also, when walking into the dunes to measure these pins, the footprints can damage both the measurements and the stability of the environment itself. In order to remedy these problems, we decided to try to use photo technology to eliminate this physical measurement step. The key to being able to do this was the GigaPan panoramic system. This system takes a panorama of the sample area consisting of hundreds of pictures, which are then stitched together, creating one panorama. Since the panorama is hundreds of individual photographs, we are able to zoom in to the resolution of the original photos and measure each pin individually on the screen in pixels. After measuring in pixels, we are able to convert this measurement to centimeters, giving us an accurate measurement of the pins. We were not able to use this system in any situations where the sand shifted drastically, like after a storm, but we were able to generate some positive results in terms of proof of concept. We were able to measure many of the pins, and most of these measurements were accurate to within a fraction of a centimeter.

This research was supported by donors to the Holleman Geology and Environmental Science Student Research Fund and the Nicholas VerHey '75 Geology Summer Research Fund.

The Growth of Epidote and Tianite During Upper Amphibolite to Lower Granulite Facies Metamorphism in Stensjoestrand, Southwest Sweden

Austin Krehel
Dr. Edward Hansen
Department of Geological and Environmental Science

Titanite and epidote minerals were observed in the Stensjöstrand area of southwest Sweden within a metamorphic reaction zone between two rock types. These minerals are characteristic of rocks with low-grade metamorphism and tend to be consumed when exposed to higher metamorphic conditions. A sequence of lens-like, calcsilicate enclave rocks contain higher calcium and iron concentrations than the titanium-rich, host amphibolite rock in which it occurs. Textures of three traverses between the two rocks were examined by SEM at Hope College and mineral analyses were performed via microprobe at the GeoForschungZentrum in Potsdam, Germany. Iron and calcium-rich minerals such as anorthite and hedenbergite increase in concentration from the host rock to the core of the enclaves. Iron oxides containing titanite occur throughout both rocks, with higher concentrations of titanium found within the oxides of the host rock. Epidote grains contain high concentrations of rare earth elements (REE) in the host rock and outer enclave rims (REE up to 13 wt%), small concentrations in the middle of the enclaves (REE < 0.1 wt%), and a moderate amount in the enclave cores (0.5 < REE <5 wt%). Textural and mineralogical patterns both suggest titanite and REE-poor epidote formed by diffusion from a higher gradient in the enclave to a lower gradient in the host. More recently-crystallized epidote appears to have formed by nucleating on pre-existing REE-rich epidote, while titanite formed by a reaction of the iron titanium oxides.

GEOLOGICAL & ENVIRONMENTAL SCIENCES

Rare Earth Element Enriched Minerals in Hydrothermal Copper Deposits from the Keweenaw Peninsula, Michigan, USA

Connor Mulcahy
Mentors: Drs. Edward Hansen[1], Dieter Rhede[2], and Theodore Bornhorst[3]
[1] Geological and Environmental Sciences Department, Hope College
[2]Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum (GFZ)
[3]Geological and Mining Engineering and Sciences, Michigan Technological University

Hydrothermal metamorphism associated with copper mineralization in Michigan's Keweenaw Peninsula created concentrated masses of calc-silicate minerals in both basalts and arkosic conglomerates. These masses consisted of epidote, pumpellyite, prehnite, and titanite in the basalts and epidote, titanite, and sporadic andradite in the conglomerates. The calc-silicate masses were examined by Scanning Electron Microscope, and electron microprobe analyses were completed on the calc-silicate minerals from three localities of mineralized basalts and two localities of mineralized conglomerates. Epidotes enriched in rare earth elements (REE) were found in samples from both conglomerate localities and can be classified into three textural types. Type I enrichment is a growth zoning characterized by narrow zones with up to 6 wt.% REE outlining euhedral crystal zones enclosed within REE-poor epidote grains. Type II enrichment is a dissolution-reprecipitation zoning and consists of irregular REE-enriched zones around fractures or as incomplete rims/embayments at the margins of REE poor crystals. Type III enrichment consists of masses of small, acicular crystals with an allanite component of up to 47 mole% projecting from the margins of REE poor epidote crystals or intergrown with titanite/REE poor epidote. The REE-fluorocarbonate synchysite occurs with calcite in some conglomerate samples that contain little or no epidote. Only one basalt sample was found to contain REE-enriched minerals where it occurs in the form of clusters of irregularly shaped patches with up to 4.3 wt.% REE within REE-poor epidote. Either a change in the hydrothermal fluid composition or a sudden decrease in temperature during the last stages of epidote growth led to super-saturation of REE elements that in turn led to the development of Type II and Type III enrichment. The most probable source for the REE are the rhyolite clasts in the conglomerates.

Developing a Time Lapse Camera for Monitoring Sand Dunes

Kara Seymour
Mentor: Dr. Brian Bodenbender
Department of Geological and Environmental Sciences

The goal of this project is to develop a time lapse camera system to monitor short-term sand transportation in the sand dunes around Saugatuck, Michigan. A low-cost digital camera captures movement with time lapse still photographs which are then turned into a high speed movie. This lets us observe slow movement and gradual progressions and regressions. The ideal time frame is a single storm or wind event. Some past projects have used expensive equipment and have monitored short term as well as long term movement. Along with minimizing cost, we concentrated on decreasing the chances of theft by making the case as discreet as possible; decreasing site visits by using higher-capacity memory cards, and creating a battery that is compatible with the camera's voltage yet still has a long lifespan. We use Canon powershot A495 digital cameras, 16GB memory cards, high capacity D-cell batteries, and waterproof camera/battery cases. We control the camera using a Canon Hack Development Kit (CHDK) intervelometer script programmed into the camera. For the video software we use iMovie on Macs and Windows Live Essentials Movie Maker on a PC. In iMovie, we are able to zoom in on detailed portions of the video and in both programs we are able to cut short sections of detailed events out of the videos. The 16GB memory card gives us ample memory space for more than 1,000 pictures. The D-cell batteries we use can last as long as 19 hours when taking a picture every 16 seconds, which is the minimum time interval between images based on the camera's speed at saving data to the memory card.

This research was supported by donations to the Holleman Geology and Environmental Science Student Research Fund at Hope College.

MATHEMATICS

There are Two Kinds of Bean Beetles in this World- Those that are Easy to Catch, and Those that Aren't: A Study of Polymorphic Traits in *Callosobruchus maculatus*

Joseph Adamson, Kristen Bosch, Amanda Schuiling, Alicia Castillo, and Daniel Faghihnia
Mentors: Drs. Brian Yurk and Aaron Putzke
Departments of Mathematics and Biology

When food resources, percent relative humidity, and population density are satisfactory, the bean beetle will present itself in a sexually dimorphic state referred to as the sedentary morph that renders males and females easily distinguishable. However, when food availability, humidity, and population density become environmental stressors for adult bean beetles they convert to dispersal morphology. In the dispersal morph, the males and females react by changing behavior and morphology. There has been very little study on the differences in oviposition behavior between sedentary and dispersal morphologies in the bean beetle. We designed a set of experiments to better understand how this change may affect oviposition rate, development rate, and adult longevity. We found that an increase in available substrate for egg-laying resulted in an increase in adult longevity and an increase in the fecundity of adult females. Furthermore, we found that beetles in the sedentary morph were much more likely to initiate oviposition on the first day of the experiment, while beetles in the dispersal morph were seen to delay first oviposition even into the tenth day. Lastly, we found that ovipostion rates for sedentary beetles were greatest within the first few days, laying almost all of their eggs before day five. Females in the dispersal morph laid fewer eggs, and laid almost all of their eggs between days four and five.

This research was supported by the National Science Foundation, Exxon Mobil, and the Howard Hughes Medical Institute.

Lights Out: The Effect of Graph Operations on Null Space Dimension

Erica Budge and Laura Ballard
Mentor: Dr. Darin Stephenson
Department of Mathematics

Based on a handheld puzzle created by Tiger Electronics, Lights Out is a problem in graph theory and linear algebra that has been investigated for over 30 years. A graph begins with vertices that are either on or off, and the edges determine which other vertices are affected when just one vertex is turned on or off. The objective of Lights Out is to turn off all of the lights, in which case a graph has been won. Our approach to the Lights Out problem has not only been on the investigation of winnable states of graphs, but has also led to the investigation of the null space of the neighborhood matrices of those graphs, and how the null space changes when a graph is altered. We develop results that determine how the Lights Out puzzle is affected when two or more graphs are connected together in various ways, or when certain subgraphs are removed.

This research was funded by the National Science Foundation REU grant #0645887.

Predicting Insect Development in Changing Climates: Bean Beetle Phenology Modeling

Joseph Adamson, Daniel Blake, Kristen Bosch, Alicia Castillo, Daniel Faghihnia, Bennett Riddering, and Amanda Schuiling
Mentors: Drs. Brian Yurk, Aaron Putzke, and Airat Bekmetjev
Departments of Mathematics and Biology

The success of a species within its environment is largely dependent upon its developmental timing. In insects, temperature plays a key role in determining rates of growth and development for various life stages including the embryonic stage. Thus time-lapse photography was used to measure the timing of this stage for bean beetles at various temperatures in the laboratory. Mathematical models were developed to fit these data, and statistical analyses were performed to provide a deeper understanding of the relationships between developmental timing and temperature in insect populations.

This research was supported by the National Science Foundation, the Howard Hughes Medical Institute, and the Hope College Mathematics Department Tanis Fund

Breast Nurse Navigation Impacts Timeliness of Care for Breast Cancer Patients

Mattie Coolman
Mentors: Loril Garrett, BSN, RN, OCN, CBPN-IC, CBCN[1], Geralyn Roobol, RN, BS, LMSW, CMAC[1] and Susan Dunn, PhD, RN[2] Spectrum Health[1] and Hope College Nursing Department[2]

Breast cancer care is often delivered by multiple health care providers over an extended period of time within an already fragmented health care system. This can result in persistent gaps in the care process leading to inadequate follow-up and delays in treatment. The breast nurse navigator (BNN) role seeks to address these shortcomings by bridging the gaps and therefore assists with improving patient outcomes in the process. Some BNN programs have demonstrated improvements in timeliness of access to care, resolution of barriers to care, and heightened patient satisfaction. The purpose of this retrospective descriptive study was to examine the impact of the BNN on timeliness of care throughout a breast cancer patient's treatment trajectory. Hildegard Peplau's Interpersonal Relations Model of Nursing was utilized for this study as it highlights the effectiveness of the therapeutic nurse-patient relationship on reaching mutual problem-solving goals, providing for optimal patient outcomes. The study was conducted at a large health care institution in West Michigan, comparing 423 patients who received care prior to the initiation of the BNN program (fiscal year 2009) compared with 170 patients who received BNN services during the initial year of the program (fiscal year 2010), and with 82 patients who received BNN services in fiscal year 2011. Data was collected from the institution's cancer registry and the patients' medical records by nursing students. SPSS statistical software was used for data analysis. Analysis of variance tests showed significant improvements in timeliness of care from 2009 (pre-BNN program initiation) to 2010 (first year of BNN program) and from 2010 (first year of BNN) to 2011 (year two of BNN program). Potential limitations include data collection from only one health care institution and limited demographic information available for analysis. Findings validate the role of the BNN in removing barriers to care, potentially improving patient outcomes and the overall quality of health care delivery. Study results support the implementation of BNN programs nationwide. Further research should be done with a variety of BNN programs across the nation and should be further conducted to support the expansion of nurse navigation to a variety of cancer diagnoses.

Reduced Risk of Hospitalization or Emergent Care for Home Care Patients

Julia Fulton
Mentors: Renee Nyhof, RN[1] and Barbara B. Vincensi, PhD, RN FNP[2]
Holland Hospital Home Health Care[1] and Hope College Nursing Department[2]

Hospital admission rates contribute to increased health care costs. These costs are higher at this Midwest suburban hospital compared to the rest of Michigan, and Michigan's rates are higher than the national average. The use of the M1032, a tool used to look at admission risk factors, may be useful in decreasing admission rates. The purpose of this research was to explore the use of the M1032 in identifying those at risk for emergent care (EC) with or without hospitalization in the home care population. Imogene King's Goal Attainment Theory was applied because it focuses on how the patient and nurse work together to reach goals, in this case remaining healthy and avoiding hospitalization. A retrospective chart review was done to identify which patients said "yes" to questions regarding core risk factors on the M1032. One-hundred charts were reviewed of home care patients at a facility in western Michigan in September of 2012. Data was analyzed using the SPSS 19.0 statistical software. With the p-value being set at .05 and the confidence interval at 95%, the only significant correlation detected was between risk factor 2 and EC with hospitalization. There was no significant correlation between the number of risk factors and EC with or without hospitalization. The M1032 tool is not useful in identifying those at risk for emergent care with or without hospitalization for Medicare patients admitted to home health care services. Limitations of this study include: data collection from a single home health organization, the M1032 is used for Medicare patients only so there is limited generalizability, and a homogenous sample population. Due to the results of this project, nurses and other healthcare personnel at this agency should investigate what tools are being utilized by other health care agencies to predict the risk for emergent care with or without hospitalization for home health care patients. This will ultimately improve patient health outcomes of hospital admission and healthcare costs overall.

NURSING

Elevated Systolic Blood Pressure in Femoral Artery Sheath Removal

Megan Johnson
Mentors: Kara Heck, BSN, RN-BC, CCRN[1] and Barbara Vincensi, PhD, RN, FNP[2]
Holland Hospital[1] and Hope College Nursing Department[2]

Multiple methods of arterial closure after femoral arteriotomy are used to reach hemostasis. Research has not yet determined which method is most effective when considering different patient risk factors. The purpose of this study was to determine the impact systolic blood pressure (SBP) has on complication rates associated with different closure methods. The study was based on Neuman's Systems Model that recognizes people have unique interacting characteristics that affect response to illness and treatment. A retrospective observational analysis of patient charts was conducted. Data was collected from a convenient sample of 21 patients at a small private hospital in West Michigan. Statistical analysis was done using SPSS 19.0. A chi-squared test of independence was completed using stage of hypertension, complication, and type of closure device. No significant relationship was found (p=.813). Results imply that complications are independent from elevated SBP and closure method. This implies that closure method does not need to be selected based on patient's SBP in order to prevent complications. Limitations of the study include the single collection site, homogenous convenience sample, small sample size and incomplete data records that could make generalization inaccurate. Further research should include a larger sample size from multiple sites and needs to consider other risk factors affecting hemostasis. By determining the best methods for reaching hemostasis, an algorithm could be developed to assist heath care providers in determining the safest method considering patient co-morbidities.

A Descriptive Study of Social and Emotional Development in Children 0-5 Years Old

Angelina Matthews
Mentors: Drs. Sonja Trent-Brown and Susan Dunn
Departments of Psychology and Nursing

Research shows that screening for social and emotional distress in children is important, yet there is little nursing research on the use of the Ages and Stages Questionnaire/Social and Emotional (ASQ/SE) Screening Tool. The purpose of this descriptive, cross-sectional study was to describe the levels of self-regulation, compliance, communication, adaptive functioning, autonomy, affect, and interaction and differences in these levels in male versus female children. Betty Neuman's Systems Model is used, as a foundation for this project as it focuses on the clients' system response to actual or potential environmental stressors and the use of primary, secondary and tertiary nursing interventions to restore, promote and maintain optimal wellness. Data collection took place between August and December of 2012, from patients and their parents that the students and healthcare workers interacted with at a clinic in West Michigan using the ASQ/SE, and chart audit. SPSS 19.0 statistical software was used for analysis using descriptive statistics and independent t-tests. The sample size is 28 children from 0-5 years of age. Results were that males had a higher average ASQ/SE score than females, and self regulation across all age groups had the highest average ASQ/SE scores. Limitations included a small sample size, data collection from only one clinic in West Michigan and data was collected without the availability of the ASQ/SE User's Guide. Implications are that there will be an increase in the understanding by nurses and healthcare workers of the social emotional needs of this population and potential better development of future programs for children with social emotional delays.

This research was supported by Holland/Zeeland Ready For School Initiative, Kellogg Foundation, The Hope College-Howard Hughes Medical Institute Faculty Development Grants for Interdisciplinary Research, Community Health Network, Healthy Beginnings RNs and CHWs.

A Factor Analysis of Two Post-Partum Depression Assessments Used in the Hospital Setting

Courtny Mullens
Mentors: Nancy Roberts, RN, CCE[1]; Karen J. Vander Laan, PhD, MSN, RN[1]; and Barbara Vincensi PhD, RN, FNP-BC[2]
Spectrum Health[1] and Hope College Nursing Department[2]

A woman's risk for post-partum depression (PPD) can be assessed in the hospital setting. Two instruments, the Post-Partum Depression Risk Assessment (PDRA) and the Edinburgh Postpartum Depression Screen (EPDS), are used in a large

Midwestern hospital. The purpose of this study was to determine if the PDRA and EPDS were measuring different elements of PPD using factor analysis, identifying items that clustered together. Nola Pender's Health Promotion Model informed the study because how a mother perceives her risk of PPD will lead to taking preventative action if PPD symptoms occur. This study was a factor analysis of PDRA and EPDS risk assessment using de-identified data collected from a convenience sample of 585 mothers within 24 hours of delivery. The variable self-harm from the PDRA was eliminated because there were no occurrences of this variable in the dataset. Principal components analysis was conducted using oblique rotation, initially revealing four components. These components loaded on four factors, which were stress, emotional response, history, and self-harm. Emotional response was composed of only factors from the EPDS, history from PDRA, and harm was only one question from the EPDS. Limitations for the factor analysis include this study being the first to compare the PDRA and the EPDS, and data collection from only one healthcare institution. Conclusions are that the PDRA and the EPDS are measuring different factors. The PDRA focuses on history, whereas the EPDS focuses on the current pregnancy. Therefore, when evaluating PPD, both PDRA and EPDS should be used. Further research is needed.

A Descriptive Analysis of Gender Differences in Patients Working With a Lung Cancer Nurse Navigator

Amanda Russ
Mentors: Erin VanDyke, BSN, RN, OCN[1] and Susan Dunn, PhD, RN[2]
Spectrum Health[1] and Hope College Nursing Department[2]

Nurse navigation is the teaming of an oncology-prepared nurse and a patient with cancer in order for the nurse to ease the patient's transition through the health care system, provide support, and remove barriers to treatment. Previous research demonstrates that navigation improves patient satisfaction with care and timeliness to treatment. The purpose of this project was to describe a sample of patients working with a lung cancer nurse navigator. The framework used for this project was Dorothea Orem's Self-Care Theory because it emphasizes the role of the nurse as helping the patient care for themself and providing care when the patient is unable, much like the role of the nurse navigator. A student nurse collected data through retrospective patient chart review. The sample consisted of 150 lung cancer patients, inpatient and outpatient, actively working with a nurse navigator. The study took place at a large, metropolitan cancer center in the Midwest United States. Data analysis included descriptive statistics and correlations, and was analyzed using SPSS software. The results showed that there were not significant differences between males and females regarding the time to treatment, age, or stage at diagnosis. The limitations are some missing data, data only being collected from a single cancer center, and convenience sampling. The implications of this study are that it provides an increased knowledge of gender similarities related to lung cancer and the prevalence rate among women. Further research needs to be done regarding timeliness and the benefit of a nurse navigator.

Comparison of Quality of Discharge Teaching Scores on a Postpartum Unit

Leigh Schenewerk
Mentors: Sharon Strek, MSN, RN[1] and Susan Dunn, PhD, RN[2]
Spectrum Health[1] and Hope College Nursing Department[2]

The Quality of Discharge Teaching Scale (QDTS) was used to determine the effectiveness and preparedness of discharge teaching. It was administered by nurses at discharge for patient feedback to help develop changes to the discharge teaching plan. From the QDTS results, changes in discharge teaching were made to focus on what the patient determined as their learning needs. The QDTS was administered after changes were made to determine if improvements in scores occurred. The purpose of this project was to compare QDTS results before and after adjustments had been made to the concept and focus of discharge teaching. The conceptual model for this study was Pender's Health Promotion Model which emphasizes how health promotion, in this study the quality of discharge teaching received, was used to increase client's level of function and wellbeing. This study used a between-subjects design via patient completion of the QDTS scale, comparing results between two time frames. The pre-test data included 488 participants and the post-test project currently has a sample size of 307. Participants were women being discharged from the postpartum unit at a hospital in West Michigan. Data analysis involving SPSS statistical software will be used to run correlation tests on the data. Results and conclusions are pending. Limitations include use of a convenience sample, lack of demographic data and data collected from only one hospital. Future implications would be improved satisfaction and understanding in discharge teaching received.

NURSING

Validity and Reliability of the Mishel Uncertainty in Illness Scale (MUIS) for Medically Managed Patients with Coronary Artery Disease

Christine Springer
Mentors: Barbara Vincensi, PhD, RN, FNP, and Donna Garrett, MSN
Department of Nursing

Uncertainty is a complex phenomenon that may be detrimental to health and overall quality of life. Although the experience of uncertainty is individualized, nursing interventions to increase patient knowledge and control over disease outcomes have been effective to decrease anxiety and depression. The purpose of this study is to determine the validity and reliability of the Mishel Uncertainty in Illness Scale (MUIS) for use in a larger interventional study on medically managed patients with coronary artery disease. This project is based on Mishel's Reconceptualized Theory of Uncertainty in Illness, focusing on the experience of uncertainty over time as patients integrate uncertainty into their way of life. A review of the literature was done to determine validity and reliability of the tool, obtaining research articles using the databases CINAHL, Medline, Ovid, PSYCHInfo, and PubMed. Ten articles were chosen for analysis. The inclusion criteria for the articles were limited to primary research studies in English that used the MUIS Adult Form. Studies that did not meet inclusion criteria were those examining children, caregivers, and nonhospitalized adults, and were not included in this review. Therefore, the main limitation of the study is that only the form for one population was examined. Reliability for the total scale ranged a=0.64-0.91, with support for construct and convergent validity. The MUIS Adult Form is a valid and reliable tool. In the future these findings may be used to support the utility of this tool, and subsequently more fully understand the experience of uncertainty.

Evaluation of Screening Tools for Health Literacy in an Acute Care Setting

Sarah Venlet
Mentors: Susanne Brooks, MSN, RN, AOCNS[1] and Susan Dunn, PhD, RN[2]
Spectrum Health[1] and Hope College Nursing Department[2]

Health literacy, the capacity of an individual to obtain and comprehend basic health information or services to make healthcare decisions, can impact re-hospitalization, healthcare costs, health behavior and self-care of patients. Approximately one third of Americans have inadequate health literacy levels, producing worse health outcomes, decreased use of preventative services, and medication non-adherence related to misunderstanding of their health condition. The purpose of this project was to describe the prevalence of patients with limited health literacy in acute care settings, as affected by age. Dorothea Orem's *Self-Care Deficit Nursing Theory* guided the study, which assumes that a person's knowledge of health problems (health literacy) is necessary for promoting self-care behaviors. Data collection followed a prospective, descriptive design using three tools: a health literacy assessment questionnaire, Newest Vital Sign, and Short Test of Functional Health Literacy in Adults, which were administered by student researchers and other research team members in the patient's hospital room. The 105 adult participants were randomly selected from the daily census of acute care units. Data collection took place in two metropolitan hospitals in one Midwest city. Data analysis was done using descriptive statistics via SPSS software. All tests were two-tailed with a significance level set at $p<0.05$ The study results indicate a moderate correlation between health literacy survey score and year of birth on all three instruments, with patients born 1945 or earlier having significantly lower literacy scores than those born 1946 or later. Limitations for this study include sampling from two hospitals in one city and lack of diversity of patient ethnicity. Results of this study will increase nurses' knowledge of health literacy, be used to identify individuals at greatest risk for limited health literacy, and to further development of interventions to promote health literacy in acute care populations.

Rate of Treatment for Osteoporosis in Patients with Previous Fragility Fractures at the Time of Current Fracture

Katelyn VerHage
Mentors: Anne McKay MSN, ANP-BC[1] and Barbara Vincensi, PhD, RN, FNP[2]
Holland Hospital[1] and Hope College Department of Nursing[2]

Fragility fractures secondary to osteoporosis and osteopenia have reached epidemic levels in the United States. Osteoporosis is one of the most under-treated chronic diseases because it is often disregarded by physicians. The purpose of this study is to assess whether a higher rate of patients who have had a previous fragility fracture are taking osteoporosis medication at the time of their current fragility fracture than patients who have not had a previous fragility fracture. This will help us to see what the current standard of care is for medications following a fragility fracture, and aid in the improvement of this standard. Betty Neuman's Systems model was used as a framework for this study. The model focuses on the internal and external environments of a patient and how they affect their health and disease process. The sample included all patients who were admitted to a West Michigan hospital following a fragility fracture. Patients are both male and female ages 62 to 93. The study was carried out via retrospective chart review. Chi-squared tests and descriptive statistics will be run using SPSS 19.0. The findings and conclusions of this study are pending. Study limitations include all of the participants coming from one institution which makes generalization to others difficult. The assumption was made that the patient's current fracture was a fragility fracture. Providing patient education and follow-up care for fragility fractures are the two main implications for future nursing.

This material is based upon work supported by the Bone Health Services of Holland Hospital.

PHYSICS

Characterization of a Magnetic Coil and Magnetic Force Microscopy of NiFe Thin Films

John Baranski
Mentor: Dr. Jennifer Hampton
Department of Physics

Magnetic thin films are widely used in the storage and reading of computer data. Electrochemical deposition is an effective way of creating these films. The purpose of this project is to electrodeposit permalloy (NiFe) films on gold-plated silicon wafers and characterize them through multiple analytical techniques. The structure and composition of these deposits were characterized with Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). The magnetic domains of the films were then analyzed using Magnetic Force Microscopy (MFM). Preliminary results suggest that the size of magnetic domains of the depositions decreases over time. A magnetic coil was also characterized so that it can be used in the future for MFM imaging in applied magnetic field. The coil was able to produce a magnetic field of 0.00352T±0.00007T at a distance of 1cm away when driven with a constant current of 0.3A.

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Effect of Carrier Doping on Nonlinear Distortion of Microwave Signals by Superconducting Thin Films

Michael Bischak
Mentor: Dr. Stephen Remillard
Department of Physics

The performance of high temperature superconductors is limited by signal distortion under the influence of high electric current. Measurements of nonlinear distortion made on $Tl_2Ba_2CaCu_2O_{8-x}$ (TBCCO-2212) wafers using a 5.5 GHz sapphire dielectric resonator reveal dependence on carrier doping x, with grain boundaries contributing more significantly in underdoped films (x>0.1) as compared to those optimally doped (x=.1). The doping level was tuned by annealing the TBCCO-2212 thin films in a reducing nitrogen atmosphere at temperatures ranging from 250°C to 400°C. The microwave current dependent surface impedance of both pre- and post-annealed films was measured. With the critical temperature being used as the indicator of carrier density, it was found that underdoped samples have larger nonlinear grain boundary losses as indicated by a weaker variation of surface reactance with surface resistance, revealing the preparation conditions for optimal wafer performance.

This project was supported by the National Science Foundation NSF-REU Grant No. PHY/DMR-1004811, NSF-RUI Grant No. DMR-1206149 and the Hope College Division of Natural and Applied Sciences.

Mapping the Nonlinearity of Superconductive Passive Circuits

Brooke Jeries and Sean Cratty
Mentor: Dr. Stephen Remillard
Department of Physics

The nonlinear response of High Temperature Superconducting (HTS) microwave resonator samples of $Tl_2Ba_2CaCu_2O_8$ (TBCCO) and $YBa_2Cu_3O_7$ (YBCO) on $LaAlO_3$ (LAO) substrates was analyzed around the transition temperature (T_c). Nonlinearity is an undesirable response in commercially-produced superconductors that can potentially be minimized through the understanding of its effects through our investigation. HTS microstrip lines were examined with a travelling microscope and a scanning electron microscope (SEM) to determine the dimensions, geometry, and edge structures of each sample, and Energy-dispersive X-ray Spectroscopy (EDS) was used to verify the material composition. Multi-tone measurements of even and odd order intermodulation distortion (IMD) currents were performed utilizing a simultaneous and synchronous measurement technique developed at Hope College. Around their respective T_cs, resonators of the two material systems exhibited different even and odd order IMD currents. The degree to which the superconducting current breaks time reversal symmetry (TRSB) is revealed by the ratio of the 2nd and 3rd order IMD levels. In YBCO samples, this ratio steadily decreased with increasing temperature, but then rapidly increased through T_c, indicating a considerable amount of TRSB. TBCCO showed a steady decrease in this ratio, as well, with increasing temperature, but did not show any indication of a rise in TRSB whilst approaching T_c. In TBCCO, 3rd order IMD exhibited a peak around T_c which is consistent with the nonlinear Meissner effect. TBCCO also appears to show nonlinearity past T_c much more than does YBCO, indicating the possibility of quantum mechanical fluctuations: a phenomenon associated with anisotropic superconductivity.

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Characterization of Electrodeposited Nanoporous Ni and NiCu Films

Kyla Koboski
Mentor: Dr. Jennifer Hampton
Department of Physics

Nanoporous thin films are interesting candidates to catalyze certain reactions because of their large surface areas. This specific project focuses on the deposition of Ni and NiCu thin films on a Au substrate and further explores the catalysis of the hydrogen evolution reaction (HER). Depositions are created using controlled potential electrolysis, a process where the potential at which the metal alloy deposition occurs is set and the length of time or total charge of the deposition is adjusted. Samples are then dealloyed using either DC potential amperometry with an applied constant potential or cyclic voltammetry for linear sweeping.

Before and after the dealloying, all the samples are characterized using multiple techniques. Electrochemical capacitance measurements allow comparisons of sample roughness. HER measurements characterize the reactivity of the sample with respect to the specific catalytic reaction. The Tafel equation is fit to the data to obtain information about the kinetics of the HER of the samples. Other methods for characterizing the samples include scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The use of SEM allows images to be taken of the deposition to determine the change in the structure pre- and post- dealloy of the sample. EDS allows the elemental composition of the deposition to be determined before and after the dealloy stage.

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PHYSICS

Quantitative Analysis of Various Metalloprotein Compositional Stoichiometries with Simultaneous PIXE and NRA

Andrew McCubbin[1] and Megan Sibley[2]
Mentors: Drs. Paul DeYoung and Graham Peaslee
Departments of Physics and Chemistry
[1]Hope College, [2]Clemson University

Stoichiometric characterization has been carried out on multiple metalloproteins using a combination of Ion Beam Analysis methods and a newly modified preparation technique. Particle Induced X-ray emission (PIXE) spectroscopy is a non-destructive ion beam analysis technique well suited to determine the concentrations of heavy elements. Nuclear Reaction Analysis (NRA) is a technique which measures the areal density of a thin target from scattering cross sections of 3.4 MeV protons. A combination of NRA and PIXE has been developed to provide a quantitative technique for the determination of stoichiometric metal ion ratios in metalloproteins. About one third of all proteins are metalloproteins, and most do not have well determined stoichiometric compositions for the metals they contain. Current work focuses on establishing a standard method in which to prepare protein samples. The method involves placing drops of protein solutions on aluminized polyethylene terephthalate (Mylar) and allowing them to dry. This technique has been tested for several proteins of known stoichiometry to determine cofactor content and has proven to be a reliable analysis method, accurately determining metal stoichiometry in cytochrome c, superoxide dismutase, concanavalin A, vitamin B12, and hemoglobin.

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Electromagnetic Dispersion in Periodic Structures

Caitlin Ploch, Andrew Bunnell, Kyle McClellan, and Isaac Angert
Mentor: Dr. Stephen Remillard
Department of Physics

Photonic crystals are electromagnetic structures that affect the propagation of microwaves, clearly demonstrating nonlinear, band gap dispersion in the band theory of solids. Motivated partly by the development of an advanced physics lab in dispersion, we have compared the dispersion of microwaves in photonic crystals to the dispersion of electrons in semiconducting crystals. The transmission lines were fabricated to achieve periodicity with alternating widths of adjacent copper segments using photolithography. Three identical dispersion diagrams were constructed using different sets of values: the S-parameters measured by the vector network analyzer (V.N.A.), the S-parameters simulated using finite element analysis software, and the delay values measured by the V.N.A. All three methods showed close agreement in the dispersion with a band gap at the Brillioun zone edge. The values from the network analyzer were then used to examine the group velocity of the wave near the band gap. Near the edges of the band gap, the group velocity approached zero; inside the band gap, the evanescent waves tunneled through the crystal with superluminal group velocities. Periodic transmission lines with defects were also constructed; the defects engineered into the photonic crystals produced donor and acceptor states in the band gap. These results indicate that the microwave transmission lines successfully modeled the dispersion from band gaps in photonic crystals.

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Composition of the ^{24}O Ground-State Wavefunction

Eric Traynor
Mentor: Dr. Paul DeYoung
Department of Physics

Unexpectedly, ^{24}O is a doubly magic nucleus. We would expect a nucleus to be stable with 8 or 20 neutrons but experimentally we find that 16 neutrons is more stable than 20 because at high neutron numbers the nuclear force becomes more complicated. To gain insight into the wavefunction of the ground state of ^{24}O, the cross sections for forming ^{23}O in the ground state and excited state during knockout reactions need to be determined. ^{23}O is stable and is therefore relatively easy to count directly. However, $^{23}O^*$ is unstable and decays too rapidly to detect directly (10^{-20} s). $^{23}O^*$ will decay to ^{22}O and a neutron. The neutron continues forward and is recorded by MoNA while the ^{22}O is deflected by a 4 T superconducting dipole magnet and is recorded by charged particle detectors. Using four-vectors of the ^{22}O, ^{23}O, and the neutron we can work backwards to the $^{23}O^*$ and ^{23}O. We will then be able to calculate the cross section of these two isotopes being created from a one-neutron knockout reaction from ^{24}O.

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Electrodeposition and Characterization of Nickel, Iron, and Copper Thin Films and the Creation of Nanoporous Structures

Jonathan Yarranton
Mentor: Dr. Jennifer Hampton
Department of Physics

There has been much research in creating nanoporous platinum or gold thin films for catalysis, but there has not been as much work done with other, less noble metals. This research explored the deposition of nickel, iron, and copper ternary alloys using controlled potential electrolysis (CPE) and the selective removal of the copper with DC potential amperometry (DCPA) and linear sweep voltammetry (LSV) to create nanoporous structures. These structures have the advantage of increased surface area creating more efficient catalysts. All films were characterized before and after dealloying using scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDS) for composition. The roughness of each of the films was characterized by the capacitance of the film, with higher capacitances indicating a higher electrochemical surface area.

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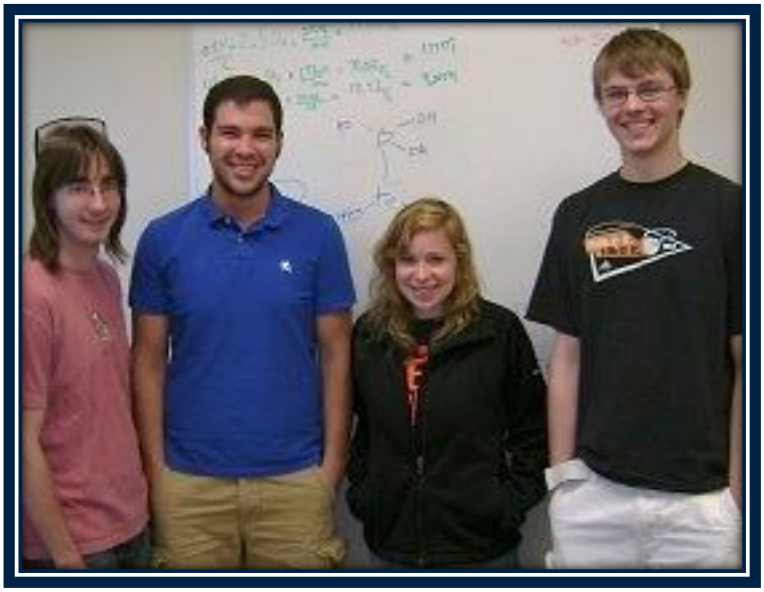


The Impact of Environmental Awareness on People's Everyday Foods

Katharine Flood
Mentor: Dr. Teresa Heinz Housel
Department of Communication

The environmental movement is gaining more popularity in American culture in the last twenty years. Consequently, more and more environmentally-friendly products are making their way into stores. This makes studying environmental behaviors increasingly important in today's society because as natural resources start to become increasingly scarce, it is critical that people learn ways to help protect the environment. Researchers have suggested that there are links between people's environmental awareness and the consumer behaviors they exhibit. To this end, this qualitative study will advance the existing research by examining how environmental awareness can affect food choices. I analyzed the relationship between how aware a person is of environmental issues and the proportion of meat, locally grown food, and organic food they consume each week. By conducting fifteen interviews with faculty, staff, and students of Hope College who have expressed interest in environmental awareness through their involvement or activism on campus, I analyzed if people's environmental awareness actually affects their foodways. Based on my research, the interview data suggests that the more environmentally aware a person is, the more likely they are to purchase food from local businesses as well as eat more organic foods.

Athletes and Food as Fuel: Choosing Premium Over Unleaded

Sarah Krueger
Mentor: Dr. Teresa Heinz-Housel
Department of Communication

A shift in American food culture has termed food as the fuel for an on-the-go nation. However, in sharp contrast with the culture of quantity over quality and fast food, athletes use food as fuel in a much different way. Previous studies have examined the advantages as well as disadvantages of how athletic involvement influences a person's use, perception, and relationship with food. Most athletes, especially professional and college athletes, have access to more nutritional information than the average American, which would suggest that their foodways are different and possibly healthier. However, these athletes have also been said to have higher levels of pressure placed on them, which can lead to disordered eating habits. This study uses interviews with college athletes and non-athletes to understand what their eating habits are and, if they are athletes, how they relate food to their involvement in sports. In addition, textual analysis of news articles about the diets of Olympic swimmer Michael Phelps, NBA basketball player Michael Jordan, Olympic volleyball player Misty May-Treanor, and Olympic swimmer Janet Evans will also be used to evaluate the way elite athletes construct foodways. I expect to find through both the interviews and textual analysis that food is used to increase performance and fuel the body to function at its best. Although college and elite athletes comprise only around .13 percent of the American population, uncovering ways in which athlete foodways vary from the norm can benefit the population by highlighting the benefits that can come from upper-tier athletics. This study's results can also be used to inform the general population how to better relate to foodways and make nutrition and exercise choices that positively shape their foodways.

The McDonaldization of Race: Racial Representations in McDonald's Television Advertisements

Elena Rivera
Mentor: Dr. Teresa Heinz-Housel
Department of Communication

Since its inception in the early 1960's, McDonald's has served as a cultural juggernaut in the United States, influencing everything from childhood development to food consumption patterns. McDonald's is a pop culture phenomenon that has also played a large role in forming cultural and societal norms in the U.S., including the formation of specific ideologies that dominate both institutions and social consciousness. Given the central role McDonald's plays in the U.S., it is important to discover the messages McDonald's is sending. This study will focus on the messages McDonald's is sending about race and race

relations in the United States. This study uses a textual analysis of 10-12 McDonald's television commercials from the present-day (2010-now) to see if the ideologies of race that are present in the commercials support or negate the dominant white ideology found in the U.S. This white dominant ideology in the U.S. is characterized by white superiority and the inferiority of people of color, as well as certain stereotypes associated with specific racial groups. By noting the frequency, the role, and the depiction of people of color in various McDonald's advertisements, I will be able to determine the media messages McDonald's is sending. I anticipate that, although McDonald's has geared much of its recent advertising towards people of color, it will continue to further dominant ideologies about race, and employ stereotypes and marginalization tactics in the television advertisements to reinforce white superiority and the inferiority of people of color.

The Differences of Organic and Non-Organic Food in a National Grocery Store Versus a Whole Foods Store

Samantha Rushton
Mentor: Dr. Teresa Heinz Housel
Department of Communications

Organic food has suddenly become a recent trend in grocery stores across the country. Many people eat organic simply because they enjoy the taste or want to enjoy the benefits that come with eating natural, organic food. This qualitative research project will discuss the ideologies that shape people's everyday foodways, specifically the foodways of organic eaters. The project's research question examines how are organic versus non-organic products marketed and are they really healthier? Through two textual analyses (one of a "whole food" store and one of a national grocery store) my project will analyze what types of foods are sold at each store and how both organic and non-organic foods are marketed to consumers. Textual analyses of features of the packaging of food products (such as color, food descriptions, and graphics) will also reveal how specific organic and non-organic products are marketed and which products are healthier. I predict that this research will find that organic food is healthier than non-organic food, but it does not matter whether the organic food is from a brand-name or generic label – both will have the same health value.

ECONOMICS, MANAGEMENT, ACCOUNTING

The Effect of the Kalamazoo Promise on Kalamazoo Public School Enrollment, Graduation Rate and Kalamazoo Unemployment

Erica Budge
Mentor: Dr. John Lunn
Department of Economics, Management and Accounting

Introduced in 2005, the Kalamazoo Promise is a unique place-based scholarship program that is intended to revitalize the economy of Kalamazoo. Some of the first visible effects of the Promise on the school system should be an increase in enrollment in Kalamazoo Public Schools and an increase in the graduation rate. Further, since the Promise is intended to help the entire city, a preliminary economic outcome should be that the Promise will have an effect in reducing unemployment. This research compares Kalamazoo to 20 other Michigan school districts to determine the effect of the Kalamazoo Promise on enrollment and graduation rate. Regression analysis has found that enrollment and enrollment change in Kalamazoo after the Promise is significantly higher than in other school districts, and that the Promise has had a significant effect on Kalamazoo unemployment. There have not yet been significant impacts on the Kalamazoo graduation rate.

Matching Across Sorority Rush: Learning in a Dual-Sided Matching Context

Laura English and Josh Kamstra
Mentor: Dr. Peter Boumgarden
Department of Economics, Management and Accounting

This paper explores learning in dual sided markets, a context initially described by Gale & Shapley (1967) in their exploration of college wait list decision-making. Since their initial research, we have seen an expansion of work on matching in dual side markets by, amongst others, Alvin Roth whose research on organ transplants and the sorority rush process earned him the 2012 Nobel Prize in Economics. This paper expands Mongell and Roth's (1991) study of the sorority rush process by including a wider range of behavioral motivators. While Mongell and Roth assumed perfect information, utility maximizing homogenous players, and attitude stability amongst other things, we relax the assumptions of attitude stability and homogeneous agents and therefore model the process by including personality and network perspectives. In this context and with these assumptions, we model learning of participants across the rush process in three different ways: learning by motivated reasoning, learning from interaction with the houses, and learning from one's peers. Learning from motivated reasoning (Kunda, 1990) is a process of seeking confirmation of initial opinions, a process that would be result in continuity of house ranking alongside a growing spread of house evaluations. Learning by interaction with houses involves attendance at the house events and also the interpretation of signals sent from the house—signals like rejection from events not open to the public. In this approach, attitudes would be shaped by rejection, where either rejection acts as a signal of scarcity and therefore drives evaluation up, or rejection would cause house devaluation as a way to protect one's identity. In regards to learning from one's peers, we recognize that girls don't enter this process alone and therefore formally model the influence of the attitudes of one's peers on a girl's attitudes over time. Across the learning mechanisms, we also drop the assumption of homogenous individuals and therefore account for how differences in self-esteem moderate the learning process. Our model is tested using panel survey data during the sorority rush process at a small Christian liberal arts college. The results from this study help us to better understand the way individuals form their attitude toward a given house or in a larger context, sort themselves into organizations across a given market. Initial findings suggest learning does occur but it is a complex mix of the outlined mechanisms.

Venture Capital and Valuation: the Importance of the External Landscape

Charles Page
Mentor: Dr. Peter Boumgarden
Department of Economics, Management, and Accounting

Venture capitalists evaluate start-up companies as potential investments through complex decision processes in environments characterized by high levels of uncertainty. Previous research on valuation and venture capital focuses on the role of networks in the valuation process, as well as the emphasis on ventures as standalone entities, specifically in the dimensions of team, market, and proof of concept. Through a qualitative method consisting of 16 semi-structured interviews, we have discovered

that the external landscape is a very important factor that often receives only implicit recognition in both previous literature and the thoughts of VCs themselves. Our data suggests that the external landscape has a heavy effect on the start-up companies it interacts with, and is a very important evaluative factor. We think that approaching valuation problems from this more holistic viewpoint is more true to the actual context that VCs inhabit, and it is an important component missing in both the literature and common current practices in the venture capital industry.

Innovation and Distribution Structure: Exploring Consumer Behavior Via Responses to Innovation Across Distribution Channels

Chris Ray and Will Payne
Mentors: Drs. Peter Boumgarden and Thomas Smith
Department of Economics, Management, and Accounting

The following study explores the differential performance of radical and innovative products across distribution channels in a high fashion product design firm. While previous research has clearly demonstrated that radical and incremental innovation are a necessity for long term success for a firm, the focus of much of this work has been on how firms manage the *production* of these different forms of innovation, and specifically the process by which they are designed to do both simultaneously. One limitation of this work however is its failure to look at differences in how products are eventually distributed to customers, and whether different forms of innovation may perform across distribution channels differentially By looking at radical and incremental product sales data from a high design retailer across direct (company stores), indirect (large retailer and boutique stores), and e-commerce (company website) channels, a number of implications can be teased as to how a given firm can best strategically plan product roll-out across the pipeline of innovation. Specifically, we find that radical and incremental innovation do perform differentially across the three channels, and then seek to explain such differences in terms of the level of control the retailer has, the level of competition the products experience, and the type of customer likely to end up in a given channel. We conclude by delineating the corresponding implications for multi-channel firms looking to manage a radical and incremental innovation process simultaneously.

The Value of a Teacher: Teacher Compensation and Resulting Budget Constraints in Public Education

Anna Slemp and Madeleine Ferguson
Mentors: Drs. Peter Boumgarden and Brian Porter
Department of Economics, Management, and Accounting

This project theoretically and empirically explores the relationship between teacher compensation and school performance, with specific focus on the role of higher compensation leading to budget constraints at both the district and state level. We start by exploring a theoretical puzzle. Using classical incentive theory, we argue that higher compensation of various forms has positive impact on the motivation, recruitment, and retention of individual teachers. That said, we also acknowledge that compensation for individual teachers may also have a negative impact on school performance by virtue of the resulting budget constrains created by higher compensation. This is especially true with smaller districts where compensation accounts for a larger percentage of total school costs. Using data on salary schedules, pension plans, and budgets collected from 29 districts across 26 states, we calculate discrepancies between the amount of money promised to teachers during retirement and the amount of money that districts are capable of paying. We then explore the role of such discrepancies in driving budget constraints at both the district and state levels. While our findings are preliminary due to the small sample size, this research indicates that tradeoffs exist between the district and state level when determining the extent to which each should contribute funding to district budgets and teacher pensions in the short- and long-term. Preliminary results show that when states increase educational funding, thereby taking some of the burden upon themselves, districts often decrease their respective funding towards teacher compensation, a process that releases the pressure placed on the districts while serving to increase the resulting pressure on the state. This trend is evident throughout our sample and one that we intend to explore further in both theory and analysis.

ECONOMICS, MANAGEMENT, ACCOUNTING

The Economy's Effect on College Major Decision

Steven Van Hoven
Mentor: Dr. John Lunn
Department of Economics, Management, and Accounting

The decision to pick a major has become one of the toughest choices any college student will make during their lifetime. The majority of college freshmen arrive on campus with an idea of their ideal major but throughout the four to six years of college many students will change their major due to a wide variety of factors. This single choice plays a vital role not only during their time at the institution, but also in the years following graduation, and can essentially shape the rest of their lives. There has been an increased focus on the economy across all age groups, since the financial recession of 2008. The slide in the economy made me wonder if it had an impact on the college major decision. This analysis provided a link between the nation's economy and college major decision. The college major decision is not only affected by fixed factors such as gender and race, but dynamic factors, like the economic climate that wax and wane over time.

Luxury Fashion Brands in the International Market

Lauren Wilbur
Mentor: Dr. John Lunn
Department of Management, Economics, and Accounting

The fashion industry is an interesting market to research because it combines desirability and brand recognition with rarity. Recently, countries like America and Europe have been faced with recessions and Asian countries have not been as affected. Therefore, it was interesting to research how current economic times have affected the luxury market and consumer behavior/attitude towards luxury, non-necessary, goods. Data was compiled from several luxury fashion brands including: Gucci, Bottega Veneta, Yves Saint Laurent, Burberry, Dior, Prada, Armani, Louis Vuitton, and Salvatore Ferragamo. Sales revenue data was compared with percent growth GDP per region and percent high net worth individuals per region. We found a positive relationship in Asia, a strong correlation with European data, and no statistically significant relationship in the Americas. The differences in relationship can be reasoned by changes in market share or social differences that are discussed slightly in this paper.

Public Education Spending and Graduation Rates in Michigan

Brent Wilkinson
Mentor: Dr. John Lunn
Department of Economics, Management, and Accounting

A belief held throughout much of the industrialized world is that spending on education is an investment in future economic prosperity. Many policy-makers, educators, and citizens unquestioningly assume that higher budgets for education yield better-educated students, who in turn become more productive at their jobs, spurring economic growth. While this appears logical, it is worth investigating these claims to see if increased spending truly is the best way to improve education and to examine the assumption that better education leads to economic growth. This study looks at the first of these two questions by investigating the effects of spending on graduation rates using cross-sectional data on per student spending, allocation of education dollars, graduation rates, and a number of other factors in the state of Michigan's 301 public school districts with at least 1500 students each. The findings suggest that social factors, especially the racial and economic makeup of the district's student body, are far more closely related to graduation rates than spending is.

Writing Over Time in the Special Education Major

Ashley Blauwkamp and Lindsay Timmerman
Mentors: Professors Susan Cherup and Nancy Cook
Department of Education

The faculty responsible for the Special Education majors at Hope College has been concerned about teacher candidates' writing skills for a number of years. They became intentional about improvement of these skills since the dismissal of a special education student teacher due to poor writing skills. Data from the Collegiate Learning Assessment and NSSE also motivated the Team to review how written expression was addressed in the majors for emotional impairments and learning disabilities. A Teagle Grant provided time to complete the review and design ways to improve writing in the special education sequence (summer 2011). This process included not only a review of the conventions of writing but also the ideas, main message, and supporting details that enrich and develop each assignment's theme. As a result, the Team rewrote its *Written Expression Policy* and developed its *Teagle Grant 6+1 Writing Traits* rubric, both of which were implemented in the Fall 2011 semester. Data was then gathered from the Fall 2011 through the Fall 2012 semester to determine if special education teacher candidates' writing skills improved from the fall semester of the junior year through the fall semester of the senior year as a result of the *Written Expression Policy*. Though the preliminary results indicate that there was limited improvement in the students' written expression skills, data continues to be gathered and analyzed.

Research funded by a Faculty-Student Collaborative Research Grant from the Frost Research Center at Hope College.

Project Based Learning (PBL): the Cognitive and Motivational Impact on Secondary Students of Mathematics

Nicholas Haugen and Samuel Pederson
Mentors: Drs. Vicki-Lynn Holmes and Yooyeun Hwang
Department of Mathematics and Department of Education

The Phase one of this longitudinal study investigated the impact of cognitive and motivational factors of Project-Based Learning (PBL) on Secondary mathematics' students in order to determine the effectiveness of this pedagogical approach on learning. Specifically, for two years, this study followed two comparable groups of 8th and 9th graders from a PBL school and a conventional public high school, which represented a wide range of mathematical abilities (deep vs. superficial conceptual knowledge) and demographic diversity (race/ethnicity/SES). Each semester, both quantitative (i.e., on-line surveys) and qualitative assessments (student and teacher interviews and classroom observation) were conducted and analyzed. These results showed that at-risk and minority students benefited from PBL in learning mathematics; the academic performance gap was present, but the width of the gap diminished significantly. Compared to conventional high school students, PBL students were stronger in employing or regulating effective study strategies, critical thinking skills self-efficacy and self-regulation, while showing significantly lower test anxiety.

The Relationship between Types of Student Engagement (Emotional, Cognitive, and Behavioral) in an Informal Summer Science Camp Setting

Amanda Littleton
Mentors: Dr. Vicki-Lynn Holmes, Professor Tod Gugino, and Dr. Catherine Mader
Departments of Education, Mathematics & Chemistry

The relationship between student engagement and achievement has inspired additional research on the causes and effects of engagement. However, its definition is debatable. Therefore, engagement has been separated into three definable spheres: emotional, cognitive, and behavioral. Some researchers measure these spheres independently, while others call for a more multidimensional analysis of engagement. This study investigated the interaction between emotional and cognitive engagement, and how the relationship impacted student camper learning during summer science camps. Results showed a self-reported student increase in learning when a science activity was cognitively engaging; and an emotional engagement that remained relatively high throughout the camp. Results emphasized the inter-dependency between the three concepts:

While neither cognitive engagement nor emotional engagement had a very large direct relationship with learning, when cognitive and emotional engagement interacted, learning was significantly affected. These findings highlight the importance of curriculum development can be improved if activities account for multiple forms of engagement.

This research is based upon work supported by the Howard Hughes Medical Institute

Assessment of Early Elementary Student Learning of Science in an Informal Education Setting

Sarah Schuiling
Mentors: Dr. Vicki-Lynn Holmes, Professor Tod Gugino and Dr. Catherine Mader
Departments of Education, Mathematics, and Chemistry

The purpose of this study was to determine the effect of how challenging a science activity was perceived to be on an elementary student's content mastery. The study was conducted in an informal science education setting (summer camps) at a small, private college in the Midwest. Classroom observations, student interview/focus groups, and student survey results indicate that when 2nd-3rd grade students like an activity and find it challenging, they learn more from it. Results showed that likableness trumps challenge. Those students who liked an activity and found it challenging learned equal or significantly more than those who found the activity only challenging. Moreover, if an activity was disliked, not much learning occurred at all. Children learned when the science activity was fun. Additionally, the effectiveness of different types of activities were uncovered -- the most surprising being videos. Evaluations suggest that although videos are engaging to children, they do not necessarily teach or encourage learning. Non-educational films can be used as supplementary teaching tools but by themselves are more for entertainment than learning. More detailed results and science camp activity illustrations are detailed in this poster.

Research funded by a grant from the Howard Hughes Medical Institute.

Effects of Caffeine on Anaerobic Activity in Trained and Untrained Individuals

Olivia Allore, Chase DeMaagd, Kristine Eagen, Ariel Edsall, and Mark Karam
Mentor: Dr. Kevin Cole
Department of Kinesiology

It is well documented that caffeine has positive effects when it is coupled with aerobic or long distance exercise. However, the literature shows mixed results when the supplement is taken before anaerobic or short distance events. Certain studies have shown that when caffeine is paired with trained athletes completing sprints, the caffeine has resulted in positive effects. Previous research examining intermediate sprints lasting more than 30 seconds using trained athletes, demonstrates an increase in power output levels. The current study was designed to determine if caffeine had a positive effect on power during a Wingate test. It was also designed to determine whether there was a difference between trained and untrained subjects. Nineteen Hope College males were selected to participate in this study and were split into 2 groups based on power training, trained (n=11) and untrained (n=8). All participants were asked to perform three Wingate tests separated by at least five days. The first test was a familiarization trial where the participants had height and weight recorded and completed a practice Wingate test. The next two trials were preceded by either a caffeine pill or placebo 30 minutes prior to testing administered in a double-blind manner. All participants completed a 5-minute warm-up and a cycle ergometer before the test and a 5-minute cool down afterwards. The data will be thoroughly examined and run through a series of statistical analyses to determine significant differences between treatments and groups.

Femoroacetabular Impingement in a Collegiate Athlete with Subsequent Labral Pathology: An Overview of Surgical Care and Rehabilitation for Return to Competition

Jordan Ashdown
Mentor: Dr. Kirk Brumels
Department of Kinesiology

Femoroacetabular impingement (FAI) is not a very well understood pathology and is currently receiving more attention and recognition within the medical community. FAI presents within the hip joint and is caused by excess bone growth on either the head/neck of the femur or the rim of the acetabulum. This excess growth limits range of motion within the joint and causes impingement on the labrum or associated hip structures. Experts today still do not fully agree on whether or not this pathology is only congenital, or if it can be developed throughout life. This pathology presents with a number of symptoms and can be treated conservatively or surgically. During fall 2012 the Hope College Athletic Trainer's worked with four cases of FAI and were a part of the assessment and rehabilitation process of each athlete. The case of a 22 year old male track athlete with this condition was followed from diagnosis to return to competition. Details relating to assessment criteria, diagnostic and surgical procedures, as well as, treatment and rehabilitation protocol will be discussed.

Case Study: Injuries to the Base of the 5th Metatarsal

Peter Aune
Mentors: Dr. Kirk Brumels and Professors Meg Frens and Tonia Gruppen
Department of Kinesiology

The base of the 5th metatarsal is a common location for lateral foot injuries that occur in athletics. There are three different types of injuries of differing severity that can occur at this junction creating difficulty in assessment, diagnosis, and treatment for the caregiver. An avulsion fracture, Jones fracture, and finally a stress fracture are the three possible bony injuries that can occur in this location. In addition, but uncommonly there can also be accessory or sesamoid bones that can become symptomatic and create additional difficulties in diagnosis and management. The research for this case study was precipitated and conducted based on an injury to the foot of an NCAA Division III male basketball player. The study describes the common signs and symptoms, diagnostic difficulties, treatment options, rehabilitation procedures, and the prognosis for return-to-play.

KINESIOLOGY

The Effects of Pre-Cooling on Exercise Performance and Perceived Exertion under Moderate Environmental Conditions

AJ Baar, Nichole Harpham, Paige Jowski, and Lauren Maslyk
Mentor: Dr. Kevin Cole
Department of Kinesiology

Cooling the body prior to exercise under thermally stressful conditions has been shown to improve exercise performance and core thermoregulation in a number of athletic situations. Studies have investigated the effectiveness of internal and external pre-cooling methods other than a standard ice bath immersion, suggesting that similar results can be produced through use of various cooling protocols. Despite extensive research on exhaustive exercise performance in hot/humid conditions, few studies have assessed moderate environmental conditions or the effects of pre-cooling on perceived exertion. This study examined two novel and easily transportable methods of pre-cooling used under moderate environmental conditions: iced towels (external cooling) and ice slurries (internal cooling). The main experimental variables in this study were perceived exertion and distance traveled in a self-paced run as well as core temperature changes over the course of the prescribed exercise. Twelve moderately active, college-aged participants performed a ten-minute warm-up run on a treadmill after which core temperature was measured as a baseline prior to cooling. One of three pre-cooling methods was then administered over a 20-minute period: drinking room temperature water [Control], drinking an ice slurry [Internal], and drinking an ice-slurry in combination with placement of iced towels on the head, neck, and feet [Internal/External]. Over the course of the study, participants underwent each of the three cooling methods, allowing for within-subjects analysis. Core temperature was again measured following the cooling procedure and following a 15-minute run, self-paced at RPE of 15. Heart rate, speed, and current RPE were recorded throughout the 15-minute run, and total run distance was recorded at conclusion of the run.This information will be disseminated upon the completion of data collection.

The Acute Effect of Exergaming Compared to Traditional Aerobic Activity on Cognitive Processing Speed in College Students

Sara Beery, Danielle Christensen, Leah Coggon, Siebron Mallard, and Shelby Schilling
Mentor: Dr. Maureen Dunn
Department of Kinesiology

Previous research has shown that physical activity may improve cognitive function in college students. Other research has indicated that certain video games may also improve cognitive function. This study examined the combination of those variables. The purpose of the study was to evaluate the effect of video game exercise compared to aerobic cycling exercise on mental processing speed. Forty-five college students enrolled in 'Health Dynamics' at Hope College were split in to three groups. There was a cycling group, a video game dancing group, and a resting (control) group. Participants in the treatment groups completed 20 minutes of supervised activity (stationary cycling or playing "Just Dance 3") at 60%-70% of their estimated maximum heart rate, while control group participants remained seated in a quiet room for 20 minutes. Following the 20 minutes of the respective activity, each participant was administered a modified Stroop Test and a survey that assessed the engagement level during the activity. This study is ongoing, and results are not yet available. However, if Stroop scores are higher following one activity compared to the others, this may suggest that that particular activity might have a greater effect on cognitive processing speed. Therefore, it may be beneficial for college students to participate in that particular activity prior to completing a cognitive task.

The Effect of Sprint Interval Training Compared to Endurance Training on Aerobic Capacity in Female Collegiate Athletes.

Amanda Black, Kylie Clark, Erin Holstad, Rebecca Stocker and Catie Trompeter
Mentor: Dr. Maureen Dunn
Department of Kinesiology

High intensity interval training has previously demonstrated improvements in aerobic capacity. The purpose of this study was to examine whether high intensity sprint interval training would be as effective in improving aerobic capacity as traditional endurance training. Sixteen female soccer and volleyball players (19.5 ±1.1 yrs) were recruited for the study. Participants were

divided into 2 groups, an endurance training (ET, n=9) and a sprint interval training group (SIT, n=7). Prior to and following training, VO_2peak and time to exhaustion tests were assessed in all participants. The training for both groups consisted of 6 exercise sessions over a period of 2 weeks. The ET group exercised at 65% of their VO_2peak for 45 to 60 minutes for the 6 sessions. The SIT training consisted of 4 to 6 sets of four 40 meter sprints on a 30 second interval with 4 minutes rest between sets. If results indicate improvements in aerobic capacity similar to endurance training then low volume high intensity interval training has the potential to change the way athletes train and may increase their workout efficiency.

Cognitive Rehabilitation In Multiple Sclerosis Using Xbox® Kinect® Gaming

Amanda Black, Erin Holstad, and Rebecca Stocker
Mentor: Dr. Maureen Dunn
Department of Kinesiology

The prevalence of cognitive deficits in multiple sclerosis (MS) necessitates effective rehabilitation paradigms; however, relatively few studies have investigated cognitive training in this population. Recent evidence has suggested that physical activity may have a positive effect on cognition. Furthermore, increased technology associated with commercially available gaming devices has enabled videogame play to stimulate both cognitive and motor function. This pilot study examined the effect of 10 weeks of gameplay using the XBOX® 360 Kinect® game "Body & Brain Connection" on cognitive function in people with MS. Since the game requires full body movement to respond to various cognitive tasks, successful play thus combines motor response with cognitive stimuli. Nine female and 2 male participants with MS and cognitive deficits underwent the Paced Auditory Serial Addition Test (PASAT) and Symbol Digit Modalities Test (SDMT) prior to treatment. The experimental group (n=7) followed the initial assessment with 10 weeks of "Body & Brain Connection" videogame play (3 sessions/week, 30-45 min/session) while the control group (n=4) followed with 10 weeks of habitual activity. Both groups then participated in a follow-up cognitive assessment. Four of the initial participants in the training group dropped out of training for various reasons; therefore, only 3 participants completed 10 weeks of training. Nevertheless, training was associated with a greater effect size for SDMT scores (n=3, d'=0.93) compared to dropouts (n=4, d'=-0.06) and controls (n=3, d'=-0.02). A similar trend was observed for PASAT scores (d'= -0.22, -0.125, 0.22; dropouts, control, and training, respectively). Recruiting difficulties and participant drop-out resulted in poor study completion rates. Those who did complete the study found the training to be helpful (n=3) and invested in the Xbox® gaming system and the "Body and Brain Connection" game. Results suggest that training with this system may improve cognition in MS.

The Effects of Caffeine and Muscular Fatigue on Static Balance

Matthew Blunden, Brooke Dippel, Riley Hoernschmeyer and Jared Lincoln
Mentors: Drs. Kirk Brumels and Maureen Dunn
Department of Kinesiology

Caffeine is the world's most consumed pharmacologic and psychoactive substance. A potent adenosine antagonist, caffeine is a CNS stimulant that easily crosses the blood brain barrier due to its lipophilic properties. Research by Davis et al. 2002, suggests that blocking of the CNS adenosine receptors may explain the fatigue-delaying properties of caffeine. Fatigue, which can impair the proprioceptive and kinesthetic properties of joints, increases the threshold of muscle spindle discharge, which in turn disrupts afferent feedback and ultimately alters joint awareness. Despite this, no study exists that has examined the effect of caffeine on postural control following lower-body fatigue. Therefore, the purpose of this study was to determine the effect of caffeine on balance prior to and following fatiguing activity. Participants in this study were assessed for postural control while balancing quietly on one leg on a force platform for 20 seconds with eyes open and eyes closed. Balance was assessed prior to and following ingestion of 5 mg/kg of caffeine or placebo, and again following 5-7 minutes of fatiguing cycle exercise. Some athletes find it beneficial to ingest caffeine prior to performance; however, little evidence exists to show how caffeine may affect balance or how caffeine in the presence of fatigue may affect balance. Study results may provide insight regarding the effects of caffeine on muscular fatigue, and how this effect is translated in the proprioceptive and kinesthetic awareness of joints.

KINESIOLOGY

Effects of Caffeine on Balance in Dancers Following Fatiguing Cycle Exercise

Richele Ehardt, Alecia Ivery and Hannah Yancey
Mentor: Dr. Maureen Dunn
Department of Kinesiology

The effects of caffeine on postural control have been underexplored. Since balance is a key component to dance performance, studying the effects of caffeine on postural control could be beneficial to the dancer population especially under fatiguing conditions. The purpose of this study was to examine the effects of caffeine ingestion (5mg/kg) on balance performance in collegiate dancers after a cycle ergometer fatigue test. It was hypothesized that caffeine ingestion would improve balance post-fatigue, measured by decreased center of pressure (COP) path length and area during unilateral quiet standing or increased Star Excursion Balance test (SEBT) scores compared to placebo. Eleven female Hope College dancers participated in this double blind, counterbalanced study. Balance was assessed pre and post-fatiguing cycling exercise under conditions with (CAF) and without caffeine (PBO). Results indicated that caffeine increased average cycling time to fatigue (PBO: 6:47±0.04 seconds, CAF: 7:00±0.03 seconds, p=.035). There was a significant decrease in balance performance post-fatigue as measured by COP path length during 20s of unilateral quiet standing with eyes open (pre: 97.7±1.9 cm, post: 112.4±2.4 cm, p=.000) and eyes closed (pre: 177.1±7.6, post: 206.0±8.5, p=.008). There was also a significant decrease in balance under caffeine conditions for eyes open COP path length (CAF: 108.0±2.1, PBO: 102.1±2.5 cm, p=.04), eyes closed COP path length (CAF: 199.6±6.5 cm, PBO: 183.5±7.7 cm, p=.002) and eyes closed COP area (CAF: 26.6±2.2 cm^2, PBO: 22.3±2.2 cm^2, p=.01) during unilateral quiet standing. No change occurred in eyes open COP area or SEBT scores as a result of caffeine intake. There was no interaction between trial conditions and time (pre vs. post). Contrary to the hypothesis, caffeine increased postural sway during unilateral quiet standing, but had no effect on SEBT. Therefore, dancers should not be advised to consume caffeine before performances as a method of enhancing balance.

"Insanity: The Asylum": Effects on Agility, Power, Speed, Body Composition and Endurance in Female College Students.

Tania Habbouche, Katie Hollerbach, Reanna Janisse and Kelly Marsman
Mentor: Dr. Maureen Dunn
Department of Kinesiology

Although the beneficial effects of regular exercise are well known and used to promote exercise videos, the claims made in many advertisements are often not validated. For instance, the creators of "Insanity: The Asylum", a 30-Day at-home sport-based video, claim their program will facilitate noticeable improvements in fitness, including increased agility, power, speed and endurance, and an overall leaner body composition. The present study was designed to determine whether completion of "Insanity: The Asylum" would result in improved agility, power, speed, endurance and leaner body composition in college age females. Participants were placed in either the control condition (N=9), performing submaximal exercise 4 hours each week, or experimental condition (N=16), participating in the training program 4-5x a wk, 1 disc each day. Before and after the 6-week training program, participants (N=25) were assessed for: 1) peak oxygen consumption (cardiovascular endurance) 2) body fat percentage and body mass, 3) vertical jump height 4) 40m sprint time and 5) agility. Following the 6-week training program, no significant differences were observed between initial and post testing values regarding body mass, body fat percentage, peak oxygen consumption, power or speed (P>.05). Furthermore, no differences were observed between the control and training condition (P>.05). Findings demonstrated significant improvements in agility over time (pre= 5.03±0.11 seconds, post= 4.67±0.08 seconds, P=. 000). Additionally, the training group improved their agility score significantly more than the control group (P= .034) following the training period. The present study has demonstrated that improvements in agility were observed after completion of "Insanity: The Asylum".

Case Study: A 360 Degree Glenoid Labral Injury

Zach Johnson
Mentors: Dr. Kirk Brumels and Professor Meg Frens
Department of Kinesiology

A 360 degree glenoid labrum surgical repair is a very rare surgical procedure. This case study will follow a specific case of a

Division III collegiate football player. It will delve into the specific case of the football player tearing his glenoid labrum 360 degrees and the entire process of his injury and rehabilitation. The glenoid labrum surrounds the glenoid fossa and creates a more stable glenhumeral joint, as well as the attachment site for the capsular ligaments of the glenohumeral joint capsule. There are three main types of injuries to the glenoid labrum: (1) a SLAP lesion, which is a tear of the superior aspect of the labrum, (2) a bankart lesion, which is a tear of the anterior, inferior portion of the labrum, and (3) a reverse bankart lesion, which is a tear of the posterior aspect of the glenoid labrum. A 360 degree glenoid labrum tear is a very rare pathology and surgical repair. It is a tear of the glenoid labrum around the entire glenoid fossa. We decided to follow this pathology to learn more about the specific surgical and rehabilitative process that is involved with a 360 degree glenoid labral tear. We followed the specific case starting the day of injury and going through the diagnosis of the injury, the surgery, and the rehabilitation following the surgery. This specific pathology helped us learn: (1) about the diagnosis process of a glenoid labral tear and how hard it is to see the severity in MR arthrogram imaging, and (2) the type of rehabilitation process that is involved with this type of pathology.

The Acute Affects of Whole-Body Vibration on Power Output and Muscular Activation of the Vastus Lateralis in College-Aged Female Basketball Players

Justin Johnston, Kathleen Martin, Morgan McCardel, and Daniel Pesch
Mentor: Dr. Kevin Cole
Department of Kinesiology

Whole-body vibration (WBV) is a nontraditional training technique that provides mechanical stimulation that may produce acute adaptive neuromuscular responses that include an increase in motor unit recruitment and muscle fiber activation and synchronization. These muscle adaptations may increase overall power output and electrical activity of the muscle, which can improve athletic performance. This study was designed to determine the effects of acute bouts of WBV on power output and muscular activation of the vastus lateralis. It was hypothesized that in a repeated measures design, the WBV intervention (n=9) for one minute would induce an increase in power output and muscular activation in the vastus lateralis as measured by vertical jump and electromyography (EMG), while no change would be observed in the control treatment. Following the completion of both experimental and control treatments, no significant differences were observed in peak power ($p=0.738$; control $=0.00 \pm 103$ (W); experimental $=17.5 \pm 86$ (W)) or muscle activation ($p=0.635$; control $=-0.4122 \pm 1.03$ (V); experimental $=-0.2433 \pm 0.66$ (V)). Accordingly, there is little evidence to support previous findings that WBV increases power output and muscular activation, though the present study has a number of limitations that may have contributed to these findings.

The Effects of Barefoot Training on Balance and Postural Control in Adults aged 65-85

Jared Lincoln, Rachel Slotman, and Rebecca Stocker
Mentors: Dr. Maureen Dunn and Professor Stein Slette
Department of Kinesiology

Proprioception (the body's conscious and unconscious awareness of a joint's position in space) represents an essential component of postural control, providing orientation information about movement and position of the joints and muscles. Research shows that as age increases, proprioception in the form of foot position awareness declines and is further aggravated by footwear use. Examples of this deterioration in proprioceptive feedback are best observed in the elderly, of whom, approximately 30% fall at least once a year and ~15% fall more than once a year. Although, a number of factors have been recognized as risk factors for falling, the effect of footwear on postural stability is often overlooked. Due to the potentially adverse effects of a traditional wedge-style running shoe on proprioceptive feedback of the somatosensory system, an investigation into the effects of barefoot balance training on postural control in the elderly is warranted. Subjects were separated into three groups a control group that received no training, a shod (SH) group that was required to perform exercises wearing exercise footwear, and a barefoot (BF) group that performed exercises barefoot. Subjects in the SH and BF groups received 13 weeks of twice-weekly training of balance and stability, vestibular awareness, and functional strength. Pre- and post-test measurements were taken to assess balance using the AMTI AccuSway Balance Platform and the Berg Balance Scale.

KINESIOLOGY

Salivary IgA in Female Cross Country Runners: The Correlation to Training Level and URTI Risk

Lauren Maslyk
Mentor: Dr. Mark Northuis
Kinesiology Department

This primarily descriptive study observed the changes in salivary Immunoglobulin A (IgA) levels and rate of Upper Respiratory Tract Infection (URTI) that occurs during "normal training in collegiate cross country women". Previous research has indicated a significant negative correlation between training and IgA in various athletic groups that may put athletes at an increased risk for infection, specifically URTI. This study aimed to find a quantitative measurement of IgA levels that might act as an indicator for overtraining. The study also investigated whether IgA levels would increase during taper training (reduced mileage) at the end of the season, which may indicate how rested an athlete is for championship competition. Twenty-four college aged females participated in this study [14 cross-country (XC) athletes, 10 moderately active controls]. Participants followed their usual workout regimen during the 10-week study. Logs were used to record perceived exertion of workout, infection symptoms, motivation, and tiredness measures. Weekly, participants provided a 2mL saliva sample via passive drool. Samples were assayed using an ELISA protocol for IgA concentration. Five of the top eight XC runners reported sickness during the study, with two demonstrating significant decrease ($p<0.05$) in IgA during week of sickness. Similarly, six of nine control participants reported URTI symptoms, with three demonstrating a significant decrease in IgA during sick week. Mean IgA levels significantly increased in the top eight XC runners from weeks 6 to 7 ($p<.012$) and weeks 6 to 9 ($p<.017$) positively correlating with reduction in training volume and intensity during weeks 7 and 9. The correlation between IgA and URTI is limited, but it appears that tapering does produce a rebound in salivary IgA levels.

This research was funded by the Carl Frost Center for Social Science Research.

Distal Clavicular Osteolysis in a 20 Year Old Collegiate Football Player

Jordan Meyers
Mentors: Dr. Kirk Brumels, and Professors Meg Frens and Tonia Gruppen
Department of Kinesiology

Distal Clavicular Osteolysis (DCO) is a painful deterioration of the distal end of the clavicle. It was first described in 1936 and is characterized as an overuse phenomena that typically occurs in younger athletes with an intense exercise regimen. The frequent training and repetitive stress placed on the Acromioclavicular joint will cause numerous micro-fractures along the clavicle, leading to permanent deterioration of the osseus structures, resulting in resorption of the distal clavicle. The pain will continuously worsen and will be exacerbated by weight training with point tenderness over the AC joint and a decrease in functional activities. Prior to diagnostic imaging, an injection of corticosteroids will be injected into the AC joint. To confirm clinical suspicions of DCO, diagnostic testing will include magnetic resonance imaging (MRI), plain radiographs, and x-rays. Treatment options can be both surgical or non surgical. Non surgical treatment will consist of modifications to weight training and pain modulation. Surgical treatment will include a distal clavicle resection. It may be done with an open incision or an arthroscope. The surgeon will then attach the coracoacromial ligament over the remaining end of the clavicle.

Effect of Caffeine on Sprint and Vertical Jump Reaction Time in Male Collegiate Basketball Players

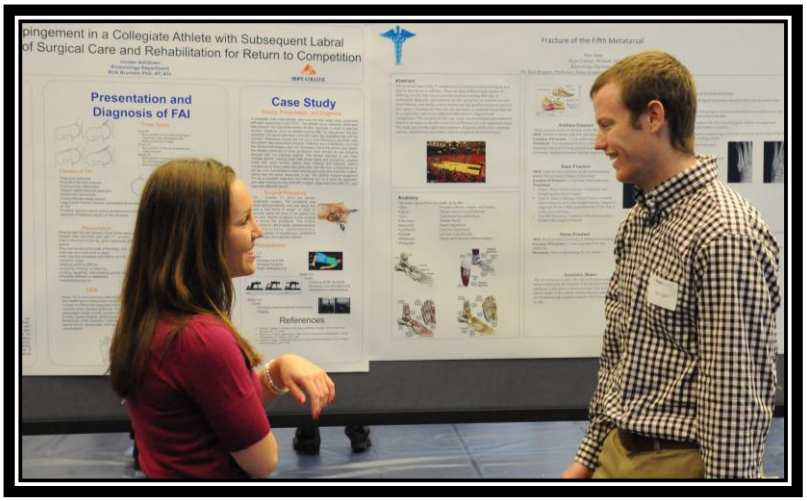
Joel Rietsema, William Seiler, Luke Vander Zouwen, and Eric Zylstra
Mentor: Dr. Kevin Cole
Department of Kinesiology

Numerous studies have been conducted that link caffeine supplementation to improved reaction time. The purpose of this study was to investigate whether there was a difference in reaction time during sport-specific movement with supplementation of various dosages of caffeine. Over a period of three weeks, 11 male NCAA Division III basketball players participated in two tests: 1) Vertical jump and 2) 40 yard dash. The tests were administered on three separate testing days. Each participant was randomly assigned in a double blind fashion to one of three caffeine supplementation dosages (3mg/kg body weight, 6mg/kg body weight, or placebo) until they had completed testing days with each dosage. Their reaction time to movement after an auditory stimulus was measured, as well their 40 yard dash time and vertical jump height. Caffeine supplementation of the 3mg/kg body weight dosage resulted in a decreased reaction time to movement of 0.042s ± 0.019s when compared to the placebo group ($p < 0.1$). No other statistically significant relationship was found between dosage level of caffeine and reaction time or performance. Caffeine supplementation at relatively low dosages (approximately 3mg/kg body weight) can improve reaction time to begin movements requiring maximal speed sprinting.

Effects of Total Body Vibration Training on Postural Control in Collegiate Male Athletes

Ryan Walters
Mentor: Dr. Kevin Cole
Department of Kinesiology

This study aims to determine if various balance exercises performed on the Total Body Vibration (TBV) machine have greater effects on postural control compared to balance exercises performed on the ground. Nine male collegiate soccer athletes (age 19-21) were randomly assigned to three different groups: total body vibration training (TBVT), ground training group (GT), or control group (CG). Before the training, the subjects completed a pre-test on the Force Plate measuring path length and area of their sway from center of gravity. During the study period, the TBVT and GT groups training both consisted of two different balance exercises with four variations to the exercises. The balance exercises increased in difficulty each week with the addition of catching a tennis ball during eyes open balance exercises and rotating their head left to right during the eyes closed balance exercises. We will analyze the data from the Force Plate readings after the four weeks of training to find significant data between the TBVT group and the GT group.



POLITICAL SCIENCE

Politics of Diaspora in the Digital Age: How Immigrant Communities Use Social Media to Change Their World

Anne Harrison
Mentor: Dr. Paula Booke
Department of Political Science

Internet access has shaped the ways in which diaspora maintain their cultural identities and political ties to their homeland. The internet provides far more than a cheap phone line to faraway places. Websites such as YouTube serve as a free space for the production and reproduction of cultural identity and political suffrage. This project examines YouTube postings made by the Jamaican diaspora in the United States. The videos posted by Jamaican diaspora are used as a case study of the way in which diasporic communities use digital media to construct a culturally based political identity. Our sample consists of YouTube videos produced by or featuring Jamaican Americans. Using seven keywords, (Jamaica, Jamaican culture, Jamaican and American, Politics in Jamaica, Jamaican diaspora, I am Jamaican, and Jamaica politics), we selected the top twenty-five videos based on relevancy. We used content analysis to examine the relationship between diaspora, culture, and politics in the videos that we sampled. Our expectation was that the videos would exhibit the attributes demonstrating support for the use of YouTube as a cultural repository for the production and reproduction of a political identity.

This research was funded by a grant from the Carl Frost Center for Social Science Research..

Teaching a Man to Fish: NDGOs, Development Interventionism, and the Capacity Building Approach

Sa'eed Husaini
Mentor: Dr. Jack Holmes
Department of Political Science

The international development world has witnessed a marked increase in the presence and participation of transnational non-governmental development organizations (NGDOs) over the last two decades. This has in turn inspired much deliberation concerning what the appropriate roles and approaches for NGDOs in the development and effort should be. A large part of this discussion has featured sustained criticism regarding NGDOs failure to engage with political processes in the developing world and the inability of popular interventions to inspire empowerment for the marginalized by relying on their own agency to achieve the improvement of their societies. Considering the recent growth in the popularity of "capacity building" as a preferred development intervention, this study contributes to ongoing conversations by examining the theory and practice of this approach—critically evaluating its innate ability to escape from the forgoing constraints and envision development solutions that are not pursued at the expense of the empowerment of the marginalized and the development of their own institutions. To further characterize capacity building as a development approach, this study examines both available literature on the concept and a few examples of NGDOs and bilateral organizations that rely on this approach in their work within the context of certain Least Developed Countries (LDCs). Following this, it concludes that capacity building does not innately escape this political empowerment constraint faced by previous approaches. It also concludes that unless (i) cognizant of and seeking to engage with development as a larger process of change rather than on a project or single policy level; (ii) directly and intentionally engaging issues relating to civic life, rights, and responsibilities; (iii) and aware of and seeking to counteract power imbalances in their interaction with beneficiaries and governments, NGDOs working in capacity building have a very limited ability to contribute to empowerment towards long term development.

Constitutional Implementation and Democracy in Kenya: A Comparison study between Domestic vs. International Sources of Media

Caitlin Schwark
Mentor: Dr. Virginia Beard
Department of Political Science

Kenya made huge progress in 2010 when the people voted to pass a new constitution. Key laws in the document, such as the

Integrity Bill, could be instrumental in guiding the people of Kenya in voting for their future president (summer 2012) and what that could mean for democracy in the country. Because of the high importance given to this topic in Kenya currently, it is a main focus for various media sources throughout the state. It is also important to note that there has been an international eye kept on the implementation, along with the upcoming election, due to the democratic consequences and the violent outbreak of 2007. This study looks to see how different sources of media, both domestic and international, portray the implementation of the 2010-approved Kenyan Constitution. Do international versus domestic media sources differ in their reporting on the Constitution depending and, if so, what factors cause emerging differences? Furthermore, what are common themes covered across media sources, if any exist, and what do they reveal about Constitutional implementation in an emerging democracy?

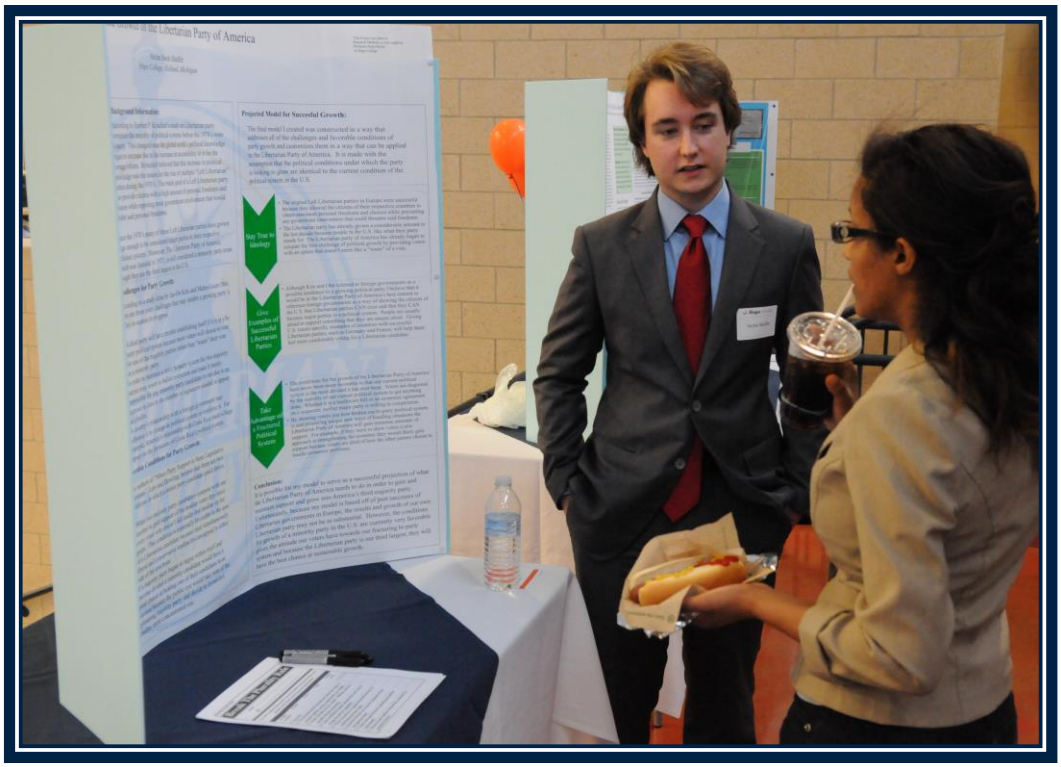
This research was supported by a Nyenhuis Student/Faculty Cooperative Research Grant.

A Theoretical Understanding of Housing and Homeless Policy: Pennsylvania and New York as Examples of Punctuated Equilibriums and Advocacy Coalitions

Caitlin Schwark
Mentor: Dr. Virginia Beard
Department of Political Science

Homelessness and housing insecurity have gained increasing attention since the 1980s in the United States. The federal level policy responses to homelessness – from Homeless Persons' Survival Act and the Stewart B. McKinney Homeless Assistance Act and current reauthorizations under the Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2009 – potentially reflect *stasis of ideologies and thus policy responses with a few key punctuated changes in the U.S. housing policy framework*. This research employs the lens of Punctuated Equilibrium Theory (PET) and Advocacy Coalition Framework (ACF) as theoretical vantage points through which to understand federal level US homelessness policy creation and how it is reflected at the state level as seen in New York and Pennsylvania.

This research was funded by a grant from the Carl Frost Center for Social Science Research.



PSYCHOLOGY

Do Religious Commitments, General Commitments, and Religious Affirmations Mitigate the Negative Effects of Exposure to Thin Ideals?

Angelo Alago, Jessica Breslin, Amber DeGraaf, Bradley Fong, Erica Iceberg, Danielle Johnson, Laura McKeel, Amanda Milliken, and Mary Tripp
Mentor: Dr. Mary Inman
Department of Psychology

Being committed to God should foster positive body image in women because of the belief of God's unconditional love (religious commitment) and/or because one is pursuing an important goal (commitment in general). Might reading Biblically-affirming statements increase feeling loved? We tested the relationships among religious commitment, general commitment, and satisfaction in 111 women at a religious-affiliated college. We tested whether religious-affirming statements buffered against exposure to thin models for everyone, or for women with strong religious commitment. Women completed the commitment scales and baseline body measures (body esteem, body dissatisfaction, drive for thinness, dieting). They were matched and randomly assigned to read one set of affirming statements, viewed pictures of thin women, and completed body measures again. Reading religious affirmations increased feeling loved and accepted. General commitment was positively related to body esteem, body satisfaction, and healthy dieting. Religious commitment was positively related to body esteem and satisfaction. Religious commitment buffered against exposure to ultra-thin models: Women who were strongly (but not weakly) religiously committed felt happier with their body appearance and weight.

Automatic vs. Controlled Processing of Metaphors: An ERP Study

Nathan Axdorff and Sydney Timmer
Mentor: Dr. Gwenda Schmidt
Department of Psychology

The study examined automatic versus controlled processing of metaphor and divided visual field (DVF) presentation. Past research has shown that the right hemisphere processes broader semantic connections in language such as metaphors (Beeman, 2005). A negative-going event related potential (ERP) component 400 ms after the stimulus (N400) was presented was examined. When presenting certain figurative stimuli in either visual field the different hemispheres should have varying N400 peaks. We examined these components in sixteen right-handed, native English speaking undergraduates to compare results with a future study to be done with right hemisphere stroke patients and people with autism.

We used a controlled stimulus set of 300 sentences that was divided into three figurativeness conditions (literal, metaphor and anomalous) (Cardillo et al., 2010) and counterbalanced to present the final word of each sentence to the left or right visual field. Stimulus onset asynchrony (SOA) was a between subjects factor that included long (1500 ms) and short (200 ms) SOA. Participants had to indicate after reading each sentence if they believed the sentence made sense. Electroencephalographic recordings at 16 electrode sites were used to assess the N400 amplitude, from 425 to 525 ms, post-stimulus which indicated the ERPs across the scalp in response to the presentation of the final word. Participants also completed the Autism Spectrum Quotient and the Systemizing Quotient-Revised (Baron-Cohen et al., 2001 & Wheelwright et al., 2006) for future comparison to the autistic subjects.

A 3 (figurativeness: metaphor, literal, anomalous) x 2 (DVF: left, right) x 16 (electrodes sites) x 2 (SOA: long, short) mixed ANOVA revealed that short SOA elicited a larger N400 than long SOA which was marginally significant, $F(1, 14)= 4.0$, $p= .065$. Findings demonstrate some evidence that automatic processing (short SOA) elicits a larger N400 area under the curve than controlled processing (long SOA).

Influence of Gender on Parent-Child Activity Preferences

Anthony Bednarz
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

Prior research has established a relationship between parents' activity preferences and the activity preferences of children.

However, parents failed to accurately predict the activities that their children preferred. In particular, parents tend to evaluate their children as more active than they actually are. This study collected data on parents and children from the Holland, MI area in order to assess the relationship between parent and child activity preferences. The influence of gender and gender stereotyping on parents' predictions of child activity preferences and the preferences of children themselves is undeniable. The relationship between parents and children with respect to their activity preferences has a great impact on important issues like childhood obesity and other health-related concerns. Understanding how and why parents interpret their children's preferences the way they do provides opportunities to re-educate them in how to train their children in healthy, active behavior.

Vowel Perception and Production

Danielle Meyer and Divya Dhaliwal
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

Vowel identification is influenced by various parameters which enhance or hinder perceptual processing. Those stimuli that are typically more readily identified than are others likely require less time for listeners to make their responses. It was expected that differences in the accuracy of identification across the various vowel categories would be reflected in the reaction times of the respondents. Listeners made judgments across sixteen different vowel categories. Within each block listeners heard a unique randomization of tokens. The listeners were 20 male and female undergraduate students residing in the Midwestern U.S. The speakers were 20 African American and European American adult males and females whose utterances were screened for dialectal variation to ensure that the productions were in General American English (GAE). Results for identification accuracy included a significant main effect across vowel categories. In addition, results for identification reaction time included a significant main effect across phonemic classes. Frontal vowel placement was found to be advantageous for increasing listeners' accuracy and decreasing their reaction times in vowel identification. These findings suggest that there is differential perceptual facility across the vowel quadrilateral.

A Comparison of Acoustic Vowel Spaces in the Hindi and Punjabi Languages

Divya Dhaliwal
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

This is an empirical study investigating the vowel space of Hindi and Punjabi speakers residing in Southeast Michigan. The study explores acoustic variation in phonemic production of seven peripheral vowels within Hindi and Punjabi across adult male and female speakers. Since earlier studies primarily focused on articulatory aspects of vowels, there are very few studies focused on acoustic spacing of these two languages. Differences in temporal and spectral acoustic features, such as vowel duration, format frequencies, and other auditory cues are parameters that will be used to measure acoustic variation. Not only will this study increase our knowledge about the comparisons between acoustic parameters of the Hindi and Punjabi languages, but there are various possibilities for applications of this research in the fields of linguistic studies, foreign language studies, and speech pathology.

Acoustic Correlates of Speaker Variation in Children Ages 8 -12

Bradley Fong and Mary Tripp
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

Listeners use perceptual and acoustic cues to identify speaker ethnicity and gender of adults from purely auditory information at better than chance levels (Lass et. al., 1979; Walton & Orlikoff, 1994). Is this true only for adult speakers? Perception of vowels is important to speaker identification as voice quality characteristics are more readily accessible in vocalic production than in the production of consonant phonemes. Vowels are acoustically specified based on their formant frequency patterns (Peterson & Barney, 1952). Hillenbrand et al. (1995) published target acoustic descriptions including temporal measurements, dialectal screening, and outcome differentiation for European American women, men, and "children" aged 10-12. Fundamental

frequency (F_0)—the characteristic resonance of the vocal tract—gradually lowers beginning with the onset of puberty, influencing the phonological space which could produce differences across gender, especially for the 11 and 12-year-olds. Results provide evidence to support a developmental progression with respect to age as well as significant findings for spectral parameters across gender.

A Study of Transgressors: Aspects of Restitution

Sabrina Hakim, Joshua Stafford, Sydney Timmer and Lauren Wade
Mentors: Drs. Lindsey Root Luna, Charlotte vanOyen Witvliet, and Daryl Van Tongeren
Department of Psychology

The purpose of this study was to examine restitution-making behavior after committing a transgression. Previous research has explored how victims of an offense forgive, whereas this study investigated how perpetrators of an offense make restitution. The two main factors of the study we manipulated were the degree to which participants valued the person they offended and the degree to which they felt responsible for the transgression. Previous research has found relational value to be an important component to forgiveness (Burnette, McCullough, Van Tongeren & Davis, 2012). We hypothesized that feeling responsible or highly valuing the victim would be related to restitution-making behaviors.

Participants were 124 (90 females) undergraduates ranging in age from 17-26. They were placed in groups of four and interacted for either five (low relational value) or ten minutes (high relational value), and then ranked the other group members on how much they wanted to work with them on a future task. Following this, they were told that the participant they ranked last was excluded from playing a game and would have to complete a boring task, and this was determined either randomly (no responsibility) or based on their specific ranking (high responsibility). Subsequently, participants played an enjoyable game on the computer for five minutes. Each participant then allocated 700 math problems amongst themselves and the other members, which served as the restitution-making behavioral measure.

A 2(responsible vs. not responsible) x 2(low vs. high relational value) x 3(group member: self, first-ranked, last-ranked) mixed ANOVA yielded a significant interaction on restitution-making behavior. Highly valuing the victim led to equitable allocation of problems. In the low relational value condition, participants gave more problems to the victim when they didn't feel responsible; however, this effect was reversed when the person felt responsible. Implications for these results will be discussed.

Self Affirmation of Morality: Do Implicit Meaning Threats Increase Self-Reported Morality?

Sabrina Hakim, Joshua Stafford, and Lauren Wade
Mentor: Dr. Daryl Van Tongeren
Department of Psychology

Humans function best when they have a sense of meaning. They also need to keep that meaning intact, which often includes reaffirming meaning sources following a threat. Van Tongeren, et al. (2011) suggests a theoretical link between meaning and morality. We hypothesized that when people's meaning is threatened, they restore meaning by viewing themselves as more moral (i.e., moral self-affirmation). In addition, we predicted that moral identity may serve as a moderator; this effect should be stronger for those with a strong moral identity, as morality is more central to their self-concept. Using a 2×2 mixed ANOVA (priming condition × time), we predict that participants in the meaning threat condition will report increased self-reported virtues and overall meaning in life compared to their scores before the threat, and higher scores relative to participants in the neutral condition. By analyzing the interaction between moral identity and priming condition, we predict the reaffirmation of morality will be moderated by moral identity: this compensatory reaffirmation should be stronger among those high in moral identity (i.e., highly value being moral). Our study was composed of 82 participants, 32 males and 50 females with ages ranging from 17-21. Participants filled out a number of measures on the computer that assessed self-reported virtues. They then completed an implicit priming induction, which involved a 20-iteration lexical decision task where before each word, a meaninglessness-related or neutral word was flashed for 50ms. Finally, participants once again filled out the self-report measures. As predicted, the results indicated a significant interaction between the priming condition (meaning threat vs. neutral) and time (before vs. after priming) on self reported virtuousness. Furthermore, there also appeared to be an interaction between moral identity, priming condition, and time for self reported virtuousness, as hypothesized. Implications of these results are discussed.

Self-Enhancement and Ratings of Mate Desirability

Erica Iceberg, Jessica Roberts, and Alison VanLoon
Mentor: Dr. Carrie Bredow
Department of Psychology

Past research has shown that people often view themselves more positively than is warranted in order to protect their feelings of self-worth. Past work also has shown that individuals are particularly likely to self-enhance on traits that are personally important and traits that are global, rather than specific, in nature. The goal of our research is to extend previous research by examining correlates and potential consequences of people's tendency to self-enhance their own desirability as a spouse. 502 unmarried adults were recruited from college night courses, community organizations, and social media sites. Participants completed an online questionnaire assessing their personal qualities, general desirability as a partner, psychological and behavioral investment in marrying, and dating and relationship success. Each participant also nominated 2-3 peers to provide "outside" ratings of their mate value. Self-enhancement was calculated by comparing people's self-ratings of attribute-specific and global mate value to the average of their peers' ratings. As predicted, the tendency to self-enhance on global mate value was significantly higher for romantically involved individuals ($t(499)=-2.468$, $p<.05$) and those who definitively wanted to marry someday ($t(484)= 3.15$, $p<.01$). Greater self-enhancement on global mate value was also associated with greater psychological investment in marrying ($\beta=.12$, $p<.01$), greater behavioral investment in marrying ($\beta=.25$, $p<.001$), and higher expectations to marry ($\beta=.29$, $p<.001$). For attribute-specific mate value, self-enhancement was only associated with behavioral investment in marrying ($\beta=.20$, $p<.01$) and expectations to marry ($\beta=.19$, $p<.01$). Although discrepancies between self-reported and peer-reported mate value were not associated with participants' success *establishing* relationships, people with less accurate global self-perceptions reported lower relationship satisfaction ($\beta=-.17$, $p<.05$) and a lower likelihood of marrying their current partner ($\beta=-.16$, $p<.05$). Taken together, we found that placing greater value on getting married is associated with greater self-enhancement on mate value and inaccurate self-perceptions are associated with poorer relationship quality.

The Relationship between Activity Preference in Children and Parents

Mary Kelso, Mackenzie Kostizen, and Katharyn Burke
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

Today, children seem to be considerably less physically active than previous generations and rising childhood obesity is presenting itself as a major problem (CDC, 2006). Leary et al. (2008) investigated the self-reported activity preferences of parents and the preferences reported by their preschool children and found a significant positive correlation between the two. The present study strives to establish a relationship between the activity preference in children and their parents for young elementary students.

Two questionnaires were developed, one for parents' self-evaluation and one for each parent's evaluation of their children. The self-evaluation for parents included various sociodemographic items and 15 activity preference items, each presenting one sedentary and one physically active option. Sedentary activities included watching TV, reading, crafts/projects, and art. Active options included walking/jogging, riding bike, playing sports, and park/playground. The parents were asked to identify their most preferred activity in each pair. Child participants completed their activity preference measures during class time. The sedentary and active activities were nearly identical to those offered to parents but were presented using child-friendly options. Physically active choices were given a "1" and sedentary activities given a "0". The scores of all preferred activities were totaled to establish a summed score, which was categorized based on an adaptation of Leary's (2008) scale. A summed score of 0-5 was classified as Sedentary, a score of 6-9 was Neutral, and a score of 10-15 was Active. We expected that self-reported Active parents would have children who reported active preferences. Likewise, self-reported Sedentary parents would have children who reported sedentary preferences. Support of our hypothesis would suggest that parents could be targeted to influence healthy lifestyles for future generations.

PSYCHOLOGY

Attachment and God Concepts in Japanese Young Adults

Hanna Ogawa and Alexander Krieg
Mentor: Dr. Jane Dickie
Department of Psychology

Using Bowlby's (1969) attachment model, studies of children and young adults conducted in Christian dominated societies suggest that early attachment relationships with parents create internal working models (IWM) of nurturance and power which then predict images of God (Dickie et al., 1997; Granqvist, 2006). This study looked at both Christians and non-Christians in the multi-religious setting of Japan to see whether or not images of parents shape images of God in contexts where Christianity's personalized God is not built into the fabric of the culture. We expected that: 1) Because Christians have a personalized concept of God, that they would rely most on the IWM of parents to describe God; 2) With continuing strict gender roles in Japan, we expected that mothers would be more important than fathers in predicting God images (Kimura and Nagai, 2004; Kumagai 1995). Sixty-three Japanese participants completed an online survey assessing their Religious beliefs, Concepts of God's, mothers' and fathers' Nurturance and Power, and their attachment to God. The result showed that the IWM of mothers were more nurturing than fathers or God for both Christians and non-Christians. As predicted, Christians viewed all attachment figures as more nurturing and powerful than did non-Christians, and as more similar to mother than father. Non-Christians viewed mother as more nurturing and powerful than father or God, but viewed God as more similar to father than mother. The result also showed being Christian even in a non-Christian context appeared to be a strong predictor of a participant's attachment to God as well as their concept of God as nurturant and powerful. Our research suggests the value of understanding parental relationships and the internal working models of authority figures, mothers and fathers, in predicting God images, even in a non-Western, multi-religious country.

The Effects on Activity Level of Parents and Children

Sydney Timmer
Mentor: Dr. Sonja Trent-Brown
Department of Psychology

This study was conducted in conjunction with the Outdoor Discovery Center (ODC) in Holland, MI. The overall project was a pre-test, post-test study looking to observe the strength of a nature based intervention on child activity preference. Research shows that parents have an effect on the preferences that can lead to obesity that children develop even at young ages (Wardle et al. 2001). Prior research has also indicated that adults with more active jobs are more likely to have active lifestyles (Van Domelen et al. 2011). This study examined the relationship between parents' job type and their preferred activities in order to explore potential underlying causes. A total of 120 fathers' and 111 mothers' of children from seven West Michigan public schools filled out and returned questionnaires. We tested differing activity preferences in parents using an adaptation from Leary et al's (2008) study and scored them accordingly. Parents' activity preferences were scored and categorized as sedentary, neutral, or active based on responses. Questions pertaining to health, preferred activity and job were included. Parents also indicated the type of work they do at their job, for example, sitting mostly or rigorous activity. Findings indicated that mother's activity level at work and father's activity level at work were related to mother's activity preferences at home. This suggests that mothers who are more active at work may prefer activities that are more physically vigorous at home. Since prior research has demonstrated that parent lifestyle has a significant influence on children's preferences and lifestyles, mother's activity preferences interacting with work type could have implications on what encourages more active lifestyles.

The Impact of Teens on Mothers' Perspectives on Work and Family

Jackie Baumeister and Ariel Edsall
Mentor: Dr. Debra Swanson
Department of Sociology

Much of the research on a mother's work choice and its effects on family life is limited to non-longitudinal data. This qualitative study fills that void by providing data regarding mothering when their children were toddlers and then again when their children were teenagers. By using a holistic approach, this research assesses how various factors in a woman's life are affected by her child's aging. Using a sample of twenty-one mothers, changes in marriage and work choice were analyzed in their life as their children grew older, and the stress of these changes. We found that a woman's work choice affected self-perceptions as well as spousal relationship. We discovered that full-time employed mothers valued family time, part-time employed mothers, however, valued the flexibility to choose when they could take time for themselves through work or personal activities, and stay at home mothers were found to value being always present in their children's lives. While lack of time is a permanent quality in every woman's life, mothering appears to be less demanding of time. Mothers will identify themselves as mothers whether they are employed or not. It was found that women reported an increase in the strength of their marriage as their children aged. This research could be used as a resource to women looking to become mothers and to those interested in how aging can impact perceptions of work choice and family.

An Evaluation of the Milk and Medicine Feeding Program: Lusaka, Zambia

David Blystra
Mentor: Dr. Deborah Sturtevant
Department of Sociology and Social Work

The purpose of this research is to evaluate a community-based feeding program in Lusaka, Zambia for AIDS orphans and other undernourished children. Since it was implemented in 2004 by the Christian Alliance for Children in Zambia (CACZ), the Milk and Medicine Program has provided formula, nutritional supplements, medicine and social work support to roughly 400 children in this AIDS-stricken region of the world. The longitudinal nature of the data set has allowed for year-to-year comparisons as well as annual reports of the most recent data collected from each of the five distribution sites. In addition, recent efforts have been made to understand the age-specific efficacy of the program. Our findings illustrate the impact of this program and highlight the need for continued and improved aid in the future. This research provides a statistical understanding of the success of this program and will enable CACZ to adjust and continue their program as necessary in order to fully support these vulnerable children.

Making Sense of Another Time and Another Place: The Mid-Twentieth Century Letters of Two Missionaries to Arabia

Emma Zagar
Mentor: Dr. Donald Luidens
Department of Sociology

Edwin and Ruth Luidens were Christian Missionaries in the Middle East from 1944 to 1964. Commissioned by the Board of Foreign Missions and working for the Arabian Mission of the Reformed Church, Edwin and Ruth provided educational and evangelistic mission work in various places in the Middle East. This span of twenty years in Arabia was a time of tremendous change and uncertainty. Edwin and Ruth documented their entire trip in the form of very detailed, personal letters written back to their parents living in the States. The thousands of letters provide a unique insight into the daily experiences of Edwin and Ruth as well as the reactions of their family. Included with descriptions of their work, Edwin and Ruth write thoughtfully about every person they encounter from all levels of society. The missionary journey of Edwin and Ruth greatly contributed to the overall Christian influence in the Middle East and it is of great importance to preserve their history.

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