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Hope College Abstracts: 13th Annual Celebration of Undergraduate Research and Creative Performance

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Hope College

ABSTRACTS

13TH Annual Celebration of Undergraduate Research & Creative Performance

2013-2014

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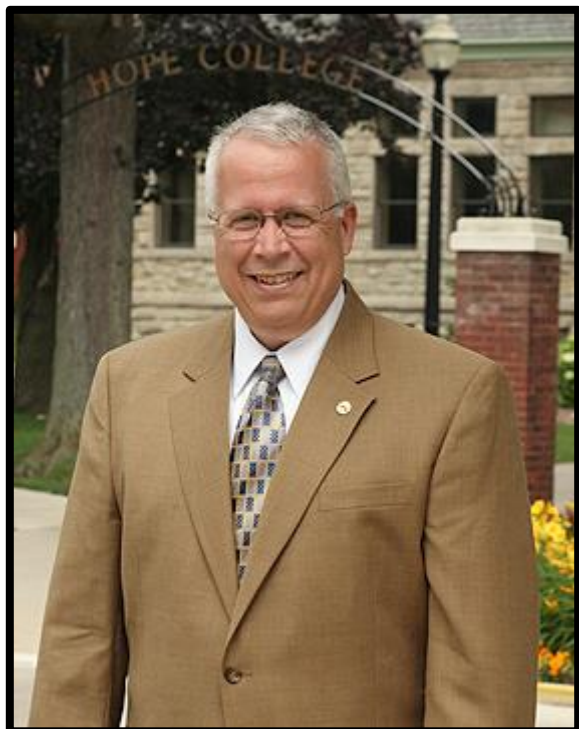
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WELCOME FROM THE PROVOST



May 1, 2014

DEAR FRIENDS,

We were pleased to welcome more than 350 students and many, many guests to the Thirteenth Annual Celebration of Undergraduate Research and Creative Performance at Hope College. Each year I look forward to this event because it gives our whole campus and community the opportunity to celebrate the accomplishments of students who have completed scholarly and creative projects under the careful mentoring of our exceptional faculty. Again this year, as I talked with students about their projects, I was struck by their poise, knowledge and ability to answer questions as they described their work to me and many other guests.

The fact that the Celebration event has grown in numbers of student presenters is a wonderful testament to how faculty members across the whole campus are putting a premium on working with students on meaningful and challenging research and creative projects. But numbers

are just one part of the story. The dramatic improvements in the quality of posters and presentations made by the students is another validation of the deep learning and skills development that has taken place throughout their research experiences.

This book of abstracts is another record of the creative and rigorous projects that were carried out during 2013 and 2014. Each abstract describes a collaborative project between the present and the next generation of scholars—a collaborative effort that brings the disciplines to life and inspires curiosity and reflection that goes well beyond the confines of a typical classroom. For each student, staff member and faculty mentor who contributed to 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 all that you have accomplished.

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
Provost

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COVER AND HEADER ART

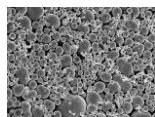


Image taken by **Katherine VanDenburgh** ('14) using a Scanning Electron Microscope, at 6,000 times magnification. It is of antimicrobial nanoparticles that are currently being studied at Wayne State University. The research was part of a Summer Research Program with Dr. Olivia Merkel, and Dr. Steven Firestone, and was presented as a poster at the Celebration of Undergraduate Research.



Image by **Jeffrey Zita** ('16), taken with a GoPro camera that was mounted on a DJI Phantom 2 drone, at sunset over Lake Michigan shoreline near Holland State Park, January, 2014.

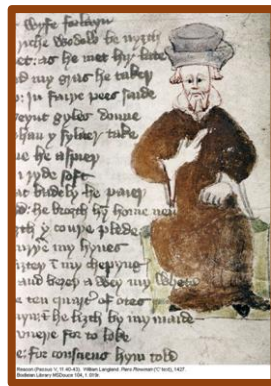
ARTS & HUMANITIES

ENGLISH

Visualizing *Piers Plowman*

Heather Patnott
Mentor: Dr. Curtis
Gruenler
Department of English

The complex narrative structure of *Piers Plowman*, a fourteenth-century, visionary poem attributed to William Langland and surviving in three versions, provides a struggle for both students approaching the poem for the first time and scholars who have been studying the poem for years. Often the poem is divided into *passus*, meaning steps, and sometimes split into two sections, the *Visio* and the *Vita*. These divisions are based on manuscript markings, but scholars disagree about their validity. Another way to break apart the poem, one that doesn't rely on manuscript markings that may or may not be a result of scribal corruption, is into the dreams and dreams within dreams of the narrator. A further complication of working with the poem is that the narrative itself is discontinuous and defies attempts to summarize it. The goal of my project was to examine shapes scholars have used to define the narrative structure of *Piers Plowman* in order to come up with a way to visualize the poem without denying its complexity. I worked with a future project in mind of the creation of a digital tool to help students and scholars alike explore the poem.



Illustrations of *Piers Plowman* (Conscience on left, Reason on right) from Bodleian manuscript Douce 104.



Rebecca Fox (Mellon Scholars/English) presenting at the Celebration, 2014.

Cultural Exchange: The Story of William Angus and His Poetry

Eric Dawson

Mentors: Drs. Marc Baer
and Gloria Tseng
Department of History

*This research was supported by
a Pagenkopf History Research
Grant.*

From 1925-1952, William Angus served as a missionary for the Reformed Church of America in China's Fujian province. During his time in China, Angus wrote over three hundred poems. When he returned back to the United States, he compiled the poems into five separate books, which, however, were never published. Angus's poems are a valuable avenue to understanding his missionary experience, for they reveal his transition from one culture to another as well as his desire to fit into Chinese culture as a Western missionary. The poems also show how difficult it was to do this, and how missionaries brought their own culture into China. In Angus's case, the poems show how natural it was for missionaries, and local Chinese, to notice the differences in one another. Angus's poems also reveal the delicate nature of his American political power. More surprisingly, his poems show how the local Chinese used his American status to further their own ends. The too often one-sided analysis of foreign missionaries forcing culture onto the indigenous people is challenged through Angus's poetry.

The Usefulness of Water: A Study of the Jordan Valley

Benjamin Foss

Mentor: Dr. Janis Gibbs
Department of History

Long before the discovery of oil, the most valuable resource to the inhabitants of the Middle East was water. Cities were built around it, and trade routes ensured that desert traders had access to water. With the population growth in the Middle East, water scarcity is an issue of national security. Poor Arab countries such as Jordan have to import fresh water to supply their citizens with drinking water. Water shortages stem from the political, military and economic interactions of the previous one hundred years, beginning with the European colonization. The division of the former Ottoman Empire by the British and the French was done without the consent of Sharif Hussein or other Arab leaders. The creation of Israel, a state whose boundaries have been contested since their creation, further denied water resources to the Arabs living in the Golan Heights, Jordan, Lebanon, and the occupied West Bank. Water resources then served as a catalyst for the 1967 Arab - Israeli War as well as the 1982 Israeli invasion of Lebanon. Jordan Valley water politics are divided into three categories: a realist approach focused on security, an idealist approach calling for cooperation, and an ambiguity approach where discussion of water is left ambiguous to allow each state to take whatever steps it deems to be necessary. This research suggests that fresh water resources serve as a point of conflict between Arabs and Israelis and pose a significant security threat to the Middle East.

The Wounded Warrior Project: American Society and Conscription

Bill Getschman

Mentor: Dr. Fred Johnson
Department of History

In recent years, there have been sharp increases in displays of gratitude toward America's military veterans. Every Memorial Day, Fourth of July, September 11th, and Veterans Day, the Internet, television, and various forms of social media are inundated with expressions of thanks for veterans and the fallen. Businesses, celebrities, politicians, and others who fail to show some form of gratitude (Twitter, Facebook, press conference, etc.) run the risk of being perceived as un-American. Firsthand interviews with veterans and secondary source research have led me to conclude that America should require some type (military, educational, governmental, public-private partnership, etc.) of post-high civil service. My project explores the socioeconomic and cultural reasons for supporting the establishment of a policy of national service.

HISTORY

Revolution in Tunisia: A Historical Analysis of the Uprisings that Began the Arab Spring

Sophia Hart

Mentor: Dr. Janis Gibbs
Department of History

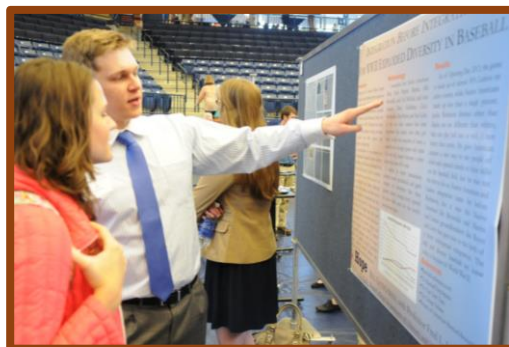
Tunisia was the first country to have a revolution in the Arab Spring of 2010. The history of Tunisia serves to explain how and why the uprisings came about. Tunisia, as it has developed through the 20th and 21st centuries, was and is engaged in a struggle between the traditional and the modern. This is clear in the various contributing factors that led to the revolution. Those factors include a restrictive, authoritarian, and corrupt government, an educated populace, the desire of the Tunisian people to choose their own government, and poor economic conditions. Religion also played a role in the revolution. After Tunisia gained its independence in 1956, its leaders Habib Bourguiba and Zine El Abidine Ben Ali set out to secularize Tunisia. Religion essentially became excluded from the public sphere. Many Tunisians in 2010 called for the revival of Islam in the public domain. The Islam they called for in their government, though, was not a radical and oppressive Islam, but a pluralistic and accepting one. Tunisians rose up against their government in 2010 because of the varied tensions that had developed over the years between the interior and coastal regions, the modern and the traditional, the secular and the religious, and the wealthy and the poor.

Voices Remembered—The Story of Richard Brokaw

Victoria Henry

Mentor: Dr. Fred Johnson
Department of History

Vietnam Veteran Sergeant Richard Brokaw served in the United States Army during a turbulent period of the latter 20th century. Like many born in the post-WWII years, he entered the service desiring to do his patriotic duty, but the complexities of the Vietnam Era forever changed him and his nation. Framed by the larger Cold War between the United States and its North Atlantic Treaty Organization allies, and the Soviet Union and its allies, Vietnam exemplified the struggle for ideological and strategic global dominance. The nebulous aims of policy leaders compounded by increasing numbers of dead and wounded, and a divisive military draft, moved young people, especially college students, to directly resist. For the men and women who joined the military as volunteers or as draftees, the social changes in the United States added to the burdens of their military service. Most performed their duties to the best of their abilities to uphold and defend the United States Constitution. Regardless of their political beliefs or feelings about Vietnam, they did their duty with honor and integrity. Sergeant Richard Brokaw was one of those persons. While not serving directly in Vietnam, he performed valuable intelligence work as it pertained to data collection against America's other Cold War rival: China. As a significant ally of North Vietnam, China's actions had significant consequences for U.S. personnel in Vietnam. This project, based on personal interviews, recounts the experiences, and contributions, of Vietnam Era Veteran Sergeant Richard Brokaw.



*Bill Getschman (Mellon Scholars/History)
presenting at the Celebration, 2014.*

Louis XIV: The Two-Part Monarch

Katelyn Kiner

Mentor: Dr. Janis Gibbs
Department of History

Louis XIV is the longest reigning monarch in European history, ruling for over 72 years. He has often been called the model of an early modern absolute monarch. The historian Paul Fox gives a brief definition of the different types of monarchs that were common in the late 17th and early 18th centuries in Europe, including despotic, limited absolute, omnipotent absolute, and constitutional monarchs. He argues that Louis XIV was an omnipotent absolute monarch, because there was no man or law that controlled him. However, according to Maurice Percy Ashley, Louis XIV was in fact answerable to the Pope on matters of religion. In a different, but similar way, Jonathan Spangler argues that Louis XIV was answerable to the nobles, because he depended on their money and support during times of war. While there were many situations in which Louis XIV acted as an omnipotent absolute monarch, his relations with nobles and the Pope show that he was a limited absolute monarch.

Dr. John A. Otte: A Study in Christian Cross-Cultural Mission Methods in China

Rebekah Llorens

Mentor: Dr. Jonathan Hagood
Department of History

When a person thinks about missionaries, the common stereotype is the idea of imposing the Western lifestyle on “savages”, the natives of a particular region. If a person takes a closer look at the evidence of the lives of missionaries, he or she might find that this stereotype is incomplete at best, with many essential holes. One case study that can help fill these holes is the life and ministry of Dr. John A. Otte, a medical missionary to China from 1888-1910 with the denomination of the Reformed Church of America. Otte ministered to the Chinese first medically, through the healing of their bodies, then spiritually, as a reference on the Christian life. Instead of making the Chinese adopt Western practices to become Christians, Otte adopted some of their practices himself so that he could appeal to them. Otte could not simply consider his ways better than others'; and he did not do so, but demonstrated immense respect for the locals. Other missionaries' accounts support that Otte's methods were appropriate and effective for the people and the time. By being intentional about relating to them, Otte presented the story of Christianity in a truly personal way to the Chinese people that caused them to love God even more than they loved him.

This research was supported by a Nyenhuis grant and a Pagenkopf grant from the History Department.

Luther's Battlefield: Analyzing Historical Perspectives on Martin Luther's Role in the Progress of the Protestant Reformation

Matthew Meyerhuber

Mentor: Dr. Janis Gibbs
Department of History

Among those who helped facilitate the Reformation, Martin Luther has historically received much of the credit for starting it. However, the nature of his role in the Reformation's progress is highly contested. Intense study and scrutiny of Luther's writings have given rise to several perspectives on the issue. Some historians, such as Harold Grimm and Robert N. Crossley, focus on Luther's social and political views. Historians like Heiko Oberman, Edward Bainton, and G.R. Evans, on the other hand, focused primarily on Luther's religious convictions. This research analyzed and evaluated a number of differing perspectives. The conclusion it reached places Luther, rather than his accomplishments, under the lens of study. Martin Luther believed he was fighting an apocalyptic battle for Europe's collective soul. This belief, combined with his religious convictions, directed his actions in the Reformation.



HISTORY

"Clothed and in Their Right Minds": A Study of the Salvation Army's Developing Social Work, 1865-1890

Alex Mouw

Mentor: Dr. Marc Baer
Department of History

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

In 1865, William and Catherine Booth, both of whom came from poor, working class families, founded the East London Christian Mission, a revivalist organization meant to convert the destitute population of London's East End. The Mission became the Salvation Army in 1878, and then underwent a distinctive change around 1890. What began as an evangelistic movement became a largely social work organization, the latter defining the Army's reputation to this day. Understanding The Salvation Army's changing conception of what the poorest Victorians most needed can give a clearer picture of the organization's transition.

In its early days, the Christian Mission viewed ignorance of the gospel as society's greatest problem, and implied that if the unsaved only knew the good news, they would seek God and better material conditions would inevitably result. By 1890, however, the Salvation Army mostly conceptualized those it was trying to save in terms of their inability to find work, and when the diagnosis changed, the Army followed a different course of action to remedy the problem. Interestingly, the Salvation Army was doing its religious and social work among the poorest of the poor at the same time that the British state was beginning to reconsider its role in the well-being of its citizens. As a prominent voice in the social welfare debate heating up in late Victorian Britain at this time, the Army is worthy of study in its own right, as well as having significance for questions of welfare that are still debated today.

The Benefits of Medical Mission Trips for Healthcare Professionals: Jean Nienhuis, Amoy, China, 1920-1952

Jillian Nichols

Mentors: Drs. Jonathan Hagood and Barbara Vincensi, RN, FNP
Departments of History and Nursing

Medical missionary work presents health professionals with the harsh realities of ill-equipped hospitals, cultural and language barriers, and the emotional toll of being beyond the comforts of home. Despite these challenges, the inspiring accounts of Jean Nienhuis's service as a missionary nurse in the early- twentieth- century China proves that these obstacles are worth overcoming. The purpose of this research study is to explore the effects of medical mission work on health professionals' faith. The project is based on Jean Watson's Theory of Caring. Watson believes that nurses provide a caring environment for patients when modern science has nothing else to offer. This qualitative, retrospective study examines Jean Nienhuis's papers held at a historical archive in West Michigan in order to discover her personal experiences as a nurse missionary to China. Three grand themes emerged: God provides, God is faithful, and sowing the seed. By sowing her seed and giving herself to China, Jean experienced many challenges, but through these challenges, she experienced God's faithfulness and provision. This, in turn, led to a deeper desire to provide a healing and caring environment for patients in China. Limitations of this project include a small sample size and the difference of long term mission work compared to short term. Implications for nursing consist of contributions to research on the history of medical missionaries as well as the understanding of the benefits of participation in medical missionary trips for healthcare professionals.

Navigating Gender in the Chinese Mission Field, 1920-1949

Madalyn Northuis

Mentor: Dr. Marc Baer
Department of History

Supported by a grant from Dr. James and Mrs. Lucy Lee.

Immediately after Holland native Tena Holkeboer graduated from Hope College in 1920, she prepared to leave for her first term of service in the mission field at the Reformed Church of America's [RCA] main mission station in Amoy (now known as Xiamen), China. She was eager to answer the call God had placed upon her heart by pursuing a career in direct evangelistic work, or relational ministry. However, when she arrived in China, her earnest desire to pursue a career in what she believed was her vocation caused her an immense amount of personal turmoil. The career opportunities available to missionaries were determined by their gender and marital status. Thus, while she was certain God was calling her to witness directly to the Chinese people, the RCA's Mission Board unanimously agreed that as a single female she would best serve God and the people of Amoy as a teacher and a principal in the field of indirect evangelism. At first she struggled to fill these roles, but over her five terms of service in China she came to realize that God was calling her to have a far greater role in His kingdom than she had ever anticipated.

Destruction and the Thirty Years' War: Impact and Influence on Europe in Historiography

Jonathan Tilden

Mentor: Dr. Janis Gibbs
Department of History

The historiography of the Thirty Years' War over the years has been a variety of perspectives. Early twentieth century historians like S.H. Steinberg claimed the long-accepted account of the war's destruction was extraordinarily overblown. Steinberg claimed that Central Europe was not ravaged by the conflict and asserted that other factors, such as disease and famine, were the real killers in the Thirty Years' War. Peter Wilson later asserted that, while the fighting was not the apocalyptic disaster which contemporaries had portrayed it as, the war still had enormous consequences for the populations and economies of Central Europe. The trend within the past decade has been to focus on a certain aspect of the war instead of the war as a whole. Scholars such as Hans Medick and David Lederer have examined the suffering caused by the Thirty Years' War with a much narrower focus. Medick investigates how contemporaries remembered the war and Lederer uses rape as an example of human suffering during the conflict. This research examined the changes in the historiography of one of the most important conflicts in European history and the major arguments put forth by several key historians. Ultimately, it was Wilson's discussion of the conflict and the breadth of his research into the demographic and economic effects of the war that proved to be the most convincing.

Veteran's Voices Remembered: Major Jeremy Latchaw

Jeb Wierenga

Mentor: Dr. Fred Johnson
Department of History

U.S. Army Major Jeremy Latchaw, an Iraqi War Veteran, followed in the footsteps of his father who served in Vietnam. As with America's involvement in Southeast Asia, the war in Iraq generated mounting angst among the American people, especially given Iraq's alleged connection to the September 11, 2001, World Trade Center attack. In response to that assault, the United States directed its military might at the perpetrators and their allies. The initial focus was Afghanistan, but it subsequently shifted to Iraq. The superiority of American firepower produced swift results in the initial stages of Operation Iraqi Freedom, and President George W. Bush declared "Mission Accomplished". Iraqi insurgents, al Qaeda affiliates, and ethnic and religious factions subsequently debunked that assertion through a deadly conflict of attrition. While most Americans remained comfortably ignorant of the daily dangers faced by America's military personnel, Jeremy Latchaw and his peers did their duty. Determined to serve their nation with loyal integrity, warriors like Latchaw took their place alongside earlier generations of veterans. This paper, based on personal interviews, recounts the experiences, and stellar contributions, of Iraqi War Veteran Major Jeremy Latchaw.

MODERN AND CLASSICAL LANGUAGES

The Persecution of the French Huguenots

Sarah Bettag

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

At the start of the sixteenth century, the French Protestants, also known as Huguenots, came to play a major role in the history of France, threatening the overarching power of the Catholic Church, and inadvertently, the power of the French monarchy. Strongly influenced by Reformation leader and theologian, Jean Calvin, this new religious movement suffered immense persecution in France throughout all periods of their existence. Although the Edict of Nantes (1589) temporarily granted religious tolerance to the Huguenots, it was subsequently revoked during the reign of Louis XIV in 1685, and the persecution and violence worsened. During this time, many Huguenots who were mostly tradesmen and members of the bourgeoisie decided to flee France, taking refuge in countries that would later reap the benefits of their skills and industriousness. Not only was the persecution of the Huguenots unjust, but it also caused a major economic downturn in France and deteriorated the reputation of the French monarchy in Europe. This research explores the reasons behind the revocation of the Edict of Nantes, the manner in which the Huguenots were persecuted, and the consequences of the Huguenot exodus from France.

Indigenous vs. Modern Medicine: At Odds or in Harmony?

Rachel Butts

Mentor: Dr. Maria Claudia André
Department of Modern and Classical Languages

The goal of this project is to explore the relationship between the indigenous medical practices of South America and Western modern medicine. Since many Andean cultures may have beliefs that conflict with or differ from the current understanding of health and illness, the integration of contemporary medical practices into society is often problematic in Andean countries. In light of the common occurrence of medical pluralism in these areas, health care workers and policy-makers face a unique challenge; they must find solutions that provide the best care for these individuals without disrespecting their beliefs and traditions. In addition to other indigenous groups that inhabit parts of Ecuador, Peru, Bolivia, and Chile, the following larger Andean cultures will specifically be investigated: the Quechua, Mapuche, and Aymara.

Patagonia sin Represas: a Social-Environmental Movement in the Northern Chilean Patagonia

Kimberly Collins

Mentor: Dr. Daniel Woolsey
Department of Modern and Classical Languages

The Chilean Patagonia is truly stunning, landscape and people alike, but faces the looming threat of disruption. The region of Aysén, in northern Patagonia, is extremely isolated, both literally by land because of the Andes mountains, and also figuratively because its remoteness has caused a sort of historic abandonment developmentally in a country that promotes a neoliberal economic model and where everything seems to revolve around the capital. Two large, powerful companies, HidroAysén and Energía Austral, seek to construct a total of eight hydroelectric dams on some of the grandest and most adored rivers of the region, in order to power mines in Santiago, 2000 kilometers away. Despite the risks and insensibility, it goes far too smoothly and unnoticed for large companies to come and take advantage of people and places so marginalized. In the last decade, an immense campaign has arisen and united against the construction of these dams, under the banner Patagonia sin Represas. This investigation seeks to reveal more about the people involved in this movement and the motivations they hold that have led them to fight for this cause. The research was conducted specifically in Coyhaique, the capital of Aysén, through revision of bibliographic materials and press, and also personal interviews. This campaign is broad and dynamic, supported by people from many different backgrounds, with motivations stemming from a variety of roots and sources, including the beauty of the earth, the injustice of the breach in powers, and a dedication to an ethic or faith duty.

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Beyond Academic Support: Non Formal Education and the Servicio País Program in Valparaíso, Chile

Leah Ewald

Mentor: Dr. Daniel Woolsey
Department of Modern and
Classical Languages

This investigation aims to analyze the operation and overall results of Servicio País Educación (SPE), an intervention-based program offered to primary, low-resource, municipal schools in Chile. SPE's involvement in the schools Colegio Juan José Latorre and Escuela Municipal de la Pacífica of Valparaíso served as the primary case studies. Functioning from 2010-2012 as an after-school mentoring program aided by college-aged volunteers, SPE provided a non-formal educational environment for a select group of students coming from especially poor socioeconomic situations. These students often underperformed academically or exhibited behavioral issues in the classroom. The program not only provided individualized academic help, but also practical education in the areas of self-esteem, social skills, and emotional health, in hopes it would serve as support for the harsh situations students faced outside school. Results from this investigation were reached from interviews and an analysis of primary documents revealing the actual implication of the program in the two schools. This information identified that a relationship of trust and communication between the school and program was key in its success and the success of the student participants of SPE. In addition, the academic, social, and behavioral development of student participants could not be fully reached through this single program, but was dependent on various external factors. Finally, this study discovered that the non-formal education methods utilized by SPE in the extracurricular environment of these schools could also be implemented by the teachers to create an engaging learning experience in their own classrooms.

Molière, Le Libertin

Maria Gowon

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

In the seventeenth century, French theatre experienced a flourishing like no other. Molière, the *Father of French Theatre*, would come to dominate his sphere of arts. Having developed a new comedic style – satire – the playwright captured the attention of Parisian audiences, the clergy, and even the king, and became a polarizing figure in the process. This research explores the varied reactions of Molière's contemporaries to his works. Firstly, the research delves deeper into the nature of satiric style to understand why there was so vast a scope of reactions. Next, it seeks to identify Molière's friends (most notably the king) and his enemies, and characterizes how the differences in opinion impacted authoritative relationships, societal hierarchies, and even worldviews. In conclusion, the research examines the influence that Molière's friends and enemies had upon the evolution of his work, his reputation, and the context in which we view the playwright today.

Marianne et le Marabout by Slimane Benaïssa: North African Culture Faces French Culture

Susan Haigh

Mentor Dr. Anne Larsen
Department of Modern and
Classical Languages

Slimane Benaïssa's play *Marianne et le Marabout* (1993), my primary research source, displays what it was like to live as a first generation Algerian immigrant, or part of an immigrant family, in France. Various secondary sources allowed me to grasp more fully the historical, political and cultural situation between France and Algeria and, as a result, explain the frustration and discontent that the characters in the play express. The social, religious, cultural, and economic conflicts described in *Marianne et le Marabout* are the root of many problems between Algerian immigrants and the French that still exist today. Benaïssa's play shows the harsh realities experienced by a first generation Algerian immigrant family in France; yet, their story and others from this immigration wave help one to approach with understanding the civil unrest between more recent Algerian immigrants and French citizens today. The conflict between immigrants and French natives will likely pose a controversial political problem for a long period of time since the

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complexities of the situation do not lead to an easy solution in French society. However, the relations between individual immigrants and French citizens could be greatly improved with the implementation of artistic activities designed to attract both French natives and immigrants in French cities. Community members would participate in dialogue unrelated to the political conflict and exchange ideas about the arts and life. As a result, the burden of the large societal problem would be reduced and the importance of civility and friendship would be augmented.

Wadji Mouwawad's "Incendies": The Consequences of Family History and Self-Identity

Taylor Mann

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

In our increasingly globalized society, the question of identity becomes more and more complex for those with multicultural origins and experiences. Playwright, actor, and author Wajdi Mouawad has grappled with questions of identity throughout his life as he has been displaced from Lebanon, to France, and finally to Canada. In his play "Incendies", which follows the journey of fraternal twins as they discover the unknown and war-ravaged past of their deceased mother, Mouawad explores the issues of identity specifically in the context of family history. Finally, he shows the power, the ramifications, and the paradox of self-awareness and ignorance: how they can lead both to complete reconstruction of self-perception and to new, liberating independence.

Understanding the Role of Polygamy and Genital Mutilation in Traditional African Societies

Arnaud Muhimpundu

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

For hundreds of women in traditional African society, polygamy and mutilation of genitals remains a large part of their everyday lives. In the "polygamy belt" stretching from Senegal to Tanzania, it is common for more than one third of married women to be in polygamous relationships (Jacoby, 1995). Polygamy has been cited as a possible contributor to Africa's low savings rates (Tertilt, 2005), widespread incidence of HIV (Brahmbhatt et al., 2002), high levels of child mortality (Strassmann, 1997), and of female depression (Adewuya et al., 2007). Even more shocking, the World Health Organization estimates that there are about 140 million women and girls worldwide that have been victims of female genital mutilation. While this practice happens on every continent, in Africa about 101 million girls over the age of 10 have been cut, mostly in sub-Saharan African countries, according to different United Nations agencies. These shocking statistics illustrate the difficult life for so many women in these countries. In this paper, the films of Ousmane Sembene, the father of African cinema, and the writings of Guillaume Oyono Mbia will be analyzed to illustrate their efforts to educate regarding the effects of polygamy and the mutilation of genitals on young woman, and to criticize and eliminate these African traditions. Education through film and theater is very important in identifying and criticizing the harsh realities of traditional society.

The Independent Woman: Simone de Beauvoir and Feminism

Katherine Pitchford

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

Despite her bourgeoisie background, Simone de Beauvoir (1908-1986) was one of the twentieth century's most influential writers. Her high level of education allowed her to succeed in a world where the "rules" were put in place by men and for men. Her schooling also brought about a lifelong intellectual friendship with existentialist philosopher Jean-Paul Sartre. With her famous work, *The Second Sex* (French: *Le Deuxième Sexe*) (1949), and one of its most famous quotes—"One is not born, but rather becomes, a woman."—Beauvoir laid a strong foundation for modern feminism by piercing the hegemony that existed in contemporary society as a result of so many years of patriarchy. She has been described as a miracle among the women of her generation because of her strong conviction for her cause, and this

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single work of literature was praised by many critics for opening the door to women questioning their social status and role in society. Through my research, I hope to show how Beauvoir's feminist beliefs, including her opinions on the female mentality, and the professional and family life of women, were highly influenced by existentialist thought.

The Changes and Remnants of French Influence in Pondicherry

Shirly Samuel

Mentor: Dr. Brigitte

Hamon-Porter

Department of Modern and Classical Languages

The union territory of Pondicherry in India was colonized by the French from 1674 to 1954. The French transformed the small fishing village into a commercial town. Pondicherry is very different from other cities in India because of its French influence. This research will explore the changes effectuated by French colonialism upon the city of Pondicherry. Along with the economy of Pondicherry, the French introduced religious, social, and educational changes. However, even after 280 years of colonialism, one can only observe vestiges of French influence. After Pondicherry received its independence from France, there were several changes that took place that decreased French influence in the city. This research will analyze the causes for the decline of French Pondicherry.

"Instrumentos": Perspectives of the Study of Literature as a Tool in Multicultural Education for the Mapuche Communities of Southern Chile

Laura Van Oss

Mentor: Dr. Daniel Woolsey

Department of Modern and Classical Languages

In 1861, the Chilean national state occupied the southern territory of the country, beginning a process of violent subjugation of the indigenous Mapuche people. Traditionally, schools were a place to impose the majority culture and systematically discourage the Mapuche language and cultural practices. The past few decades have seen a national movement for intercultural education as a platform for the revitalization of Mapuche traditions and lifestyle. Through interviews with teachers in the intercultural education field and education students at the Universidad Católica de Temuco and through a case study at the elementary school Escuela G-539 in the rural Mapuche community of Chapod, this investigation examines the current application of Mapuche culture in educational settings and the perspectives of relevant actors on its future. It focuses on the study of literature and argues that this subject area can provide a space to incorporate the culture in various arenas. Analyzed aspects include the incorporation of Mapudungun, the Mapuche language, to preserve the language and provide an authentic learning environment, traditional oral educational techniques in a literature and language arts context, and Mapuche storytelling in the classroom.

Contemporary Translation: A Re-Authorship

Brandon Verna

Mentor: Dr. Anne Larsen

Department of Modern and Classical Languages

To begin to discuss translation in the modern era, one must first grasp the idea of what a *text* is. All literary works were put into the public eye to be seen and reacted upon. They exist for the responses and interpretations elicited from themselves. When an individual sets out to translate a text, he must start with this fact in mind, and because of it the art of translation becomes very complex. To translate a text word-for-word not only won't be understandable in the culture to which the translation is being done, but does injustice to the original work. Every language and culture places differing connotations upon each word, and often these connotations do not cross cultural borders. In addition, every text has primary ideas being presented alongside secondary ideas. This complex integration of ideas must be deconstructed, analyzed as to identify the most important primary ideas, secondary ideas, and connotations, followed by the translator's decision of which ideas are absolutely necessary to keep, and which can be changed to better fit the

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culture and language. This study goes deeper into the art of translation with the explanation of *Mentalese*, the *Sapir-Worf* hypotheses, and the complication of what is intended verses what is said or written. The next steps are both controversial, and unseen. As a translator finishes re-writing the text by what he decides to be the most important ideas and senses, he achieves the status of re-authoring the text without intending to. Finally, a translator must disappear. He must produce the illusion of the presence of the primary author so the text may be taken as original, authentic, and reputable.

Sartre, Beauvoir, and the Resistance: An Authentic or Compromising Commitment to the Cause?

Natalie Woodberry

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

After France's Liberation in 1945, Jean-Paul Sartre and Simone de Beauvoir were lauded as an influential couple who exemplified the Resistance movement. However, despite their contributions to the literary and philosophic resistance, their personal and professional lives were filled with ambiguous and compromising activities. Under the oppressive Vichy regime, the two philosophers were able to better formulate and promote their existentialist ideas through extreme wartime events. This paper will first briefly discuss the historical context of the two writers, the German occupation during World War II, and the Resistance. Second, this research will explore existentialist themes in a work from each author: *Morts Sans Sepulture* (1941) by Sartre, and *Le Sang Des Autres* (1945) by Beauvoir. The analysis will emphasize the inherent ambiguity which characterized the authors' philosophies, writings, and even personal lives due to existentialism's lack of an absolute moral compass.

Natalie Woodberry presenting her research paper at Dr. Larsen's seminar "(Re)Imagining the Stage: French and Francophone Dramatists," Fall 2014.



Rachel Butts (Modern and Classical Languages) at the Celebration, 2014.

Holland Symphony Past & Present: Analysis of the Administration of This Semi-Professional Orchestra and Its Vital Role in the Community

Larissa Fall
Mentor: Dr. Julia Randel
Department of Music

The Holland Symphony Orchestra began in 1927 as a small amateur group, and has since grown into a thriving semi-professional orchestra. This project used archival sources including concert programs, notes from meetings, and family documents to reconstruct the early history of the organization, in order to try to understand some of the keys to its success. From this case study it is evident that a strong and central administrative role is needed in such an organization in order to keep it afloat. In his book *The Art of the Turnaround*, Michael M. Kaiser, the President of the John F. Kennedy Center, states that to run a successful arts organization a cycle is needed to promote and preserve the organization. A successful arts organization requires a cycle of four factors: great art, the marketing of that art, a supportive family, and revenue. When all four of these factors are sustained an organization will flourish. The evolution and growth of the Holland Symphony is correlated to 'The Cycle' laid out by Michael M. Kaiser. The increase in performers, venue size, marketing, and support the symphony has seen over the years is evidence that the community has found the Holland Symphony to be a vital source of musical entertainment and thus the administration has grown in direct relationship to Kaiser's 'Cycle'.

Progressive Rock: Why Does it Matter?

Thomas Flath
Mentor: Dr. Julia Randel
Department of Music

Progressive rock is a genre defined in the early 1970s by avant-garde musicians that were heavily influenced by classical music and attempted to blend that with modern rock. Many musicians today are not aware of the influence the genre has had. Bands like King Crimson, Yes, ELP, Genesis, Rush, and Pink Floyd were the leaders of this movement. These musicians wanted to create music that was truly a work of art and that would survive the test of time. The uniqueness of the genre can be seen when observing the instrumentation, time signatures, and the inclusion of classical music elements. They incorporated classical elements by doing unique covers of classical pieces, using classical forms and styles, and using an orchestra in the music itself. Since the genre is so diverse, defining it becomes difficult. Author Jerry Lucky arrived at a definition that covers the basics, and through that definition I see how the music has changed in the past 30 years by applying it to a song from the '70s as well as a modern day song, specifically Yes's *Close to the Edge* and Dream Theater's *Octavarium*.

Music for Silent Film: Critical Analysis of Film Scores in Metropolis and The Artist

Kelsey O'Brien
Mentors: Drs. Julia Randel
and Jayson Dibble
Departments of Music and
Communication

Silent films comprised an important stage in the history of filmmaking, as both an exciting form of entertainment and a new way to communicate ideas. A crucial influence in the success of these films was the partnership between music and moving pictures, contributing to the overall success of the films and supplementing the audience experience. By conveying moods, contexts, and themes, music for silent films has consistently added a layer of believability to the action on screen and assisted the audience in understanding the location, context, and tone of film, thus allowing them to be more easily immersed in the story. Gottfried Huppertz's score to the 1927 film *Metropolis* used the technique of leitmotifs to illustrate distinct characters and assist in the narrative of the story. In Ludovic Bourque's score to the 2011 film *The Artist*, the themes of the characters develop along with the characters themselves. Music is an essential, foundational aspect of silent film, pushing the films to success and enhancing the overall experience.

PHILOSOPHY

Is Love God?: Kierkegaard and the Catholic Tradition on God and Human Love

Chikara Saito

Mentor: Dr. Jack Mulder
Department of Philosophy

*This material is based upon
work supported by the Jacob E.
Nyenhuis Student-Faculty
Research Grant.*

All Christians must accept that “God is love” in some sense, given the claim’s biblical pedigree (1 John 4:8, 16). But the idea that love, especially neighbor-love, is God is a much more controversial claim in the Christian tradition. In his *Sentences*, Peter Lombard famously thought that the Holy Spirit *is* the love between the person, God, and the neighbor. Philipp W. Rosemann calls this claim theological dynamite and suggests that it is an important way to understand deeper differences between Protestantism and Catholicism. Søren Kierkegaard appears to endorse a doctrine like this in his *Works of Love*. The Catholic tradition, however, following Aquinas and continuing into the present day, has tended to side against this view. Aquinas instead holds that love must be a created disposition, though divinely infused, if one is to avoid the alleged dilemma between determinism and Pelagianism. In this paper we will detail Aquinas’s view of charity, articulate how Kierkegaard’s view differs, and finally consider what prospects might exist for rapprochement.



*Kelsey O'Brien (Music)
presenting at the Celebration,
2014.*



*Aaron Haecker (Theatre)
demonstrating color changes
with different lighting.*

The Sense of Wonder and the Humility It Takes

Lauren Madison

Mentor: Dr. Steven Bouma-Prediger
Department of Religion

Rachel Carson's posthumously published work, *The Sense of Wonder*, provides us with insight into the philosophy behind her passionate defense of the earth and stands as a naturalist's testament to wonder's moral significance. This paper further explores the role of wonder in earthkeeping, and argues that, when purposefully cultivated, it can be a key ecological virtue. Wonder as an ecological virtue is necessarily facilitated by the possession of ecological humility, understood as a proper knowledge of one's place on earth. Wonder and humility are frequently articulated in the field of environmental literature, which provides narratives that inform readers of these virtues' many implications, from reverence for non-human life to living simply. In this way, stories can be a powerful influence in the cultivation of ecological virtue. This paper therefore also discusses the value of narrative in cultivating virtue, and utilizes the writings of Annie Dillard, Barbara Kingsolver, Wendell Berry, and many more to illustrate that wonder and humility should be understood as key ecological virtues.



Lauren Madison and Dr. Steve Bouma-Prediger, Spring, 2014.

"Bad Girls" in the Bible and *The Social Network*

Kelcee Sykes

Mentor: Dr. Lynn Japinga
Department of Religion

Written and visual media have never been a safe place for women who defy gender norms and expectations. The media's negative treatment of female characters who attempt to break out of their socially-prescribed "sphere" can trace its lineage, quite literally, all the way back to Eve. In an effort to draw critical attention to the ways in which Old Testament writers and commentators treat women, I draw some comparisons between the stories of three biblical women, Dinah (Genesis 34), Jezebel (I Kings 21 and II Kings 30-37), and Delilah (Judges 16), with the character Christy Lee from the 2010 motion picture *The Social Network*. Though the specifics of storytelling may have changed over the years, the current treatment of women in modern media is strikingly, and often dishearteningly, similar to the way women are treated in the Bible. Christy's character is written in such a way as to reflect the silence of Dinah, the unfair one-sided storytelling that surrounds Jezebel, and the downright demonization for which Delilah is so well known. In pointing out these similarities in storytelling between ancient and modern media I call for not only a re-imagination of Biblical women, but a concerted effort to imagine women more complexly in current writing, television, and film as well.

THEATRE

Lighting As You Like It

Aaron Haecker

Mentor: Professor Perry
Landes
Department of Theatre

The purpose of this presentation is to provide a record and an explanation of the lighting design process for the production of Shakespeare's *As You Like It*, produced by the Department of Theatre at Hope College. The lighting design process begins with an analysis of the text, followed by meetings with the director and other designers in order to discuss approaches to this production. When working with the text, designers seek to discern what the playwright had in mind. For example, what were the moods and what were the locations. For *As You Like It*, the director and designers chose to set the time to in the middle 1800's just before the industrial revolution. These times were saturated with urban shift and conflict between cities and the country, similar to Shakespeare's play. For a lighting designer, evocative visual images are especially useful in conveying the thoughts of the designer to the other members of the design team. The research is then translated into practical design in the terms of direction, color and texture. Collaboration with other designers is also an important part. The designer plots the lighting using a computer-aided design (CAD) program and leads the crew in hanging and focusing the lighting units. The designer will then write light cues to support the action, shape the appearance of the scenery and costumes. Through the process of rehearsals, actors, sound, scenery, costume, and lighting, all aspects are joined together and the production is formed.



Set design for "As You Like It" by David Barbour, guest set designer.

As You Like It Properties Design

Angelica Kurtz

Mentors: Dr. Daina
Robins and Professor
Richard Smith
Department of Theatre

In most of Shakespeare's plays and other Elizabethan theatre, props are generally few and far between. They may be alluded to in the script but, unless it is necessary to the plot, there is rarely any mention of theatrical properties. Furthermore, the timelessness of Shakespeare's plays permits the setting to range in virtually any time period and place. These two factors allow for a lot of creativity and collaboration within the production team to decide the aesthetic of the play as well as the objects that live in that world. *As You Like It* focuses on young, fleeting love and the duality between civilization and nature. Particularly for the latter reason, we decided to give the play a primarily Industrial Revolution aesthetic. As Properties Designer, I attend production meetings and collaborate with Daina Robins, our director, and the other designers to create a cohesive world between properties, set, costumes, lighting, and sound. It is also my responsibility to have a solid grasp of the period and theme by doing extensive research. For this particular play, I will be studying Victorian hunting weaponry as well as period furniture, luggage and travel bags, paper and writing utensils, and food found in the region among other details. These being such narrow subjects of research, I use all the sources I can to find what is accurate: books on period props, history books, the Internet, primary sources, and sometimes even Pinterest boards. Finally, with the director's approval, I acquire, fabricate, or construct the objects that will bring the world of the play to life. With these skills, I hope to help create a world that captivates the audience and reflects the themes that Shakespeare so eloquently penned.

INTERDISCIPLINARY CENTER FOR FAITHFUL LEADERSHIP

The Legacies of Holland, Michigan — A Study of Nine Influential People

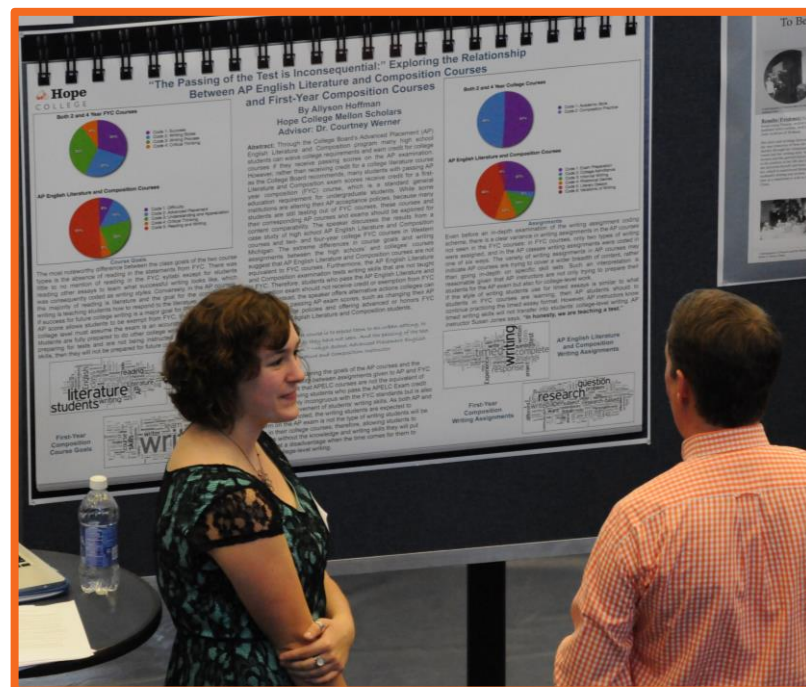
Victoria Henry

Mentor: Drs. Marc Baer and
Steven VanderVeen
Department of History and
Center for Faithful
Leadership

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the Center for Faithful
Leadership and a History
Department Pagenkopf grant.*

Holland, Michigan was founded in 1847 by Dr. Albertus Van Raalte, who also founded a Dutch Reformed Church congregation. Dr. Van Raalte and these immigrants came to the area in the hopes of securing religious freedom from the Dutch Reformed state church in the Netherlands. The community faced many hardships in the first fifty years of existence, including a devastating fire in 1871 and a split in the Dutch Reformed Church in 1882, but Holland prospered and thriving institutions, such as Hope College and Pillar Church, grew out of the population and continue to exist today. The prosperity of the community in the first fifty years would not have been accomplished without the help of nine influential leaders.

This project focuses on the lasting influence of nine leaders from the first fifty years of Holland's existence: Dr. Albertus Van Raalte, Philip Phelps Jr., Isaac Cappon, Edward J. Harrington, Teunis Keppel, Gerrit J. Diekema, Arend Visscher, Christina Van Raalte Gilmore, and Henry D. Post. Each one of these nine Holland community members had a lasting impact on the institutions and society of Holland that have continued to the current day.



Allyson Hoffman (Mellon Scholars/English) presenting at the Celebration, 2014.

EMMAUS SCHOLARS

Politics and Integral Mission

**Brandon Bowser and
Nathan Longfield**

Mentor: Dr. Mark
Husbands
Emmaus Scholars Program
and Department of Religion

Strong cultural and historical forces generate considerable challenges to American Christians seeking to become informed, meaningful and faithful political actors. Given the widespread lack of exposure to a number of the most basic elements of Christian Political Theology many are unfamiliar with rich historical (Augustine) and contemporary political thought (Oliver O'Donovan, Mark Noll, Ron Sider) within the Christian tradition. In the absence of a Christian political theology "politics" is often reduced to the decision of being either a Republican or Democrat. While Scripture calls all Christians to "be subject to governing authorities" (Rom 13:1), it sets this mandate within the broader context of the rule and kingdom of God. Christians, in short, properly engage in politics when they embody and seek the *shalom* and justice of the kingdom of God.

Just Care: Healthcare on the Margins

**Erick Skaff, Jacob Boersma,
Lauren Gentry**

Mentor: Dr. Mark
Husbands
Emmaus Scholars Program
and Department of Religion

Inequality is one of the most significant issues facing contemporary society. This is evident upon a close examination of the Organization for Economic Co-operation and Development (OECD) Health Data report "U.S. Health Care System from an International Perspective". This report documents a number of critical deficits with respect to accessibility and quality of health care in the United States compared to the other 33 member nations in the OECD study. The U.S. spends over two and a half times more than the majority of developed countries while providing significantly fewer physicians, hospital beds, and a slower increase in life-expectancy per person than most other OECD countries. The findings of the OECD report raise normative claims regarding public health policy and the delivery of medical care in the U.S. We maintain that nations have the moral responsibility to provide "just care" for the marginalized, poor, indigent, and undocumented persons. Such care follows from a number of basic claims about the nature of health care, the dignity of persons, and the moral/social fabric of a nation. These claims are undermined by the pursuit of profit leading to the disparity in health care. The existence of health care organizations that succeed in providing "just care" demonstrates that such care is both achievable and represents a positive alternative to the dominant for-profit model of health care delivery. In fact, such work begs the question of equity and justice. A nation that spends \$8,233 per capita per year on health care owes its citizens and non-documented workers greater accessibility and a higher quality of care than is currently provided.

*Kevin Wonch (Mellon Scholars/English)
presenting at the Celebration, 2014*



A Little Birdie Told Me: Researching Twitter's Effect on Formal and Informal Writing Among College Students

Allison Barnes

Mentor: Dr. Jayson Dibble

Andrew W. Mellon Scholars Program and Department of Communication

Although technologically mediated communication (TMC) is widely used, especially among young adults, no researchers have yet examined the potential impact of Twitter use on individuals' writing. In TMC, a texting-like language called "textese" has emerged. Within textese, textisms (or text shortcuts and variations) occur and range from abbreviations to emoticons. Twitter users often use textisms in their writing when they "tweet" due to Twitter's character limit. Previous research found that self-reported textism usage while text messaging over a mobile telephone associated positively with informal writing scores and negatively with formal writing scores. The current study's objective is to examine if Twitter use influences one's quality of formal and informal writing. Additionally, the frequency of textisms within formal and informal writing will be examined. College undergraduate students will be asked to compose a formal writing sample (a scholarship letter) and an informal writing sample (an email to a friend). Both samples will be scored according to a rubric. Then participants will be asked to report on their Twitter usage frequency, Twitter habits, and how often they use specific textisms when tweeting. Amount of Twitter use as well as use of textisms will be compared to the formal and informal writing samples to determine whether any relationships exist between Twitter use/textisms and writing quality. The results from this study will expand textism research, especially in regards to undergraduate writing, and extend it to the context of Twitter.



Allison Barnes presenting at the Celebration, 2014.

Relationships between Religiosity, Spirituality, and Charitable Involvement at a Christian Institution

Anthony Bednarz

Mentor: Dr. Lindsey Root Luna

Andrew W. Mellon Scholars Program and Department of Psychology

In 2003, the Higher Education Research Institute at UCLA began a multi-year study to examine the spiritual development of college students. This study highlighted the differences between religiosity, spirituality, and spiritually related qualities. It found that, nationwide, many college students are highly spiritual, but religiosity is waning. A replication of that study was conducted at Hope College to determine how closely tied Hope students' religious practices are to their spiritual beliefs, and how these factors are demonstrated in their lives. As an institution devoted to education in the Christian tradition, Hope College seeks to provide students with deeply meaningful religious beliefs. Not only would we expect Hope students to be more religious than students at other institutions, we would expect that their religious beliefs are strongly related to their spirituality and the practice of spiritual qualities in everyday life. Furthermore, this study examines the differences between Christian and non-Christian students at Hope.

MELLON SCHOLARS

Morality, Urbanity and Rurality in the Roman and American Consciousness

Ian Bussan

Mentor: Dr. Marc Baer
Andrew W. Mellon Scholars Program and Department of History

The contrast between urban and rural is one ever-present in societies with these conceptual spaces, along with interpretations of this contrast, as societies rationalize these different spaces in terms of their material conditions. This trend reaches as far back as *The Epic of Gilgamesh* and Aristotle's *Politics* which rationalize it in terms of Ancient Mesopotamia and Greece. Two interpretations with an interesting, spontaneous and unconscious similarity are those of Rome and America. Both, as articulated by writers and politicians, viewed the rural lifestyle of a farmer as the most virtuous and moral role in society compared to the urban citizen, who lived amongst corruption, decadence, and general immorality. This lens of morality, of viewing the contrast as primarily one of virtue/vice, is an interpretation shared by these societies, unlike others. This project will examine each society's interpretation of the urban-rural dichotomy in historical context, focusing on the similarities, nuanced differences, and smaller, competing interpretations in each society. Much has been written about the concept of 'City and Country,' but not as a Rome-America comparison, or with this synthesis of evidence. Close parallels exist in works like Williams' *The Country and the City* and Hofstadter's *Age of Reform*, but this study will go beyond the scope of either. This project will examine an unstudied, spontaneous similarity between two different societies with very different contexts. Understanding this similarity, what led to such interpretations of the urban-rural, and how each arose separately but are both so similar will aid in understanding why and how societies construct these interpretations of conceptual spaces. Using political tracts, poetry, essays, speeches, a novel and a film, I will demonstrate that Rome and America held similar views on the dichotomy, why this occurred, and how this can lead to a better understanding of each.

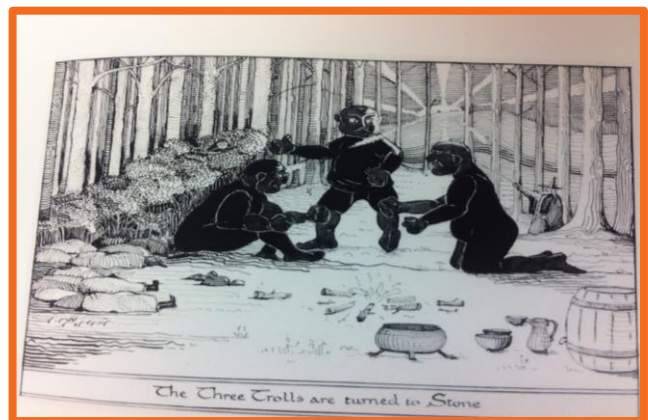
Shedding Light on Illuminated Manuscripts of the Anglo-Saxon Age: An Investigation into the Life and Illustrations of J.R.R. Tolkien

Stephanie Emanuele

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

For decades, the work of J.R.R. Tolkien has fueled investigations in medieval studies due to his incorporation of Anglo-Saxon themes in his writing. A fact unbeknownst to some readers is that Tolkien was also an avid artist, and the illustrations that accompany many of his pieces are evidence of how medieval culture influenced his life. The scope of this research project includes gaining a general understanding of the Middle Ages, as well as a history of Anglo-Saxon manuscripts and their illuminators. This paper will explore Tolkien's inspirations as a writer and artist, and conclude with a comparison of his illustrations to manuscript illuminations. After dissecting these pieces, it is clear that Tolkien's technique, context, style, and content were influenced by the work of medieval artists and writers.

This project was supported by The Andrew W. Mellon Foundation Scholars Program in the Arts & Humanities at Hope College.



*"The Three Trolls are turned to Stone" by J.R.R. Tolkien
[from The Hobbit]*

Location and the Evolution of Ideology and Aesthetics in Post-Second Wave American Black Metal

Carsten Forester

Mentor: Dr. Julia Randel

Andrew W. Mellon Scholars Program and Department of Music

Black Metal is a style of extreme metal that began to develop during the 1980's from a handful of unconnected bands which combined dark, often occult themed lyrics with highly distorted, dissonant guitar playing, aggressive vocals and fast tempos. The style was crystalized into a distinct form of metal music in the early 1990's in Norway, with a subculture that embraced the violent ideologies their music represented. In a few cases, these violent ideologies brought the subculture to action, resulting in over fifty church arsons, two murders and multiple other violent crimes. This brief outburst of violence garnered international media attention and destroyed the coherence of the scene through lost members and internal conflict. In recent years, several American bands have come to the foreground of the extreme music scene whose music is black metal in style but is used to communicate things other than violence and hatred. The purpose of this research is twofold. First, the research will explore the relationship between physical location and the evolution of ideological and aesthetic differences within American black metal through a combination of lyrical and musical analysis, interviews and subculture studies. Second, the research will examine the process by which the original style of black metal has been adapted and rebranded both musically and ideologically as "American" by three different bands: Wolves in the Throne Room, Deafheaven, and Liturgy. In addition, related factors are discussed such as the role of the internet and modern music distribution in underground music, and the increased cross pollination and genre bending that is more prevalent in underground music than ever before.



Carsten Forester presenting at the Celebration, 2014

The Turn, the Cauldron, and the Scapegoat: A Study of the Second Branch of the Mabinogi Through the Mythological Theories of René Girard and J. R. R. Tolkien

Rebecca Fox

Mentor: Dr. Curtis Gruenler
Andre W. Mellon Scholars Program and Department of English

Myth has always captured the imagination of humankind, yet there is great disagreement among scholars over what these stories reveal about human nature. The Four Branches of the Mabinogi, a group of Welsh myths written down in the twelfth century, certainly are among the most enigmatic of the world's stories. Like all myths, the tone of these four interrelated stories ranges from captivatingly beautiful to strikingly violent. This study attempts to interpret the Second Branch through the lenses of two very different theories of myth—those of J. R. R. Tolkien (1892-1973) and René Girard (b. 1923)—while keeping in mind other interpretations of this story by leading scholars. Tolkien, the famous author of *The Lord of the Rings*, believed that myths are just a form of fairy-story. His theories focus on the magical elements of such stories and the effects that they have (or ought to have) on readers. Tolkien's work mainly concentrates on the joy produced by the happy ending—or 'turn'—and the communal element of fairy magic. Girard, the literary theorist and social philosopher famous for his Mimetic Theory, on the other hand, believes that myths are based on actual events. Therefore, in order to reveal the facts, certain facets of the story, including the supernatural aspects, must be removed. His theory focuses on the violence of myths and the traditional villains of such stories. The ideas of these two men reveal two completely different interpretations of the strange tale of Brânwen Daughter of Llŷr, while also leaving other sides of the tale completely unexplained. I suggest that together they can help a reader understand this myth, just as the myth helps a reader prove the validity of both such opposite theories.



MELLON SCHOLARS

Integration Before Integration: How World War II Exploded Diversity in Baseball

Bill Getschman

Mentor: Dr. Fred Johnson
Andrew W. Mellon Scholars
Program and Department of
History

Although Jackie Robinson became the first African American to play Major League Baseball in April 1947, he was not the first nonwhite person to play the sport. Latinos and Native Americans preceded Robinson, and some even before the 20th century. The opportunity to play particularly opened up in World War II, when legends like Bob Feller, Hank Greenberg, and Stan Musial left at the peaks of their careers to serve overseas. Players like 15-year old Joe Nuxhall, one-armed outfielder Pete Gray, and a number of Latinos and Native Americans debuted at this time. Thirteen out of sixteen Major League teams had a non-American born Latino on their roster during World War II. Adrian Burgos, professor of history at University of Illinois, highlights 57 Latinos who played before Robinson, and more than a third of whom played from 1941-1945. The gap created by white players serving overseas led to opportunity. As a continuation of research on Native American baseball players conducted at the National Baseball Hall of Fame and Museum, I look at statistics, roster transactions, and periodicals to highlight four Native American players and four Latinos. Their movement into the Major Leagues was directly linked to the crisis precipitated by World War II. Though many had short professional careers, they were trailblazers and exemplars for future foreign and nonwhite players. After World War II, owners and general managers were not as reluctant to sign foreign nonwhite players. This put American baseball on the path to becoming the world's most diverse professional sport.

The 1876 Centennial Exposed: How Souvenir Publications Reveal Contrasting Attitudes of Race and Gender in the Postbellum United States

Hope Hancock

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

The Centennial Exhibition of 1876 celebrated not only the 100-year anniversary of the signing of the Declaration of Independence but the industrial innovation and reuniting of the United States after the Civil War. Frank Leslie, a Northern publisher, and James Dabney McCabe, Jr., a former Confederate soldier, recorded all aspects of the Exhibition in their publications, *Frank Leslie's Illustrated Historical Register of the Centennial Exposition, 1876* and McCabe's *The Illustrated History of the Centennial Exhibition*. A close analysis of these souvenir publications, which have not been previously compared and contrasted with one another, reveals two distinctly important views of American society – not only the differing perceptions of women's suffrage but the conflicting views of the North and South regarding race. In response to scholars' belief, such as that of David Blight, that African Americans were not at all involved at the Exhibition, this project asserts that although African American involvement was minimal, as discussed by scholars Mitch Kachun and Philip Foner, they did indeed participate, though it often went unrecognized. For instance, Leslie illustrates African Americans working on the construction of the Exhibition and overall provides an inclusive portrayal of African Americans reflecting Northern attitudes supporting equality for African Americans. Likewise, Leslie includes many illustrations of women and their participation in the Exhibition. McCabe, however, largely excludes women and African Americans in his discussion of the Exhibition. Readers reach an understanding of these opposing views by examining the historical context of the Exhibition, the authors' backgrounds, and a close analysis of key text and images within each book.

Allyson Hoffman
Mentor: Dr. Courtney
Werner
Andrew W. Mellon
Scholars Program and the
Department of English

Christian Model of Mental Health Care for South Korean Youth

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The state of mental health in South Korea is very poor, where a flourishing mental health state is rare and a struggling one is the norm. This is true for a wide range of populations, but adolescents, specifically high school students in South Korea, very well may be most vulnerable. Suicide statistics in South Korea are the highest among Economic Co-operation and Development (OECD) nations, with statistics of students' happiness ranking South Korea at the bottom of the world alongside third-world countries. Studies have identified alcohol abuse, peer pressure, competition at work and in education, and a warped sense of oneself and what is beautiful as some of the sources of this deprived mental state. In investigating this issue, the project takes an approach based on the Christian faith. A Christian understanding of the Fall and the redemptive work of Christ will provide new perspectives, both in understanding a deprived state of mental health, and in developing a model of mental health care that is in alignment with the teachings of Christ. Understanding mental health poverty as broken relationships with others, God, self, and the environment acknowledges that only Christ has the power to redeem and save. How could our model of mental health practices be influenced by a holistic understanding of the causes behind mental health poverty and by defining a completely healthy and flourishing state of mind as one that is in alignment with God's vision of shalom and our purpose of giving Him praise? The project will systematically examine the causes of poverty of mental health as perceived by high school students in urban South Korea to inform the development of a model of mental health care specifically suited to that population.



MELLON SCHOLARS

Women's Philanthropy: Why Knowing General Trends Is Not Enough

Ivy Keen

Mentors: Drs. Natalie Dykstra and Julia Randel, and Mr. Geoffrey Reynolds
Andrew W. Mellon Scholars Program, Departments of English and Music, and Joint Archives of Holland

Although women have engaged in philanthropy for centuries, their personal contributions have often been masked because their donations were given in their husbands' names. I argue that to fully understand a person's actions, it is important to know the historical context in which they performed such actions because each historical time period has its own set of characteristics and challenges. By looking at the individual stories of women philanthropists, we can learn more about these women than from general trends. To support this claim, I looked at four general trends I saw expressed in women's philanthropy: Influences from religion and education, the time in their lives when women donated, and the effects of societal gender norms on their philanthropy. I also used the life story of Mrs. Margaret Sage, a philanthropist during the Gilded Age who exemplified all four of these trends, as a basis for comparison against individual stories. Using archival resources located at the Joint Archives of Holland, I researched two women philanthropists, Mrs. Martha Kollen and Mrs. Elsa Prince, both local philanthropists born and raised in Holland, Michigan. In addition to seeing the extent to which these individual stories varied from general trends, I also examined the role culture plays in women's philanthropy. Research by Stephen Post, a scholar of American ethics, has found that much of twentieth-century philanthropy was "disinterested benevolence." This kind of benevolence was used to express one's faith in the form of Christian love. Using these two local women, I looked to see if being from Holland, a city with a distinct Christian culture, resulted in philanthropy such as the one mentioned above. I found it does to an extent; therefore, culture is also important to keep in mind when thinking about women's philanthropy, as leaving it out can prevent one from seeing the whole story.

Between Two Eras: *Arresting God in Kathmandu* and the Search for a Modern Nepalese Identity

Nicholas Kwilinski

Mentor: Dr. Pablo Pescheira
Andrew W. Mellon Scholars Program and Department of English

In the collection of short stories *Arresting God in Kathmandu* by Nepalese-American author Samrat Upadhyay, Upadhyay describes the lives of middle class Nepalese people living in Kathmandu during the late 20th century. In my research, I make the case that modern Nepal, specifically the capital, Kathmandu, occupies a unique position between two eras: that of modernity and that of tradition. Upadhyay comments on this position in his stories, which capture the essence of the modern Nepalese experience through the desires and fears of his characters. Furthermore, I propose that Upadhyay offers the allegorical message, through his stories, that modern Nepalese people must embrace both their past and their future so as to maintain their rich heritage while still continuing to progress into the modern world. My paper begins with a brief history of Nepal's entrance into modernity, where I explore the origins of Nepal's unique state of "between-ness." In this segment I utilize Mark Lichty's book on the growth of consumer culture in Kathmandu, *Suitably Modern* to make my arguments and compare the culture observed in Lichty's research to that explored in *Arresting God*. In the second half of my paper, I move into a literary analysis of many stories in *Arresting God*, specifically an allegorical interpretation of Upadhyay's work and the commentary it makes on the modern Nepalese identity. In my presentation, I will compare the nature of modernization and generational conflict in Nepal with several other Asian countries in an effort to distinguish what makes Nepal's story unique.

Why It Shouldn't Have Been a Surprise: The Story of Japanese Immigration and Anti-Japanese Prejudice Before World War II

Dorothy Mitchell

Mentor: Professor Andy Nakajima

Andrew W. Mellon
Scholars Program and
Department of Classical
and Modern Languages

Rather than highlight the plight of the Japanese-American community during WWII as many scholars have done before, I will explain, using a variety of period and contemporary books, newspaper articles, and encyclopedia sources, how prejudice against the community began and led to the incarceration of Japanese-Americans in the internment camps. In the beginning, Japanese in America experienced spillover prejudice from the Chinese who came during the Gold Rush. However, once the Chinese were no longer able to immigrate into the United States, anti-Japanese sentiment became a movement of its own due to the same white fear of losing their jobs to immigrants. Japan's government anticipated this problem by protecting and controlling the immigrant communities to minimize negative attention. Though the first generation of Japanese immigrants, the Issei, were guided towards surprising success in establishing themselves in the United States, the middle-class dreams of their children, the Nisei and the Kibei, were frustrated. This history touches on significant events of national interest as well as abstract topics such as the politics of race and citizenship in the Supreme Court, challenges to the doctrine of "separate but equal" concerning racial segregation, the teaching of nationalism, and hidden institutionalized racism.

Becoming Citizens: The British Women's Suffrage Movement, 1918-1928

Madalyn Northuis

Mentor: Dr. Marc Baer

Andrew W. Mellon
Scholars Program and
Department of History

Prior to the passage of the Representation of the People Act on February 6, 1918, the British law code stated that women were the legal equivalents of male infants, lunatics, idiots, paupers, and criminals. Since access to citizenship in the United Kingdom was determined by sex, every British man had the potential to become a citizen but this privilege was not extended to a single woman. Therefore, enfranchising women would threaten the nation's sex-based political dichotomy of Man is to citizen, as Woman is to not citizen. However, the nation's binary definition of citizenship disappeared when Parliament passed the 1918 Representation of the People Act. While approximately eight million British women age thirty years and above became the legal equivalents of British men age twenty-one and older, newly-enfranchised women remained greatly disadvantaged because they still had to learn how to act, think, and organize as citizens. Therefore, I argue that it is more accurate to state that enfranchised women started the process of becoming citizens on February 6, 1918. Because the 1918 Act restructured the boundaries that defined the United Kingdom's traditional sex-based political dichotomy, enfranchised British women had to reconstruct their own identities and redefine their relationships with men and disfranchised women before they could navigate the political world as citizens and effectively lobby for an equal franchise a decade later.

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The Tolkien Guide to the Literary Phenomenon of Fan Fiction

Amanda Palomino

Mentor: Dr. Curtis

Gruenler

Andrew W. Mellon

Scholars Program and

Department of English

As the Internet is playing an increasing role in our lives and consciousness, literary scholars are now entering the conversation on how technology has impacted the way we think about and experience literature. New trends in digital literature such as the extraordinarily popular phenomenon of fan fiction—web-based fiction written by amateur fan-authors who build upon already established characters, settings, and plotlines—have created quite the controversy, causing us to re-examine many concepts, from the roles of readers and writers in the creative process to how we define literature itself. Does fan fiction have a place in the literary world or is it merely another new craze of popular culture? In my theoretical inquiry into fan fiction, I apply a framework of analysis developed by J.R.R. Tolkien in his study of fairy stories which may serve to point out the potential of this new digital literacy and address some key concerns involved in an in-depth investigation of fan fiction.

“God Making His Appeal through Us”: The Theology of Reconciliation in the Church’s Practice

Andrew Peecher

Mentor: Dr. Mark

Husbands

Andrew W. Mellon Scholars

Program and Department of

Religion

As both a political concept and a tenet of Christian theology, reconciliation bears upon the here and now. Politically, the Truth and Reconciliation Committees of South Africa engaged in public acts of reconciliation in their effort to redress the wrongs of apartheid. In the effort to address the concerns of the political sphere, talk of reconciliation has grown amongst theologians as well. With concern arising from unrest in his native Croatia, Episcopalian theologian Miroslav Volf has articulated a theology of reconciliation in his book *Exclusion and Embrace*. He claims that God’s reconciling act on the cross should serve as a model for humans to imitate in their interaction with one another. Does this accurately depict human relationships and how they can be made peaceful? Can humans imitate divine action in this way? In my paper, I give an equitable summary of Volf’s theology of reconciliation before politely disagreeing. In my analysis, Volf’s Christology and soteriology are insufficient for the unity spoken of in Ephesians 2 and 2 Corinthians 5:11ff. These passages depict reconciliation as springing from God’s creation of reconciled human relationship in Christ’s life, death, and resurrection and the human reception thereof. The basic tenets of this theology of reconciliation are then shown to be already present in the Word and sacraments regularly received by the Church. Ultimately, this study seeks to give the Church a better understanding of its role in God’s reconciling work in a way that can be seen in its weekly worship and realized in its everyday practice.

The Artist in the Image: A Discussion of Style and Content in "Flotsam" and "A Sick Day for Amos McGee"

Hailey Perecki

Mentors: Prof. Stephanie

Milanowski and

Dr. Heidi Kraus

The Andrew W. Mellon

Scholars Program and

Department of Art

The role of children’s picture books has served as a reprieve for both adults and children from the bombardment of digital technology and visual stimulation in today’s global society. It is the purpose of this study to examine the causes of this respite by examining the aesthetic choices of the illustrator, and the narrative content therein. Furthermore, I will engage with other scholarship related to my topic through the discussion of education. Children’s illustrations are of importance to educators as well as illustrators, and artists. This paper will bring the educational aspect of illustration into the conversation. In order to illustrate this thesis, two children’s books were selected as case studies: *Flotsam*, written and illustrated by David Wiesner, and *A Sick Day for Amos McGee*, written by Philip C. Stead and illustrated by Erin E. Stead. Each of these books has received the Caldecott Medal, designating them as prime examples of notable children’s book illustrations.

Changing Methods, Changing Libraries: Making Digital Literacy Accessible for Undergraduate Researchers

Taylor Rebhan

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

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The Andrew W. Mellon
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in the Arts & Humanities at
Hope College.*

Rooted in research accomplished in the summer of 2013, with a fellowship from the Andrew W. Mellon Scholars Foundation, this project focuses on the rapidly changing landscapes of scholarship and storytelling in the Humanities. These changes have come about as a myriad of digital tools are now available to undergraduate scholars. From showcasing to researching, students now have unprecedented access to and support for these tools. I show through personal experience as an undergraduate Digital Humanities researcher that as these supplements are honed and further developed, they allow student scholars to ask new questions in their research, answer them accordingly, and display their original work in a refreshing and wide-reaching manner. However, these advances in digital methods also raise concerns for sustainability and integration with traditional research. Hope College's Van Wylen Library is an example of an institution that strives to be on the leading edge of the digital humanities and is seeking to address these concerns. Knowing that collaboration is the backbone of a thriving digital liberal arts community, it has taken steps to create new conversations between communities and individuals. I propose several ways in which Van Wylen has accomplished this, as well as several ways that they can in the future. As digital librarianship shows, though technological advances are shifting the way scholars think about research, storytelling is still the heart of scholarship.

Operation Swing: How Jazz Helped to Win World War II

Colin Rensch

Mentor: Dr. Brian Coyle
Andrew W. Mellon Scholars
Program and Departments
of History and Music

Names like Glenn Miller and Benny Goodman are inextricably linked to the Swing Era and were at the height of their favor during the years of World War II. Songs like "In the Mood" and "Don't Sit Under the Apple Tree" can be viewed as simply the popular songs of the day, but their importance reaches far beyond the scope of popular media. There already exists an immense body of knowledge in the areas of jazz history and World War II history, but the knowledge base on the history of jazz within the scope of the second World War is limited. My research contributes to the field by showing how the performance and symbolism of jazz as well as certain key jazz musicians helped to win the war in a real sense. This paper will assert that jazz music, and swing in particular, made a significant positive contribution to the war effort, and that, besides guns and ammunition, jazz was used as a weapon in fighting the war. The GI's' favorite jazz songs helped to keep their love for America strong, the selling of war-bonds was aided by the performance of jazz at concerts and on the radio, and jazz music was a major source of pro-American propaganda that was used to actively "fight" the enemy. The paper will also explore how World War II and the new world order worked to bring significant changes to the world of jazz. The work of Glenn Miller, Benny Goodman, and Bing Crosby in particular will be extensively analyzed to provide material support.



MELLON SCHOLARS

“Hoobla-Hoobla-Hoobla-How”: Sound and Meaning in the Poetry of Wallace Stevens

Kara Robart

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

What role does sound play in the meaning of a poem? This project served as an investigation into the patterns of sound in the poetry of Wallace Stevens. I selected four of Stevens’ poems: “Infanta Marina,” “Not Ideas About the Thing But the Thing Itself,” “Final Soliloquy of the Interior Paramour,” and “The Idea of Order at Key West.” I then studied these poems for patterns of rhyme, alliteration, consonance, assonance, etc. and recorded a number of readings of the poems performed by various students, professors, and writers. Comparing these readings offered valuable insight into the ways volume, emphasis, pause, and duration interact with the existent sound patterns to reinforce or alter our understanding of the poems. The project was also informed by the physical nature of sound—how humans biologically experience and interpret sound—as well as poetry’s ties to music.

Eternity’s Nail of Subjectivity: Subjectivity, Ethics, and God in Kierkegaard and Beauvoir

Chikara Saito

Mentor: Dr. Jack Mulder
Andrew W. Mellon Scholars
Program and Department of
Philosophy

Given the striking similarities between Simone de Beauvoir’s *Ethics of Ambiguity* and Søren Kierkegaard’s pseudonymously penned *Sickness Unto Death*, the lack of conversation between the two works is rather surprising. Structural similarities between *Sickness* and *Ethics* abound: Kierkegaard and Beauvoir intricately interweave the nature of subjectivity and the claim of ethics in becoming a self throughout these texts. A self is not simply a physical-psychic unity, but a dialectically qualified relation of the conscious corporality of being human for Kierkegaard and Beauvoir. This interdependency between subjectivity and ethics are, furthermore, heightened and clarified through rich practical phenomenologies. Through their dialectics, the nature of true subjectivity is further clarified through the ways one can fail to become a self. In both accounts, one fails to live ethically by refusing to properly relate the paradoxical tension of human existence – being immanent and transcendent, temporal and eternal, material and immaterial. Despite the striking symmetry between Kierkegaard and Beauvoir in terms of their deliberative method, however, critical differences emerge in how they understand the constitution of subjectivity. Where Beauvoir explicates an explicitly and necessarily atheistic system of self and ethics, Kierkegaard maintains that not only ethics—but even the possibility of subjectivity—is dependent upon the work of God. For Beauvoir, then, cultivating the open future of persons constitutes the sole imperative for ethics, while for Kierkegaard ethics is grounded in the divine love command which flows only out of the God-relationship. Upon sketching out the shades of concord between the two, I will argue that the resonance between the two works provide a unique avenue for posing an internal criticism as well as an impossible dilemma for Beauvoir’s schema of becoming a self.

Love, Hope, and Listening: An Oral History of LGBTQ Topics and Responses at Hope College

Katherine Sauer

Mentor: Professor Priscilla Atkins

Andrew W. Mellon Scholars Program and Women's and Gender Studies Program

The intent of this project is to provide the Hope College community with an informative compilation of documents and interview testimonies about LGBTQ topics on campus over the years. The local collection of archived reports, nonfiction books, student projects, and newspaper articles covering LGBTQ topics would benefit from a current addition. There is not a readily available resource that references all of these genres of information, as my project intends to do. Such an addition would have a two-fold purpose: first, to refresh the campus's memory of Hope College's LGBTQ history and, secondly, to record current perspectives on LGBTQ people and realities at Hope.

This project was supported by The Andrew W. Mellon Foundation Scholars Program in the Arts & Humanities at Hope College.



Katie Sauer (left) presenting her work to Heather Simpson at the Celebration, 2014.

Judging Books by their Covers: How Cover Design Influences our Perception of Books and their Audience

Erika Schlenker

Mentor: Dr. Julia Randel

Andrew W. Mellon Scholars Program and Women's and Gender Studies Program

Readers judge books by their covers no matter how many times they are told not to. Though it may seem to go against the age-old saying, publishers wish for consumers to judge books based on cover appearances. However, covers sometimes fail to accurately represent the content and themes of their books and are unsuccessful at appealing to a wide audience. Specifically, critics in recent years are concerned that covers aimed at attracting a particular gender alienate the opposite sex before they've even considered the content. This issue of cover design leads people to believe that book covers possess gender as they attract one sex and not the other. When put into the context of gender studies, the issue relates to gender stereotypes and societal perceptions about what topics a particular sex should or should not be interested in. I agree that cover design plays a major role in how consumers regard books. In this paper, I explore how design elements such as titles, blurbs, trends, and color schemes make statements about the audience and content of books. By bringing author and book examples into conversation, I argue that cover design is a book's strongest communication tool as it influences the way people classify books.

Two Champions of Migrant Healthcare in Southwest Michigan: Models for Successful Intervention

Clara Schriemer

Mentors: Drs. Julia Randel and Jonathan Hagood

Recent studies report that 94,167 migrant seasonal farmworkers and their family members reside in Michigan, and many are Hispanic (Larson 2013, Millard 2002). Because social determinants of health persist from generation to generation, significant improvement to migrant healthcare is challenging and requires the work of champions who battle for the rights of the underprivileged. Dr. Vern Boersma, a pediatrician who began his work in the 1950s, and Carolee Besteman, R.N., who began her work in the 1990s, each championed the cause of migrant healthcare in southwest Michigan for decades. Models for successful intervention into community health issues are numerous, highlighting effective characteristics such as "embracing inter-sectoral actions and partnerships" and "understanding needs and solutions through community outreach" (Cohen, Huyen, et al. 2014; Rychetnik, Frommer, et



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History

al. 2002). The importance of collaboration and cultural sensitivity to population health intervention is well established at the organizational level, but illustrations of these traits at the personal level are lacking. Using archival records from the Joint Archives of Holland and personal interviews with Boersma and Besteman, I present their contributions as a model for successful intervention at the individual level. In my analysis, cultural sensitivity is assessed as defined by Resnicow, et al., in “Cultural Sensitivity in Public Health: Defined and Demystified,” while collaboration is defined as “people and organizations from multiple sectors working together in common purpose” (Roussos and Fawcett 2000). I propose that improvement of migrant healthcare requires champions who are culturally sensitive and work collaboratively to facilitate gains in wellness and institutional strength as demonstrated through the examples of Boersma and Besteman.

The Hidden Satire in Eva Ibbotson's Novels

Megan Stevens

Mentor: Dr. Stephen
Hemenway
Andrew W. Mellon Scholars
Program and Department of
English

How young is too young? With the release of such young adult novels as *The Hunger Games* and *Divergent*, both of which contained very adult situations, parents (and Disney producers) have been struggling to redefine what adolescent children can handle in their literature and media. Violence and relationships, in particular, have come under scrutiny, but what about satire? Are satirical elements too far over the heads of young readers? Can such elements serve any purpose in young adult literature? This project deals with two specific examples of young adult satire by British author Eva Ibbotson: *Which Witch?* and *The Secret of Platform 13*. Among the topics addressed are how satire is scaled down to become more accessible to the younger audience and what the use of satire in the books intends to teach readers. For example, what purpose does the gender satire of *Which Witch?* serve? What does the political satire of *The Secret of Platform 13* say about the real-life competition of various lifestyles within a single nation?

Eva Ibbotson, who died in 2010, was shortlisted for multiple children's book awards, including the Smarties Prize (which she won in 2001), the Guardian Prize, and the Carnegie and Whitbread prizes. *The Secret of Platform 13* was said to be the inspiration for part of J.K. Rowling's Harry Potter series, yet very little has been written about her. Database searches have turned up nothing on her as a satirist or an influential children's author. This paper hopes to correct the oversight. In addition, a creative component to the project hopes to reflect the various methods of satire used in Ibbotson's work.

The Religious-Social Constraints on Sexuality in Fifth Century Athens and Crete and How They Manifest Themselves

Claire Trivax

Mentor: Dr. Stephen
Maiullo
Andrew W. Mellon Scholars
Program and Department of
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Experts in human sexuality have theorized that a person's sexual orientation is the result of a number of biological and social factors. Our sexuality is partly determined by biology, but another component determines how that sexuality presents itself in society. For example, in our society, a homosexual cultural construct placed on heterosexual relationships creates: “bromances” and “girl crushes.” This is where men and women have intimate relationships with their same gender replacing physical intimacy with emotional. The main focus of this paper is to understand and probe the extent to which religious practice controlled, regulated, and determined sexual behavior in fifth century Athens and Crete. I will examine two main bodies of evidence: vase paintings and mythological literary texts. The vase paintings show scenes of pederastic relationships between men and young boys. The two myths of Zeus and Ganymede and Apollo and Hyacinthos depict pederastic relationships between the gods and young boys. I will use this to argue

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that the ancient Athenians used these myths as a model to express their sexuality in similar ways. Also, I will show that the Cretan rituals and Dionysian religious festivals were various manifestations of sexuality. My conclusion is that the Ancient Athenians and Cretans used the Gods and their religious festivals as anthropomorphic models for expressing their sexuality and those religious-social constraints on sexuality play a major role in the overall cultural shaping of sexuality. Through adducing myth as a viable model for sexual behavior and emphasizing religion as a major component in shaping sexuality, I add to existing analysis of sexuality from social theorists such as Michel Foucault.

To Be Preserved: Frances Otte and the Historical Development of Identity, 1860-1956

Kevin Wonch

Mentors: Drs. Jonathan
Hagood and Natalie
Dykstra
Andrew W. Mellon Scholars
Program and Departments
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Frances Otte (1860-1956) is known either as the daughter of Philip Phelps, Hope College's first president, or the wife of Dr. John A. Otte, a medical missionary in Amoy, China in the late nineteenth and early twentieth centuries, and the first member of the RCA to go to China as a missionary. Yet little is known about her own life. After being one of the first two women to graduate from Hope College in Holland, Michigan, she played an integral part in John's Amoy mission—as an assistant to John and with patients—as well as a mother to their growing family. This all occurred under John's authority, with Frances having little say in such a life decision.

Her identity evolves with the times, and she is a simultaneously conservative and liberal woman, which complicates a classic binary in women's history of women being either completely conservative or completely liberal. Frances' identity is also determined by her conscious awareness of audience and context, which leads to questions about sources and how one shapes and presents one's life. This project, using original primary sources in the Joint Archives of Holland, both recovers lost voices and causes one to rethink the role of gender in relation to identity.

The Lion, the Books and the Children

Anna Yacullo

Mentor: Dr. Peter Schakel
Andrew W. Mellon Scholars
Program and Department of
English

The books we read as children have a way of staying with us for the rest of our lives, unlike anything else we will ever read. Many books written for children have the ability to be immensely impactful to both adult and children readers. Because children's literature can be extremely powerful, especially when read at a young age, it is important that the literature and its influence be given critical thought. In his writing, C. S. Lewis deals extensively with the writing and effective use of children's literature. Lewis' series of children's books, *The Chronicles of Narnia*, is one of the many wonderful examples of children's literature that becomes a part of its readers and stays with them long past childhood. In this research, I use the example of *The Chronicles of Narnia* to explore children's literature, fairy tales, and their impact on young readers to determine what makes a piece of children's literature effective, what well-written children's literature can do, and who should be reading it. Many scholars have written about and analyzed the themes presented in *The Chronicles of Narnia* and these themes, such as forgiveness, reconciliation, and humility, are relevant and important to readers both young and old. I examine not only the themes themselves but their impact on readers and how communicating these themes through a children's story can be extremely effective.



PHELPS SCHOLARS

Society: The Ex-Convict's New Prison?

Alexander Barry, Michelle Ky and Olivia Skatrud

Mentors: Professors Kristen Gray, Brigitte Hamon-Porter, Amy Otis-De Grau, Yolanda Vega and John Yelding
Phelps Scholars Program

What kind of lifestyle do convicts have after they are released from prison? How easily are they able to reintegrate into society? Why do so many ex-convicts end up coming back to prison? To answer these questions, we explored the underlying causes of recidivism and the dissonance between ex-convicts and the ease of their reintegration into society. To tie in a global aspect, we decided to look at this topic from the perspective of a country similar in culture and economy as the United States: England. Through our research, we discovered two universal, overarching issues: the negative stigma associated with and, the lack of opportunities available to, ex-convicts. In our research, we explore how these issues overlap to exacerbate the problem and suggest ways to resolve the issue. We concluded that the media's negative portrayal of convicts, ex-convicts, and the prison system play an integral role in molding society's misconceptions. These misconceptions come to fruition in many ways, one of them being through the reluctance of employers to hire ex-convicts. This issue can begin to be resolved through the implementation of rehabilitation programs that seek to equip ex-convicts with the skills needed to successfully reintegrate into society.

Feeding the World: A Continuing Tragedy

Natasha Bernal, Reginald Daniels and Michelle Roeschlein

Mentors: Professors Kristen Gray, Brigitte Hamon-Porter, Amy Otis-De Grau, Yolanda Vega and John Yelding
Phelps Scholars Program

Hunger is an issue in both developed and developing countries all over the world. Depending on where a person is living, hunger is either the desire for food or continuous food deprivation. In this study, we examined and compared hunger in the United States and Somalia. We conducted a variety of research and performed surveys to tackle this project. We focused our research on the prevalence of hunger, including its causes and effects, and the various solutions in place to alleviate this problem. Compared to Somalia, the United States has more national programs in response to the issue. According to our research, hunger in the United States is due to political and cultural reasons; while in Somalia, it is primarily due to agricultural and environmental factors. While there are varying effects of hunger in the two countries, there is a list of general critical effects of hunger, including developmental deficits and emotional and social consequences.

What Do They Dream About? The Long-lasting Effects of War and Trauma on Child Soldiers

Danny Chavez, Alexander Markos and Esther O'Connor

Mentors: Professors Kristen Gray, Brigitte Hamon-Porter, Amy Otis-De Grau, Yolanda Vega and John Yelding
Phelps Scholars Program

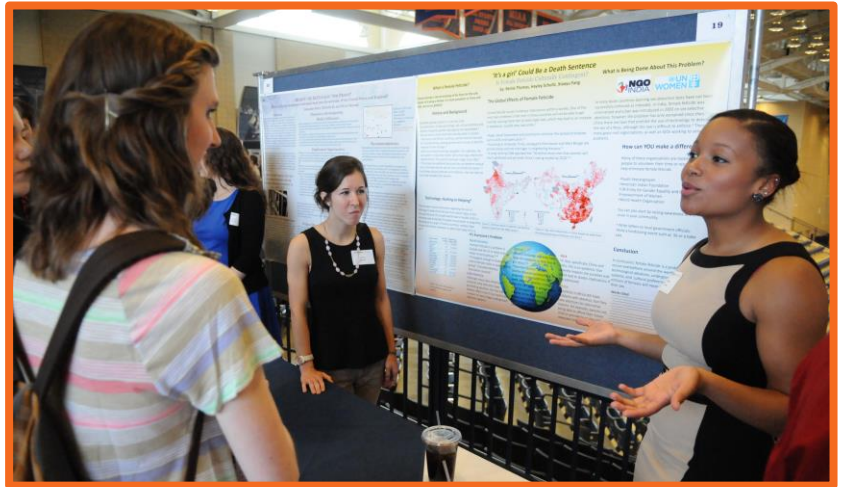
A child soldier's life is ghastly and heartbreaking. Not only are these young boys and girls exposed to high levels of trauma due to the inherent atrocities of war, they are also subjected to devastating levels of abuse amounting to human enslavement. The purpose of our research was to explore this modern form of slavery and its manifestation in our world today. We focused on the adverse effects of trauma on child soldiers and how different organizations around the globe are trying to heal and improve the conditions of these children as they attempt to reintegrate back into society. Our preliminary findings prompted further research regarding the long-lasting effects the lifestyle of a child soldier has on its victims. We found a positive correlation between the number of traumatic events experienced and the severity of PTSD, psychological problems (such as depression, anxiety, and suicidal ideation), physical complaints, and functional impairments. Our results also corroborate the effectiveness of proper reintegration programs. Most of our research was based on case studies done in the early 21st century in several African countries that use child soldiers.

“It's a Girl”—Could be a Death Sentence

Xiaoyu Fang, Hayley Schultz and Reinie Thomas

Mentors: Professors Kristen Gray, Brigitte Hamon-Porter, Amy Otis-De Grau, Yolanda Vega and John Yelding
Phelps Scholars Program

Female feticide is the termination of a fetus based on gender. Even though this practice may be associated with China and India, it is a global concern. Cultural practices and traditions that value men over women, combined with technological advances allowing for pre-natal identification of gender, may mean more pressure on families to make this choice. The negative implications within society are great. Studies show that men who are unable to find brides, due to gender imbalance, experience higher levels of depression and suicide. Women in these cultures are at an increased risk for sexual victimization such as rape and forced prostitution, or being kidnapped in order to be sold into marriage. Although sex detection tests have been banned in many Asian countries, the problem persists. There are many grass root organizations, as well as IGOs, working to solve problems related to this gender based practice. But for now, female feticide is a problem that occurs everywhere around the world. With new technological advances, underground abortions systems, and cultural preferences for males, millions of females will never be born due solely to their sex.



Reinie Thomas and Hayley Schultz presenting at the Celebration, 2014

Imagine: Living on Less than \$2 a Day...How Can Education Help Eradicate Poverty?

Katelyn Kiner, Minh Ngo and Wesley Wright

Mentors: Professors Kristen Gray, Brigitte Hamon-Porter, Amy Otis-De Grau, Yolanda Vega and John Yelding
Phelps Scholars Program

Our world is filled with poverty with more than 2.5 billion people living on less than \$2 per day. In the areas of most extreme poverty, most often the children do not attend school either because there is not one nearby, they are infected by worms, or girls do not have the proper products to deal with their menstrual cycle. However, education is perhaps the best way to break the cycle of poverty and create sustainable communities. In developing countries, the education of girls is especially important because they play the central role in taking care of the family. Their education in simple sanitation and health is often the difference between the life and death of a child. It is proven that simple treatments can increase the attendance and mental capacity of children. There are many organizations such as Brac, Unicef and Compassion that help provide practical education to children of developing nations. While there is still much to accomplish, much progress has been made.

NATURAL & APPLIED SCIENCES

BIOCHEMISTRY

Resveratrol Affects Localization of VACM-1/*cul5* in Endothelial Cells

Collin Breit

Mentor: Dr. Maria
Burnatowska-Hledin
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Chemistry

Vasopressin-Activated Calcium Mobilizing (VACM-1) protein (or *cul-5*) inhibits the cellular proliferation in endothelial and breast cancer cell lines. These effects are further controlled by its posttranslational modifications by Nedd8 protein (neddylation). In previous work, the treatment of resveratrol (*trans*-3,5,4'-trihydroxystilbene), a natural compound found in red wine, grapes, berries, and other fruits, has been found to reduce neddylation of VACM-1/*cul5* in Rat Endothelial Cells (RAMEC) and inhibited cellular growth. Treatment with Nedd8-Aldehyde has been shown to prevent deneddylation of other cullins. The aim of this study was to determine if VACM-1/*cul5* dependent inhibition of cell growth by resveratrol and 17 β -Estradiol involve the neddylation process. Immunohistochemistry assays were used to find the intracellular localization of VACM-1/*cul5* and Neddylated VACM-1/*cul5* proteins in RAMEC at specific times after treatment. Our results indicated that resveratrol decreased NEDD8 protein and increased expression of VACM-1/*cul5*. 17 β -Estradiol reduced levels of VACM-1/*cul5* in RAMEC. Further, treatment with Nedd8 Aldehyde prevented nuclear localization of VACM-1/*cul5*. Together these results suggest that the antiproliferative effect of resveratrol may involve the control of VACM-1/*cul5* neddylation.

Effects of Triple Mutant VACM-1 on Proliferation in RAMEC and Cos-1 Cells

**Sean Cushman and
Abigayle Schnell**

Mentor: Dr. Maria
Burnatowska-Hledin
Departments of Biology and
Chemistry

VACM-1 (Vasopressin-activated calcium-mobilizing receptor) is an endothelium specific protein whose expression has been shown to inhibit cellular proliferation in endothelial and cancer cell lines. The VACM-1/*cul-5* gene product regulates the cell cycle by involvement in the E3 ligase complex that leads to protein degradation. The mechanism by which VACM-1 decreases cell growth is unknown, but its cellular functions are modulated by the binding of Nedd8 to the VACM-1 protein. Analysis of the VACM-1 protein sequence has identified consensus sites specific for phosphorylation and neddylation. Because little is known about the structure-function relationship of this protein, VACM-1 mutants will be studied using mutations at the phosphorylation and neddylation sites. These sites were chosen based on the knowledge that the biological activity of cullins is regulated by their neddylation status and protein function in general is regulated by phosphorylation. Four different mutant strains of RAMEC cells were studied: CMV, VACM-1, ⁷³⁰VACM-1, and ^{3K}VACM-1. Three different mutant strains of Cos-1 cells were also studied: CMV, VACM-1, and ^{3K}VACM-1. Cell cultures were grown for each strain, and experiments were conducted to access and compare growth and VACM-1 and Nedd8 localization. The results of growth assays suggest that the antiproliferative effect of VACM-1 is attenuated in cells transfected with the 3K mutant.

Antiproliferative Effect of Resveratrol in Endothelial Cells In Vitro is Dependent on the Post-translational Modification of VACM-1/*cul5*

Expression of the VACM-1/*cul5* gene in vitro inhibits cellular growth by a mechanism which involves post-translational modification by an ubiquitin-like protein, NEDD8. We have also shown previously that in rat endothelial cells (RAMEC) and breast cancer T47D cells, the antiproliferative effect of VACM-1/*cul5* is enhanced by Resveratrol. This mechanism may involve regulation of post-translational modification of VACM-1/*cul5* by NEDD8. Thus, the aim of this study was to determine if the effect of Resveratrol on cell growth is dependent on the NEDD8ylation status of VACM-1/*cul5*. To control the NEDD8ylation of VACM-1/*cul5*, RAMEC were treated with NEDD8-aldehyde (N8a) which inhibits the de-

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NEDD8ylation process and, in preliminary studies, with MLN4924 which inhibits NEDD8 Activating Enzyme (NAE). Treatment with N8a significantly induced RAMEC growth in a dose-dependent manner. When RAMEC were treated with Resveratrol and N8a, the proliferative effect of N8a was significantly attenuated. Subsequent immunohistochemistry results suggested that this effect was associated with decreased neddylation of VACM-1/cul5. These data support our hypothesis that Resveratrol enhances the anti-proliferative effect of VACM-1/cul5 by regulating its post-translational modification by NEDD8. Consequently, control of VACM-1/cul5 NEDD8ylation by Resveratrol may be an effective model for anticancer drug development.

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

Jamie Grit

Mentor: Dr. Steven Triezenberg
Laboratory of Transcriptional Regulation, Van Andel Institute

Herpes simplex virus type 1 (HSV-1) is a highly prevalent human virus that causes cold sores. The HSV-1 virion contains VP16, a potent transcriptional activator that recruits host cell proteins, including Oct-1, to initiate viral immediate early (IE) gene expression and therefore the lytic cycle. VP16 is also an important structural protein within the viral tegument. As VP16 is so multifunctional, we hypothesize that phosphorylation of serine 375 of VP16 is important for the regulation of VP16's function throughout different times during the lytic cycle. Immunoblots revealed serine 375 phosphorylation at 20 hpi (hours post infection). Immunofluorescence assays of infected cells revealed detectable VP16 phosphorylation by 8 hpi, with dramatic increases through 24 hpi. Phosphorylated VP16 colocalized with AP1AR, a cellular adaptor protein implicated in tegument packaging. Phosphorylated VP16 was also detected in the virions by western blot. These data indicate that phosphorylation of serine 375 may be necessary for VP16's role as a tegument protein. Alternatively, VP16 may need to be pre-phosphorylated to induce IE gene expression and initiate the following lytic cycle. Future work will characterize the role Ser375 phosphorylation plays in VP16's interactions with host cell proteins throughout the lytic cycle.

Mutations and Cellular Growth: Studies of VACM-1 Site Specific Mutations

Sarah Wieskamp

Mentor: Dr. Maria Burnatowska-Hledin
Departments of Biology and Chemistry

VACM-1/cul 5 is a component of an E3 ligase complex involved in ubiquitin-dependent protein degradation. When VACM-1/cul5 is overexpressed in cells in vitro, it inhibits cellular proliferation. We have previously demonstrated that posttranslational modifications to VACM-1/cul5, by phosphorylation and/or neddylation, regulate VACM-1/cul5 protein's ability to inhibit cellular growth. To study the mechanism of the neddylation-dependent effect of VACM-1/cul5 on cell growth, VACM-1/cul5 cDNA sequence was mutated at the putative neddylation site (mutation of Lys (K) 724/Lys727/Lys728 to Ala generated 3K mutant). Subsequently, cells were transfected with a control plasmid and plasmid with wt VACM-1 cDNA and 3K-VACM-1 cDNA. Growth assays were performed using the AlmarBlue readout technique. Our preliminary results suggest that the antiproliferative effect of VACM-1/cul5 is not reversed when cells are transfected with the 3K-VACM-1 mutant expression unless initial cell density is significantly decreased. These results suggest that the posttranslational modifications of VACM-1/cul5 protein by neddylation may not directly control its antiproliferative effect.



BIOLOGY

Isolation of 32 Mycobacteriophages and Genomic Analysis of the Novel Mycobacteriophage, Roscoe

Cindy Alexander,
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Stanna Dorn, Elizabeth
Ensink, Christopher Gager,
Robert Henry, Aleksandra
Masiak, Richard May,
Samantha Moffat, Claire
Schaar, Lauren Sellers,
Kathryn Trentadue and
Carl Deeg

Mentors: Drs. Aaron Best
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Department of Biology

Thirty-two 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. Thirty-two purified phage stocks were used to prepare genomic DNA samples for restriction digest analysis. A comparison of those 32 digest results revealed few similarities among the group, further supporting our interpretation that most of the new phage isolates were distinct. One mycobacteriophage, Roscoe, was chosen for complete genome sequencing using the Ion Torrent Personal Genome Machine platform and comparative genomic analysis. The predominant plaque produced by Roscoe was 2-4 mm in diameter and displayed a clear center surrounded by a wide turbid comet-tailed ring after 24 hours of growth at 37°C. Comparison of the restriction digest pattern for Roscoe with more than 200 known mycobacteriophage genomes did not yield an exact match, suggesting Roscoe was a novel mycobacteriophage. Genome sequence data for Roscoe supported that prediction but also revealed a relationship to a large group of mycobacteriophages in Cluster B1. The genome of Roscoe is 68 Kb, 66.5% GC, and contains 103 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 research is supported by the Howard Hughes Medical Institute SEA-PHAGES program.

Isolation of 32 Mycobacteriophages and Genomic Analysis of the Novel Mycobacteriophage, Minnie

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Bulthuis, Justin Collins,
Mark Cunningham, Serena
Harris, Kimberly Hodgson,
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This research is supported by the Howard Hughes Medical Institute SEA-PHAGES program.

Phylogenetics and Biogeography of Maples Based on Plastid Genome Data

Parker Bussies

Mentor: Dr. Jianhua Li
Department of Biology

This work was supported by a Howard Hughes Medical Institute Research Scholarship.

Acer (maples) is one of the species rich tree genera in the Northern Hemisphere and consists of ~130 species. Maples are easily recognized by the opposite leaf arrangement and samara type of fruits. While the modern center of diversity is in central and southwestern China with two-thirds of the total number of species, some morphologically distinctive lineages occur in Japan, North America, Central Asia, Europe, and Indonesia. Recent phylogenetic studies of *Acer* have used sequences of nuclear ribosomal and chloroplast DNA regions. However, none have resolved the deep relationships among maple sections. This has hampered our understanding of the natural history of maples. In this study, we gathered plastid genome sequences from representatives of the sections using the IonTorrent sequencing technology, and our results suggested that maples might have experienced a rapid diversification of lineages in the Eocene resulting in most of the sections.

Finding Functions for Unfamiliar Phage Genes

Gloria Chang, Kylie Jacobs and Wessel van den Bergh

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

Mycobacteriophages are viruses that infect bacterial cells of the genus *Mycobacterium*. With more than 330 mycobacteriophage genomes sequenced and available in GenBank, they represent the largest collection of sequenced phages that infect a single host (*Mycobacterium smegmatis*). Comparative genomic analyses show the mycobacteriophages are highly diverse, representing more than 25 distinct genetic “types”. They possess a multitude of unfamiliar or novel genes –genes encoding protein sequences that do not resemble any previously studied proteins. Consequently, the functions of the proteins encoded in those novel phage genes cannot be predicted but need to be discovered. Some of the novel phage proteins are predicted to have roles in subverting host cell systems following phage infection, to benefit phage reproduction. To identify those critical phage gene functions, we expressed individual phage genes or small clusters of phage genes in the host cell and examined for effects on host cell growth (cytotoxicity). We are using this approach on a mycobacteriophage called Pumpkin, which was isolated at Hope College in 2008. We have identified three phage genes, Pumpkin_115, Pumpkin_119, and Pumpkin_143 and at least two other small genomic regions, encompassing genes 121-127 and genes 130-133 that are cytotoxic to *M. smegmatis*. Future work will include dissecting those genomic regions to identify the relevant cytotoxic genes, testing all cytotoxic phage gene products for interactions with host cell proteins to identify the host systems targeted by mycobacteriophage Pumpkin, and deleting each cytotoxic gene from the phage Pumpkin genome to confirm a role in the phage infection process.

Herbivore Response to Naturalized Tall Fescue and Its Endophytic Fungus

Alexandria Clark

Mentor: Dr. Thomas Bultman
Department of Biology

Varieties of endophytic fungi have been known to increase its host grass’s resistance to drought, photosynthetic efficiency, and resistance to herbivores. However, it is common for these grasses to produce alkaloids that cause toxicosis in cattle and other organisms of higher trophic levels. We tested the performance and preference of *Rhopalosiphum padi* (cherry-oat aphid) after feeding on grasses of various levels of infection hailing from three locations as well as grasses with different endophyte hybrids. We found that the aphids built larger populations on naturally and mechanically uninfected grasses as well as on grass infected with sexual endophytes than on other hybrids or the infected fescue. There was also no preference between grasses of different collection sites. We conclude that *R. padi* is sensitive to the presence of endophytic fungi.



BIOLOGY

Long Term Trends in Size Distributions of Eastern Hemlocks in West Michigan Dune Forests

Andrew Gomez-Seoane and Eric Hederstedt

Mentor: Dr. K. Greg Murray
Department of Biology

Size 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 several forests near Lake Michigan to determine whether active recruitment into the population is taking place at a similar rate as in the past. The diameter at breast height of trees was measured for a large sample of hemlocks in selected stands. Analysis showed that the size distribution was strongly skewed toward the intermediate and larger size classes ($p < 0.001$), suggesting a failure of recent recruitment relative to that in the past. 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 rates). Other studies in the Lake Michigan region, both inland and coastal, have documented declines in hemlock populations based on sample data and paleoecological trends. If the observed trend continues into the future, Eastern Hemlock will most likely continue to decline in density in these forests over the long term.

Cross Species Comparison of Fer kinase Regulated Gene Expression in Vertebrates (*C. elegans*) and Invertebrates (Zebrafish and Humans)

Matthew Harder

Mentor: Dr. Aaron Putzke
Department of Biology
Collaborators: Drs. Jeff MacKeigan and Mary Winn,
Van Andel Institute

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 and regulates cell proliferation (Putzke et al, 2005, 2010). 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 performed microarray analysis in nematodes, Zebrafish and human cells in the absence of Fer/FRK-1. Currently, we seek to identify common responses in key conserved pathways 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 supported by the Howard Hughes Medical Institute.

Identifying the Cytotoxic Effects of Mycobacteriophage Genes

Drew Krumm and Andrew Neevel

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

A bacteriophage 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 modified by the infecting phage and redirected toward making new phage particles. Protein-protein interactions are likely involved in this process. In this work, gene 80 of mycobacteriophage Vix, 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 caused growth inhibition. Comparative analysis of the Vix80 protein sequence shows a conserved domain of unknown function 2786 (DUF2786) near the N-terminus. The Vix80 gene was dissected, and the N-terminal 66 residues, encompassing the entire DUF2786 domain, was found to be cytotoxic to *M. smegmatis*. DUF2786 was found to be homologous to a region of three *M. smegmatis* ORFs, two of which are related by alternate initiation points of the same sequence. Using *in vitro* protein pull-down and *in vivo* two-hybrid analyses, efforts are underway to look for possible

interactions of Vix80 with itself and the three host proteins. As part of this process, different constructs of the Vix80 protein were expressed in *Escherichia coli*. We have determined that certain Vix80 constructs are also lethal to the *E.coli* host cell, while others permit growth, suggesting a conservation of cytotoxic function. 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.

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

Danielle Mila, Katherine Genzink, McLane Watson, Austin Baldwin and Bryan Phillips

Mentor: Dr Aaron Putzke
Department of Biology

This research was supported by a grant from the DTE Energy Co. (D.M.) and by the National Science Foundation under grant REU 0754293.

We have characterized FRK-1, a homologue of the mammalian Fer non-receptor tyrosine kinase, and found it to be required for differentiation and maintenance of epithelial cell types, including the stem cell-like seam cells of the hypodermis. A genomic knockout of *frk-1* (allele *ok760*) results in severely uncoordinated larvae that arrest at the L1 stage. Homozygous *frk-1(ok760)* larvae have an excess number of lateral hypodermal cells which appear to have lost asymmetry in the stem cell-like divisions of the seam cell lineage. *frk-1(ok760)* mutants immunostained with the epithelial adherens junction marker, MH27, show that the lateral hypodermal cells are abnormally shaped and smaller in size (during division), similar to the anterior daughter of a normal asymmetric seam cell division. Although we have observed an increase in seam cell nuclei using *scm::GFP* and *elt-5::GFP* (*egl-18*), we have also detected a general loss of alae formation. Crossing *frk-1(ok760)* with transgenic reporter lines containing non-seam hypodermal GFP markers, such as *elt-3*, and later markers such as *col-19*, show the lateral hypodermal cells do not precociously differentiate as adult-hyp7 cells. Interestingly, we have observed a significant change in the expression of key heterochronic regulators in *frk-1(ok760)* mutants, including up-regulation of *let-7* and *lin-4* and down-regulation of *lin-14*, *lin-28*, *lin-41* and *hbl-1*. Finally, our data also show a clear role for FRK-1 in seam cell proliferation, as eliminating FRK-1 via RNAi during the L3-L4 transition results in supernumerary seam cell nuclei, that is dependent on asymmetric Wnt signaling. We are currently investigating the dependence on FRK-1 kinase activity and FRK-1 interactions in the nucleus during mitosis for the stem cell-like self-renewal exhibited by seam cells during post-embryonic development. Our data suggest a requirement for FRK-1 in maintaining the identity and proliferation of the asymmetric, stem-cell like state of the seam cells, thereby preventing precocious differentiation prior to adulthood.

Population Genetic Structures of Two Sister Tulip Tree Species: Implications for the Diversity Anomaly Between Eastern Asia and North America

Kaleb Skinner and Mark Stukel

Mentor: Dr. Jianhua Li
Department of Biology

It has become increasingly evident that biodiversity in the world has been decreasing. In order to face this problem head on we need to understand the underlying mechanisms for the formation of the patterns of biodiversity. A well-known pattern of biodiversity comes from the intercontinental disjunction of plant genera between eastern Asia and North America with unequal species richness. One hypothesis explaining the greater species diversity in eastern Asia than in North America states that faster speciation occurred on the eastern Asian side of the intercontinental disjunction than on the North American side. If this is true, we expect a greater genetic diversity across populations of eastern Asian species than the sister species in North America. In this study, we used tulip tree *Liriodendron* as our model system to test the hypothesis. Thirty individuals representing nine populations of the North American species (*L. tulipifera*) and 17 trees from three populations of the eastern Asia species (*L. chinense*) were included in the study. Sequences of the plastid *rpl32-trnL* intergenic spacer were obtained from all trees.

BIOLOGY

This project was partially supported by a Michigan Space Consortium grant to J.Li.

Phylogenetic analyses using *Magnolia* species as the outgroup supported the sister relationship of the two species. Both the average number of differences between populations and the number of haplotypes per population were higher in the eastern Asian species than in the North American counterpart. Nonetheless, the short sequences of the rpl32-trnL region (ca. 1400 bp) provided limited information of genetic variation. Therefore, we obtained the entire plastid genome from one tree of the populations sampled, which resulted in over 97,000 bp. This study represents the first comparative genetic analyses of sister species between eastern Asia and North America to gain insights into the formation of the patterns of the species diversity between the two continents.

Endophytic Response to Methyl Jasmonate and Loline Quantification

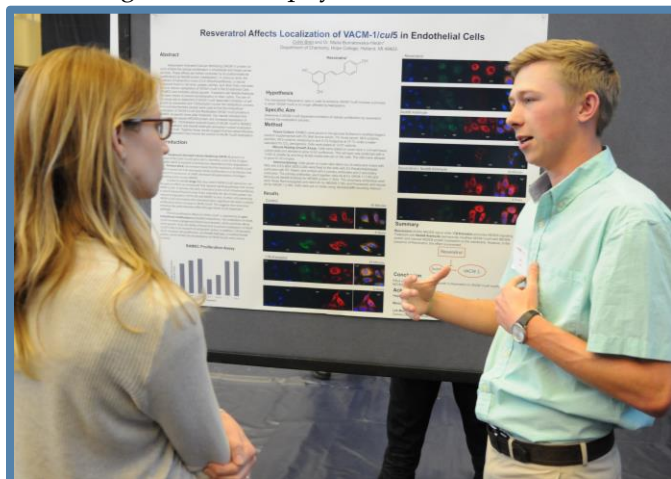
Alexander Swain

Mentor: Dr. Thomas

Bultman

Department of Biology

Tall fescue (*Schedonorus phoenix*) is a grass found throughout much of the USA and Europe, and is known to harbor the fungal endophyte *Neotyphodium coenophialum*. The fungus forms a mutualistic relationship with the host, providing both biotic and abiotic stress tolerance and resistance. Often, the highly selected agronomic cultivar kentucky-31 is used for much of the endophytic-host research, as opposed to a naturalized grass. Therefore, seeds were obtained from Gotland, Finland in order to study the effect of a naturalized cultivar of tall fescue and response to application of methyl jasmonate (MJ). Further, it is common for experiments to use mechanically uninfected seeds to act as naturally endophyte-negative seeds. The purpose of the testing naturalized tall fescue expanded further to using naturally uninfected and mechanically uninfected grass seeds. Plants were exposed to MJ by gaseous diffusion within a controlled environmental chamber, and response was assessed with an aphid (*R. padi*) bioassay. As in Simons et al. (2008), MJ decreased the resistance of endophyte-infected grasses. Further, there was no difference among mechanically uninfected and naturally uninfected treatments, suggesting that both types are viable for experimental use to act as an endophyte-negative treatment. Constitutive production of toxic chemicals to herbivores is one of the key components of herbivore resistance. However, damage to the plant (or perhaps the fungus) induces an increase in alkaloid production. Samples of KY-31 cultivar from a previous damage-treatment experiment were used to quantify loline levels. Data show that loline levels peak when the plant is cut where the fungus resides, suggesting that it is not damage to the host plant that causes an induced increase of protective alkaloids, but rather damage to the endophyte itself.



Collin Breit (Biochemistry) presenting at the Celebration, 2014.

The Effect of Directing Groups and Substituents on Rhodium-Catalyzed Decarbonylation

Byongjoo Bark, David Dykhuis, Kayleigh Schneider, Erick Skaff

Mentor: Dr. Jeffrey Johnson
Department of Chemistry

The activation of carbon-carbon single bonds is difficult due to their nonpolar nature and kinetic stability. The ability to functionalize these bonds can lead to new methodologies valuable in synthetic pathways. Recently, a new method for decarbonylation of aryl ketones via rhodium catalysis has been developed. This study examines the carbon-carbon bond activation of compounds using nitrogen-directing groups. A palladium catalyzed carbon-carbon coupling reaction was utilized and improved upon for the purpose of creating a variety of starting materials. These species are being used to explore the mechanism of the rhodium-catalyzed decarbonylation reaction.

This research was supported by the National Science Foundation (CHE-1148719).

Carbon-Carbon Single Bond Activation for Nucleophilic Addition to Michael Acceptors

Catherine Calyore, Janelle Kirsch and Erik Phipps

Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Intramolecular alkene carboacylation has previously been achieved under rhodium catalysis using quinolinyl ketones. Utilizing insight gained from mechanistic studies, new substrates containing *ortho*-substitution have been prepared and subjected to rhodium catalysis with an exogenous alkene. This research provides an overview of substrate synthesis as well as the unexpected product—rather than the anticipated carboacylation these substrates have been observed to undergo carbon-carbon bond activation followed by conjugate addition to Michael acceptors.

This research was supported by the National Science Foundation (CHE-1148719), the Towsley Foundation, the Camille & Henry Dreyfus Foundation, and the Hope College Chemistry Department.

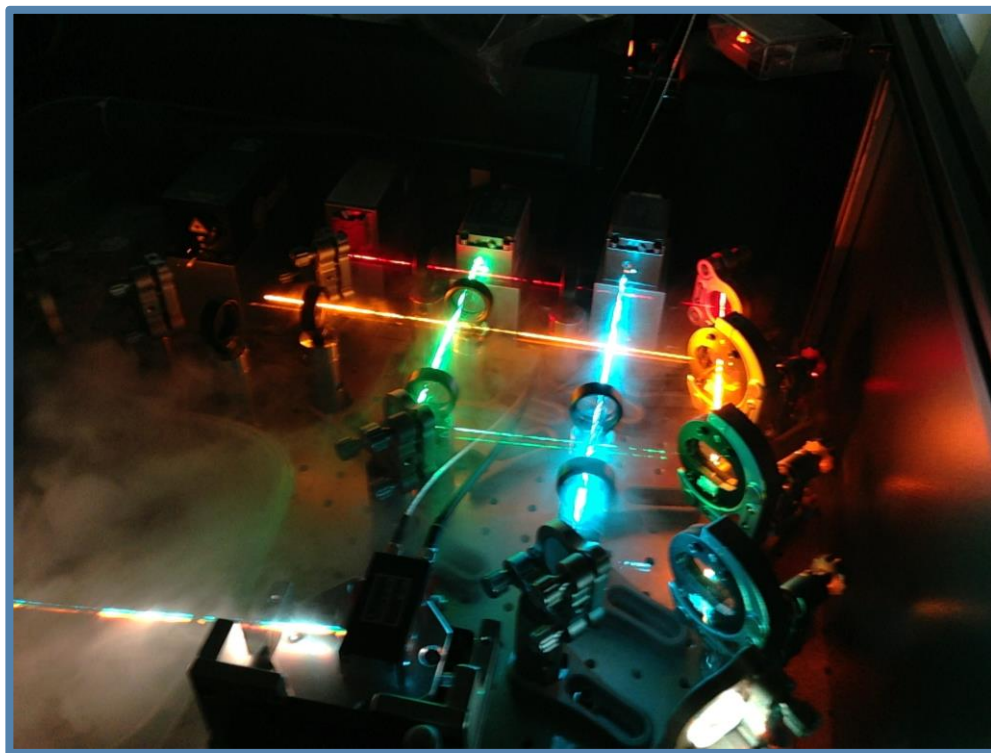
Home-Built Single-Molecule Fluorescence Spectroscopy

Andrew Cutshall, Christopher Davis, Timothy Hoffman 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 (FRET) experiments. Avoiding the averaging inherent to bulk techniques, single-molecule FRET spectroscopy allows us to resolve structural characteristics and dynamics of biological systems that often exist in multiple conformations. Donor and acceptor dyes will be attached to small biologically important molecules such as RNA, DNA, or protein. These samples will be used at low (femtomolar) concentrations, such that either zero or one molecule 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. Detection of the corresponding fluorescence, originating from either the donor or acceptor, will allow calculation of the FRET efficiency. A function of the distance between the dye molecules, the experimentally-determined FRET efficiencies will be compared to simulated FRET data calculated using molecular dynamics simulations. This comparison will lead to a better understanding of FRET and will improve the process of extracting structural information from raw FRET data.

Research funded by the National Science Foundation RUI and REU Programs.



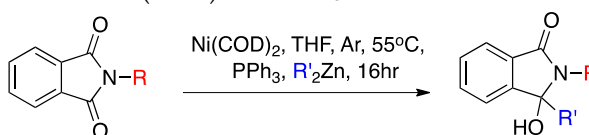
Laser excitation system for the Krueger group single-molecule fluorescence microscope.

Preparation of Gamma-Lactams via a Nickel-Catalyzed Addition of In Situ Generated Diorganozinc Reagents to Imides

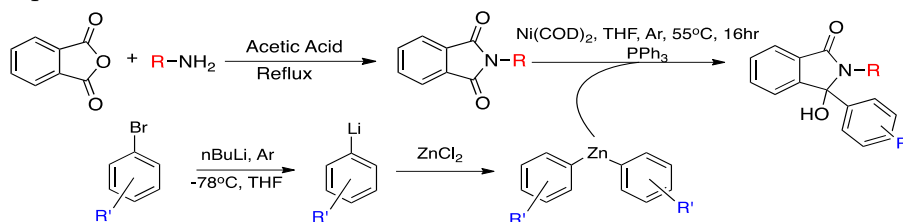
**Kimberly DeGlopper,
Joseph Dennis and
Catherine Calyore**
Mentor: Dr. Jeffrey Johnson
Department of Chemistry

*This research was supported by
the Towsley Foundation, the
Camille and Henry Dreyfus
Foundation Inc., and the
National Science Foundation.*

A range of γ -hydroxy-lactams have been prepared from the selective direct addition of in-situ prepared diorganozinc nucleophiles to *N*-substituted aryl phthalimides with catalytic amounts of $\text{Ni}(\text{COD})_2$ and PPh_3 .



A wide range of substituted phthalimides and diarylzinc nucleophiles varying in electronic character have been prepared by condensation and lithium-halogen exchange reactions respectively. Diarylzinc reagents were added directly to the *N*-phenyl phthalimide without purification. The preparation of imides and nucleophiles is shown below:



Discovery and Optimization of Nickel-Mediated and Rhodium-Catalyzed Cross-Coupling Reactions

Joseph Dennis

Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Continued exploration of a nickel-catalyzed decarbonylative cross-coupling of *N*-substituted phthalimides and in-situ prepared diorganozinc nucleophiles has prompted the study of intramolecular, decarbonylative cross-coupling reactions. The previously studied diorganozinc coupling reaction proceeds through an intermediate capable of intercepting both nucleophiles and π systems. With this insight, a variety of pendant substituents were screened in pursuit of synthesizing a range of cyclic amide compounds. In a second system, a variety of alkyl and aryl boronic acids were coupled to quinolinyl ketones through an intermediate generated through rhodium-catalyzed carbon-carbon bond activation. Current work is being done to optimize reaction conditions and to incorporate a variety of boron reagents, including boronic acids, esters, and borates.

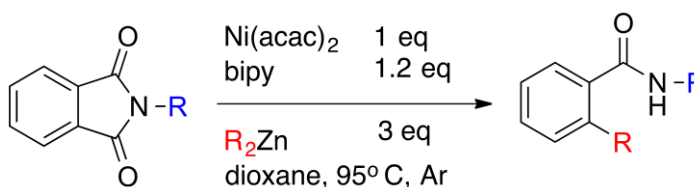
This research was supported by ACS PRF, the Towsley Foundation, and the Hope College Chemistry Department.

Investigating the Decarbonylation of Cyclic Imides Using a Nickel Catalyst

Sarah Fodor

Mentor: Dr. Jeffrey Johnson
Department of Chemistry

Previous research established that the decarbonylative nickel-mediated cross coupling reaction of *N*-substituted cyclic imides with diorganozinc reagents is possible with a range of phthalimide substitution and diorganozinc reagents. Current investigation into this reaction demonstrates that electron deficient *N*-aryl substitutions promote more catalyst turnovers than the previous work suggested.



This research was supported by the National Science Foundation.

All of the previous reactions utilized *N*-substituted phthalimides. Reaction development is underway to expand the scope of this reaction to imides with saturated backbones. Further studies to investigate the effect the saturated backbone have been performed via NMR and *in situ* IR.

Testing Quinazolinespirohexadienone Photochromes As Gatable Photoinduced Charge Transfer Initiators

David Green

Mentor: Dr. Jason Gillmore
Department of Chemistry

The quinazolinespirohexadienone (QSHD) photochromes have the potential to gate photoinduced charge transfer (PICT). The long wavelength isomer, LW, is a modest photooxidant while the short wavelength isomer, SW, is not able to act as a photooxidant. SW isomerizes to LW by absorbing UV light. LW is capable of initiating PICT from a donor molecule after excitation by visible light. The cation radical of the donor molecule can then be used in a cation radical chain process. It is important that the fade from LW to SW occurs by a purely thermal mechanism so that the LW photochemical channel is available for PICT. Photochrome reversion from LW to SW has been studied for the parent photochrome, perimidinespirohexadienone (PSHD), and QHSD in the dark and with irradiation at 578 nm. After accounting for temperature differences between the solutions, it appears that PSHD LW reversion is a purely thermal process. QSHD photochrome LW reversion shows very modest acceleration by 578 nm light, but this may not be statistically significant. While the QSHD LW is not a particularly potent

CHEMISTRY

This work was supported by the National Science Foundation under Career Grant CHE-0952768.

Radiation-Resistant Electrical Insulation Materials for Nuclear Reactors using Novel Nanocomposite Dielectrics

Eric Greve

Mentors: Drs. Tolga Aytug and Mariappan Parans Paranthaman
Oak Ridge National Laboratory, Oak Ridge, Tennessee

photooxidant, it should be sufficient to oxidize *N*,3-(bis-*trans*-1-propenyl)carbazole. This readily oxidizable monomer is distinctive because upon one electron oxidation it undergoes a genuine cation radical polymerization. Syntheses of this monomer and close analogs are underway with the ultimate goal of testing QSHD's ability to gate the PICT-initiated cation radical polymerization of these monomers.

Recently there has been renewed interest in nuclear reactor safety as commercial reactors approach 40 years of service and lifetime extensions are considered. Unfortunately, some of the current materials used as electrical cable insulators in these reactors are degrading more rapidly than anticipated. New polymer nanocomposites are of increasing interest as they can yield a material with the flexibility of a polymer, and improved thermal stability, mechanical stability and dielectric properties of the inorganic particles. We chose polyimide (PI) to investigate due to its well-known thermal and radiation properties. We prepared PI films with ceramic oxide dispersed nanoparticles. We confirmed particle dispersion by UV-Vis spectroscopy and performed dynamic mechanical analysis (DMA) to determine the PI material's activation energy (E_a) and glass transition (T_g). Certain oxide nanoparticles had large effects on E_a and T_g for the PI films. The samples were analyzed post irradiation, using DMA and electrical breakdown techniques to determine if these polyimide films could be a new viable insulation material for nuclear reactors. Improved insulation materials will decrease reactor down time, decrease nuclear waste, and increase the overall lifetime of reactors.

This research was supported by the Department of Energy Science Undergraduate Laboratory Internship (SULI) program and Department of Energy - Office of Nuclear Energy (NE) - Nuclear Energy Enabling Technologies (NEET) Program.

Allyson Hoffman (Mellon Scholar) and Eric Greve (Chemistry) were both selected to present posters at the annual national "Posters on the Hill" event organized by the Council on Undergraduate Research.



POLYAD: Predicting and Fitting Mixed Vibrational States to a Multi-Resonant Hamiltonian

Joshua Kammeraad

Mentor: Dr. William Polik
Department of Chemistry

Polyad is a computer program that constructs sets of strongly interacting vibrational states from resonant interactions. It utilizes the multi-resonant Hamiltonian model which accounts for resonances directly and handles weaker interactions using second order perturbation theory. The model is defined at runtime and includes harmonic, anharmonic, and resonance constants. Polyad connects theory to experiment by predicting energy levels within a user-defined energy range from spectroscopic constants, fitting spectroscopic constants to a set of spectroscopic data, and assessing agreement between a computed model and a spectrum. Results are provided for vibrational levels of water with up to 15,000 cm^{-1} of energy.

This research was supported by the Chemistry Department Undergraduate Research Fund and National Science Foundation grant CHE-1039925.

How (Not?) to Make Diaminoacenaphthylene for Use in Preparing Carbonyl-Substituted Photochromes

Kathryn Lindberg, Luke Peterson, Amber Prins and Douglas Yarbrough

Mentor Dr. Jason Gillmore
Department of Chemistry

The main goal of the Gillmore research group is to prepare derivatives of perimidinespirohexadienone (PSHD) photochromes to “gate” photoinduced charge transfer (PICT). Photochromes are molecules that can isomerize from their short wavelength form (SW) to their long wavelength form (LW) in the presence of ultraviolet light. PSHDs revert from LW to SW thermally. To act as photochromic photooxidants, effectively “gating” PICT, LW must be much more reducible than SW. Based on computationally predicted reduction potentials, carbonyl-substituted PSHDs are promising synthetic targets for achieving this goal. Previous experimental results show that it is not possible to add carbonyls to the photochrome bottom before coupling. Thus, it will be necessary to prepare an acenaphthylene-bottomed PSHD. This requires the synthesis of diaminoacenaphthylene. This seemingly simple molecule has proved very difficult to make. After ruling out the most straightforward syntheses and the use of protecting groups, we now detail our many failed synthetic attempts and some newly proposed synthetic routes we are currently investigating.

This work was supported by the National Science Foundation under Career Grant CHE-0952768.

Toward a (bis)Trifluoromethyl-Substituted Quinazolinespirohexadienone(QSHD) Photochrome for Gating PICT

Lauren Messer and Luke Peterson

Mentor: Dr. Jason Gillmore
Department of Chemistry

In order to gate photoinduced charge transfer (PICT), photochromes need to be able to undergo an isomerization from a short wavelength (SW) form to a long wavelength (LW) form when exposed to UV light, and only revert back thermally. Gating of PICT is accomplished when the LW form has increased conjugation so that it can accept an electron more easily than the SW form. Synthetic steps have been taken to make the LW form more reducible while keeping the ground state reduction potential (E°_{red}) of the SW relatively unchanged. One of these steps has been the synthesis of a trifluoromethyl-substituted derivative of the QSHDs in which the electron withdrawing properties of the trifluoromethyl groups make the LW form more reducible. Due to the electron withdrawing effects of the trifluoromethyl groups, synthesis of the desired photochrome cannot be accomplished in the same way as past QSHDs. An improved method has been implemented using aryl iodides and bromides. Predicted reduction potentials of the target photochrome, synthesis using the halides thus far, and possible synthetic routes toward replacing the halides with trifluoromethyl groups are presented.

This work was supported by the National Science Foundation under Career Grant CHE-0952768.



CHEMISTRY

Macatawa Watershed Project: Fecal Contamination and Microbial Source Tracking

Cameron Pratt and Stephen Skilling

Mentor: Dr. Michael Pikaart
Department of Chemistry

This research was supported by the Outdoor Discovery Center and the Macatawa Area Coordinating Council.

In Ottawa County, sewage waste pipes are separated from the groundwater pipes. The runoff from these groundwater pipes travels to Lake Macatawa and Lake Michigan. In recent years, bacterial contamination has been detected in Lake Macatawa and the surrounding watershed area. This poses a danger to people, as they can be infected by these pathogens that make it to the swimming areas. The contamination may be caused by a few factors, such as sewage seepage into the groundwater pipes or fecal matter from agricultural farms. This project relies on water and soil samples from various locations in the watershed for bacterial testing. Bacterial cell concentrations were found by using Idexx trays and mTEC agar plates. *E. coli* cells were characterized using quantitative PCR. Both human-based and cow-based *E. coli* have been detected in high amounts using qPCR. Collected soil cores show high concentrations of coliform when water was passed through them, but there were low counts when the soil itself was tested. In agricultural soils, the opposite was true for *E. coli*, which is indicative of *E. coli*'s adhesive nature.

Investigation of the Substrate Specificity of Farnesyltransferase and Geranylgeranyltransferase-I

Matt Ringel

Mentor: Dr. Corissa Lampear
Department of Chemistry
Collaborators: Dr. Carol Fierke¹, Dr. Ora Schueler-Furman² and Elia Wright¹

¹Department of Biological Chemistry, University of Michigan, ²Department of Microbiology and Molecular Genetics, Institute for Medical Research Israel-Canada, Hadassah Medical School, The Hebrew University, Jerusalem, Israel

The prenyltransferases farnesyltransferase (FTase) and geranylgeranyltransferase-I (GGTase-I) transfer 15-carbon and 20-carbon lipid groups, respectively, to a cysteine near the C-terminus of substrate proteins, targeting them to cellular membranes. Substrates of FTase and GGTase-I are involved in many cellular pathways, and inhibitors of the prenyltransferases are being investigated to treat diseases like cancer, parasitic infection, and progeria. In general, FTase and GGTase-I are thought to recognize a CaaX motif on substrate proteins. The CaaX motif is a cysteine residue followed by two "a" groups which are nonpolar amino acids and the "X" residue was thought to determine which enzyme recognizes it. Recent studies indicate that this model should be expanded. Therefore, I am studying the substrate specificity of the prenyltransferases FTase and GGTase-I using an *in vitro* peptide-based fluorescent assay. I have prepared 96-well plates with enzyme and various concentrations of substrate and measured the steady state kinetics as a function of time to refine sequence specificity of FTase and GGTase-I. This work will allow us to better predict prenyltransferase substrates *in vivo* and to better understand the modes of efficacy of prenyltransferase inhibitors.

Transition Metal Scaffolds as MRI Contrast Agents

Daniel SantaLucia

Mentor: Dr. Amanda Eckermann
Department of Chemistry

Magnetic resonance imaging (MRI) is an important technique used throughout the medical field to gain improved clinical diagnostic ability. Often, different tissues can be weighted within the images if MRI contrast agents are used. Common clinical contrast agents use gadolinium to alter the T_1 relaxation times of protons within surrounding tissues. Gadolinium(III), a lanthanide cation, has a grand seven unpaired electrons in its electronic configuration $[\text{Xe}] 4f^7$. There are already a plethora of gadolinium chelate contrast agents available for medical use; however the sensitivity of these agents may be improved by increasing the rotational correlation time, τ_r . The goal of slower tumbling rates can be achieved by increasing their molecular weight. Thus, we propose attaching multiple gadolinium chelates to

Encapsulation of an Antimicrobial Drug in Biodegradable Nanoparticles

Katherine VanDenburgh, Venkatareddy Nadithe, Qian Lin, and Shiv Sharma

Mentors: Drs. Olivia Merkel and Steven Firestine
Department: Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University

This research was supported by a Wayne State Start-up Funding Grant, and the National Institute of Health.

a central transition metal scaffold. The increase in molecular weight will alter the τ_r and improve the relaxation efficiency of the agent. These metal scaffolds will most likely include a Ru_3O core.

Bacterial infections are a cause of numerous illnesses and deaths in the world. Although numerous antimicrobial drugs have been developed, many lack effectiveness in animal systems. There are numerous reasons for this, including poor water solubility which can limit their bioavailability and thus their efficiency. One such drug, SV7, has been shown to kill numerous Gram positive bacteria, such as *Staphylococcus aureus*; however, the drug has only modest activity in animal models and no activity when given orally. Polymer based nanoparticles represent one mechanism to improve the bioavailability and effectiveness of a drug like SV7. We sought to investigate whether encapsulation of SV7 within the biodegradable polymer poly(lactic-co-glycolic acid) (PLGA) could increase the effectiveness of this agent. Spherical nanoparticle/SV7 formulations were created by solvent evaporation resulting in SV7 encapsulated within PLGA. The encapsulation efficiency was determined with UV spectrometrically and found to be approximately 60%. Hydrodynamic diameters were determined by Dynamic Light Scattering and the particles varied in size from approximately 2 μm to 100 nm in diameter. The particles were also analyzed for their Zeta Potential and the particles were determined to be quite negative. Fortunately, these nanoparticles were still effective against the bacteria cells when studied using the Minimum Inhibitory Concentration Assay.

Study of Differential Ring Opening of Quinazolin Spirohexadienones and Their Electrochemical Reduction

Eric Webb, Jonathan Moerdyk, Kyndra Sluiter, Amy Speelman, Benjamin Pollock and Eugene Lynch

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

Quinazolin Spirohexadienones (QSHDs) are photochromes that the Gillmore group hopes to use as photochromic photooxidants. Our group has previously published QSHD synthesis and photochemistry, including the proof of direction of photochromic ring opening into the LW isomer. We have subsequently discovered that QSHD opens in the opposite direction upon one electron reduction to form a different electrochromic LW isomer. Computations of bond lengths, bond orders, and molecular orbitals rationalize these results. Prior to publication, further verification of the results need to be performed. This summer I resynthesized additional amounts of QSHDs and overcame impurities in our electrochemistry. Once complete, I will replicate a few key experimental results and we will craft a final draft of our manuscript for publication.

This work was supported by the National Science Foundation under Career Grant CHE-0952768.

COMPUTER SCIENCE

Proposing Genes for Gap Reactions in Metabolic Pathways

Carl Deeg and Shinnosuke Kondo

Mentor: Dr. Matthew DeJongh
Department of Computer Science

A metabolic model is a map of the biochemical reactions that take place in an organism. These reactions are catalyzed by enzymes, which are encoded by genes in the organism's genome. However, there are reactions that are known to exist and needed to complete the metabolic model, but are not associated with any genes. These are called "gap reactions". Our goal is to find the genes that encode the enzymes that catalyze these gap reactions. We have researched two approaches: a knowledge-driven approach that focuses on finding a small set of good candidates, and a data-driven approach that focuses on scoring all candidates to rank their plausibility. Identifying the genes that are associated with gap reactions produces better predictive models and directs laboratory experimentation.

This research was supported by the National Science Foundation under Award Number DBI-0850546, and by the Department of Energy, subcontract to Argonne National Laboratory.

Building Recognition on Android

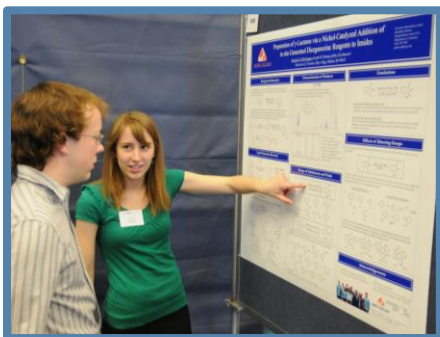
Brant Bechtel, Kevin Hartsfeld and Alek Szilagyi

Mentor: Dr. Michael Jipping
Department of Computer Science

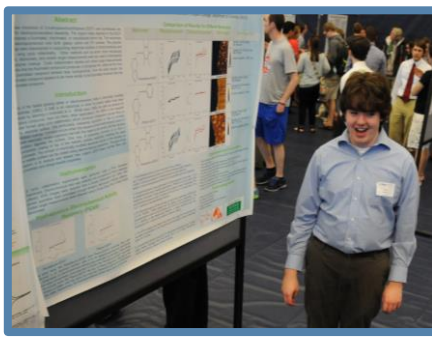
This project is a structural recognition application that is implemented on the Android operating system using either phones or tablets. Using the back-facing camera on the Android device to get a video stream, we used a Computer Vision algorithm to analyze individual frames to search for recognizable buildings. Android sensors provided us with the GPS coordinates of the device. These GPS coordinates allowed us to limit which buildings could potentially be on the screen to nearby buildings. The Computer Vision algorithm we used was SURF (Speeded Up Robust Features). This algorithm uses a matrix to compute areas of high contrast in the picture. These areas of high contrast give a good representation of the outline of the structural aspects of the building as well as the specific colors and texture of the building. Using the smart phone infrastructure coupled with the image analysis provided by SURF, we were able to provide an interactive environment for users. This included touch interaction points called Hotspots. The user can touch a Hotspot to provide more information about the building in various formats. Our application's interactive information display will be used to augment pedagogy of courses in the digital humanities.

This material is based upon work supported by the National Science Foundation under grant No. 0851293.

Kimberly DeGlopper
(Chemistry)



Gavin Donley
(Chemistry)



Surface Stimulation to Alleviate Phantom Limb Pain: Waveform to Elicit Tapping

John Boss, Carson Tobias, Lane Heyboer and Julia Slopsema

Mentor: Dr. Katharine Polasek

Department of Engineering

This material is based upon work supported by the Hope College Dean for Natural and Applied Sciences.

Phantom limb pain occurs to some degree in 50-80% of amputees with no known successful treatments. The overall goal of this project is to use surface electrical stimulation to alleviate phantom limb pain. A leading hypothesis suggests that cortical reorganization (the remapping of the somatosensory cortex) could lead to phantom limb pain. To potentially reverse this, the median and ulnar nerves will be stimulated in hopes of keeping their respective regions in the cortex receiving information from the hand. Previous work has found that reliable sensation could be obtained in the hand using electrical stimulation of nerves at the elbow, but that it most often felt like 'tingling' or 'buzzing'. In an attempt to evoke natural sensation, two stimulation types were created. After preliminary testing, both stimulation types produced a tapping sensation. Both forms of stimulation were found to be more pleasant than standard, non-modulating stimulation. Future work will include comparing the two stimulation types and deciding which produces the most natural sensation.

Design and Simulation of Tetrahedral Robotics

Korey Cook and Joshua Swett

Mentor: Dr. Miguel Abrahantes

Department of Engineering

This project was partially funded by the Michigan Space Grant Consortium.

Tetrahedral robots come from a family of crawling and tumbling robots. They operate by changing their shape. This is a different way to move compared to a traditional rover because it can crawl or tumble over rough terrain and obstacles. The current tetrahedral robot, at Hope College, (8-TET) moves by tumbling or rolling. This becomes a limitation because it constantly is changing its orientation due to the fact that it is rolling and each part is upside down at some point. A new robot was to be designed that does not change its orientation. The idea of the Tetrahedral Worm (TET Worm) came about as an alternate for the current robot. The TET Worm moves by crawling rather than tumbling. By doing this movement, it holds a constant orientation. The new robot could be designed, tested, and controlled using a computer program called SimMechanics, which is a package of MATLAB. After the robot is designed and a control system is implemented on the program several Gaits (the way that the robot will move) must be considered for the TET Worm. The Gaits can then be compared to one another to test for controllability, force on the struts, and speed.

Responsive Polymer Grafts for Patternable Self-Oscillating Gels

Sung Il Hwang

Mentor: Dr. Matthew Smith
Department of Engineering

This research was supported in part by a grant to Hope College from the Howard Hughes Medical Institute through the Undergraduate Science Education Program.

Materials that can mimic biological behavior by converting chemical energy to mechanical work under constant external conditions represent an exciting opportunity for extending traditional responsive behavior via energy harvesting and autonomous function. One such material is the self-oscillating gel which exhibits periodic swell-deswell oscillations driven by the Belousov-Zhabotinsky reaction. A key step in increasing the functionality of these materials is the ability to form arrays of individual oscillators that can behave in a cooperative fashion. To achieve this ability the gel must be patternable while maintaining enough versatility to design its polymer backbone for optimal performance (e.g. maximum swell-deswell amplitudes). To address this challenge we explored the synthesis of vinyl terminated responsive polymer grafts. By incorporating these grafts into a nonresponsive polymer backbone at sufficient concentrations and applying an appropriate stimulation, the grafts should form microdomains (physical cross links between chains), enabling printing of any desired gel pattern. Poly-N-isopropylacrylamide (PNIPAM) was chosen as a test candidate due to its extensively



ENGINEERING

studied thermo-responsive behavior. PNIPAm grafts with vinyl end group were made first by adding a primary amine group at one chain end using 2-aminoethanethiol as a chain transfer reagent during radical polymerization. Then the amine end-group was replaced with a vinyl group using an amide condensation reaction. Future work will involve the incorporation of this graft into various polymer backbones and exploring techniques for chemically fixing the networks after physical gelation.

Ruthenium-Poly(Vinyl Pyridine) (RuPVP) Metallopolymers for Catalyzing Self-Oscillating Gels

Minchul Kim

Mentor: Dr. Matthew Smith
Department of Engineering

Stimuli responsive polymer gels, in which a single stimulus (e.g. temperature, pH, etc.) causes a change in volume, have been the subject of intense interest for applications such as drug delivery and biological sensors. In these gels a periodic external change in stimulus is required for a periodic oscillation to be observed within a gel. However, many biological systems maintain periodic oscillations under constant environmental conditions, transforming chemical energy into mechanical work. Materials capable of mimicking this biological behavior represent exciting opportunities for extending responsive behavior through chemical energy harvesting and autonomous function. Autonomous oscillations can be achieved by the oscillating Belousov-Zhabotinsky (BZ) reaction within gels containing the BZ catalyst. When a gel containing a catalyst metal, such as ruthenium, is placed in a solution containing the BZ reactants (minus the Ru), the catalyst within the gel undergoes oscillation in its redox state. Due to the difference in the hydrophilicity of the polymer network at the Ru^{2+} and Ru^{3+} states, the gel displays swell-deswell oscillations. One of the challenges in producing self-oscillating gels is the lack of options for BZ catalysts. Currently used catalysts are either cost prohibitive or overly difficult to synthesize. To alleviate this problem, a facile, relatively inexpensive synthesis of ruthenium catalyst complex was attempted following previously reported procedures in the coordination polymer literature. Using readily available precursors, *cis*-Dichlorobis(2,2'-bipyridine)ruthenium(II) and poly(4-vinylpyridine) a ruthenium-poly(vinylpyridine) (RuPVP) metallopolymer was prepared. BZ reactions were successfully triggered by this ruthenium catalyst. With the catalytic ability of RuPVP established, this research can proceed with grafting the catalyst into a polymer gel, creating a versatile and accessible self-oscillating gel.

Deformation of 2024-T3 Aluminum at High Strain Rates

Chris Seto

Mentor: Dr. Roger Veldman
Department of Engineering

This research was supported by the James N. Boelkins Faculty Research Award.

The goal of this project was to study the deformation and failure pattern of 2024-T3 aluminum at high strain rates and to validate the numerical analysis of the aluminum through experimentation. This topic is relevant because of its use in aircraft safety in the event of an onboard explosion. It was hypothesized that a material model incorporating multiple stress-strain curves would be necessary to accurately model this high-velocity metal failure. The study of the aluminum was approached using two different methods. The projectile impact test involved shooting a hardened steel sphere at a clamped plate of the aluminum. Then the ballistic limits of various thicknesses of aluminum and the plate failure patterns could be examined. In the Taylor cylinder test, cylinders of the aluminum were shot at a hardened and immovable disk. The cylinders were measured before and after impact and the deformation was correlated with velocity. As expected, the results from the computer modeling were most closely aligned to the experimental data when a Johnson Cook material model, a model that incorporates differing strain rates into calculating multiple stress-strain curves, was used in the simulation.

Therefore, a Johnson Cook model of 2024-T3 aluminum was determined to be a viable source of data when used in modeling this kind of scenario involving high-velocity impacts.

Feasibility of Surface Stimulation to Alleviate Phantom Limb Pain

Julia Slopsema, John Boss, Lane Heyboer and Carson Tobias

Mentor: Dr. Katharine Polasek

Department of Engineering

This material is based upon work supported by the Hope College Dean for Natural and Applied Sciences and the Beckman Scholars Program.

Phantom Limb Pain, a pain or discomfort in the missing limb, is experienced by 50-80% of amputees. A leading hypothesis suggests phantom limb pain is due to reorganization of the somatosensory cortex of the brain. Our working hypothesis states that by eliciting a “real” sensation in the phantom limb, the progression of cortical reorganization may be reduced or even reversed to decrease or eliminate phantom limb pain.

To obtain distal sensation in able-bodied subjects, the median and ulnar nerves were stimulated at the elbow using surface electrodes. A non-symmetric rectangular voltage controlled pulse train was created using optically isolated biostimulators and MATLAB software. The adaptive procedure Parameter Estimation by Sequential Testing (PEST) was used to determine threshold values for sensation in the hand. A strength-duration curve was found for both electrode positions to relate pulse width and threshold values for hand sensation. Stimulation was then sent at 25% and 75% of the subject’s voltage range at pulse widths of 50, 100, and 500 μ s. Data was collected on the magnitude, position, and type of sensation (prickly/buzzing/tapping...). Results showed that changing the amplitude and pulse width changed the magnitude of sensation, but did not change the position or type of sensation. Future work will include using different waveforms in order to vary the sensation. In addition, the effect of using an array of electrodes in order to vary the location of sensation in the hand will be investigated.

Surface Stimulation to Alleviate Phantom Limb Pain: Current Control Waveform

Carson Tobias, John Boss, Lane Heyboer and Julia Slopsema

Mentor: Dr. Katherine Polasek

Department of Engineering

This material is based upon work supported by the Hope College Dean for Natural and Applied Sciences.

Phantom limb pain is a post-amputation phenomenon where an amputee experiences painful sensations in their missing limb. The cause of phantom limb pain may be cortical reorganization, which occurs when areas that controlled the missing limb are activated by adjacent areas of the cerebral cortex. This reorganization could result in painful sensations when an adjacent area is touched. By using electrical stimuli as a substitute for sensory input from the missing limb, cortical reorganization may be reversed and therefore provide some relief from phantom limb pain.

Previous studies by our group used voltage control stimulation while many other electrical stimulation applications used current control. The goal of this study was to compare the different sensations obtained between the two types of stimulation. The hand thresholds and maximum stimulation were determined to define the parameter space. Points within that area were tested at 100 μ s and 500 μ s pulse widths, all at 25%, 50%, and 75% of the range between the hand thresholds and maximum stimulation. These points were tested varying between current and voltage controlled stimulation. The type, magnitude, and location of sensation were recorded for each trial. Hand sensation and magnitude results were similar between the two types of stimulations; therefore voltage controlled stimulation will be used in future trials as there is less risk for painful sensation during testing.

GEOLOGICAL & ENVIRONMENTAL SCIENCES

Comprehensive Dune Study Unit aligned with Next Generation Science Standards

**Sasha Balcazar and Katelyn
Dickerson**

Mentor: Dr. Brian
Bodenbender

Department of Geological
and Environmental Sciences
Collaborator: Jason Hunter,
Grand Haven High School

*This research was supported by
a Hope College Howard
Hughes Medical Institute CSI
Grant.*

This project presents curriculum designed for a high school unit focused on Michigan sand dunes. The centerpiece of the curriculum is a field research project that is planned, deployed, and conducted by high school students and teachers so that they can examine changes in local open sand environments. The curriculum is aligned with Next Generation Science Standards and incorporates experimental design, analytical interpretation of data, and real world application of research. This curriculum model begins with the exploration of content, including such background information as the origin of Michigan's sand dunes, processes that affect sand movement, and seasonal weather patterns in the region. The curriculum includes several modules that prepare students for field exercises along the West Michigan shoreline, including field data sheets and recognition of both dangerous and endangered plants. The fieldwork relies on digital images to capture data at the site. Once students have acquired photos of the field area, they perform data collection and interpretation in the lab. They build as many as several hundred digital images of the site into a panorama that is hosted online, and then analyze changes revealed by comparing panoramas taken at different times during the year using on-screen measurement software and a spreadsheet for data collection and analysis. The real time data the students collect along West Michigan shorelines can be used by public and private institutions to aid in research and restorative practices in order to better understand and protect Michigan's fragile fresh water dunes and dune ecosystems.

Sorption of Antibacterial Compounds, Penicillin and Triclosan, to Clays: Implications for Removal of Pharmaceuticals from Aqueous Systems

**Andrew Harrison and
Alexandria Vandervest**

Mentors: Drs. Jonathan
Peterson and Michael
Seymour
Departments of Geology
and Environmental Science
and Chemistry

The fate of antibacterial compounds is an important area of research due to the correlation between antibiotic contamination and the proliferation of antibiotic-resistant bacteria. Triclosan (TCS) is a common active antimicrobial agent in antibacterial hand soaps and other antimicrobial products. The effects of TCS contamination in the environment are not understood. TCS sorption to three clays (illite, kaolinite, and montmorillonite) was studied in batch experiments at various pH conditions and TCS concentrations. Preliminary results indicate that sorption of hydrophobic TCS does not follow adsorption trends of polar antibacterial compounds at near-neutral pH. Also, expansion of the clay crystal structure interlayer spacing (d-spacing) in montmorillonite (as detected by powder X-ray diffraction) suggests multiple TCS-clay sorption mechanisms. The sorption of Na-ampicillin (AMP) to clays was also investigated in batch mixing experiments at various pH conditions. AMP is a common penicillin-class human and veterinary antibiotic. Results yield non-linear isotherms as well as interlayer expansion and clay-enhanced degradation of AMP under certain conditions. Overall preliminary results of the ongoing study indicate an important and complex role for clays in the fate, transport, and removal of antibacterial compounds in sediment-water systems.

This research was funded by the Nicholas VerHey '75 Geology Summer Research Fund.

Using Statistics to Find the Link Between Discipleship and Discipline

**Ellee Banaszak and
Valentina Shabi**

Mentors: Drs. Brian Yurk
and Airat Bekmetjev
Department of Mathematics

The debate of the influence of religion over academics and vice versa has remained steadily controversial over decades of research. Does a student's identity as a Christian impact their academic standing, social activities, and other various aspects of their college career? We studied the link between religious identity and academic standing using a small Google survey over a limited sample of Hope College students. We compared multiple religious and academically based variables and obtained several different distributions, p-values, and other statistics. Our results indicated that for the population of full-time Hope College students, religious or academic activities did not significantly influence each other.

This research was supported by the Howard Hughes Medical Institute.

Teaching At-Risk Algebra Students More Conceptually

Sydney Bryer

Mentor: Dr. Vicki-Lynn
Holmes
Departments of
Mathematics and Education

This project addressed the possibility that all students can learn mathematics conceptually through the observations and reflections of a pre-service teacher through a conceptually taught and scaffolded Extended Algebra 2A (at risk) lesson in a public school in Michigan.



Main floor of DeVos Fieldhouse during the Celebration, 2014.

Determining Effectiveness of a Discipline Model: Does the Chip System Work?

Alison Chatten

Mentor: Dr. Vicki-Lynn
Holmes
Departments of
Mathematics and Education

The goal of conducting this study was to determine the effectiveness of "the chip method" on 7th-grade math students. The chip system is a classroom management technique designed to reward good behavior and penalize bad behavior (through the removal of chips). Loss of chips results in a call home. To determine the effectiveness of this discipline technique, a 7th-grade math class was observed once a week for 12 weeks. Students' reactions to losing chips were noted. A survey was also given to the students in order to ascertain their feelings about the method. These students' pre- and post-semester grades were analyzed to correlate chip loss and math content acquisition. Results showed that losing chips did not affect their grade. Surprisingly students liked the penal system although they reported that the chips did not help them focus or pay attention in class.

MATHEMATICS

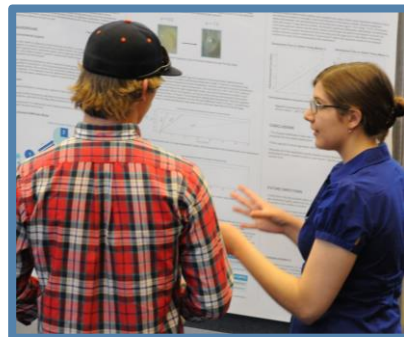
The Effects of Interactive iBooks on Advanced Secondary Statistic Students' Motivation and Academic Achievement

Brooke Dykstra

Mentor: Dr. Vicki-Lynn Holmes

Departments of Mathematics and Education

The purpose of this mixed method's study was to explore the impact (both motivational and academic) of using the media-rich, interactive iBooks in a high school statistics class. The researchers interviewed and observed a unique stats class in which the entire course was taught using an iBooks textbook. These statistic students were assessed at the beginning and end of the term via a national stats content exam and an introductory statistics attitude survey. Preliminary results indicate that high school students show academic growth of key statistical concepts, and that their motivation is directly affected by teacher attributes.



Ariel Vincent presenting at the Celebration, 2014.

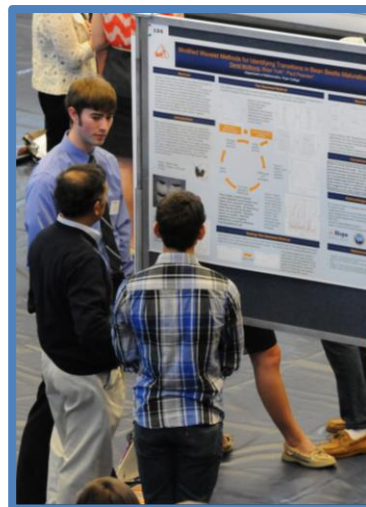
Case Study: The Performance and Attitude of Secondary Students in an Integrated Math and Science Watershed Academy Curriculum

Michael Henriksen and Ryan Reason

Mentors: Dr. Vicki-Lynn Holmes and Professor Carrie Dummer

Departments of Mathematics and Education

How does a math-and-science-integrated curriculum affect student performance and attitude? In this study we created a math/science integrated curriculum designed to guide high-school students towards critical and higher-level thinking. The premise of the curriculum is local wetlands; students will investigate specific factors such as water quality, flood frequency, stream discharge and macro-invertebrate identification. Each lesson has opportunities for students to work outside the classroom and collect the data they will then be using in the classroom. The significant result of our research provides a starting point for further investigations on cross curriculum and project-based learning being implemented in the classroom.



David McMorris presenting at the Celebration, 2014.

Modified Wavelet Methods for Identifying Transitions in Bean Beetle Maturation

David McMorris

Mentors: Drs. Brian Yurk and Paul Pearson
Department of Mathematics

As bean beetle embryos develop, time lapse photographs of their eggs exhibit varying levels of brightness that correspond to different stages of maturation. This signal can be analyzed to pinpoint the timing of these various stages. We have developed an averaging method based on a modified Haar wavelet technique to identify these changes visually. This method has been studied for both accuracy and precision through a process of randomized simulations at different levels of signal noise. The results of this study have supported the efficacy of this method, demonstrating its usefulness in analyzing a wide variety of signals.

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

Predicting Insect Development in Changing Climates: Bean Beetle Phenology Modeling

Ariel Vincent, Bennett Riddering and David McMorris

Mentor: Drs. Brian Yurk and Aaron Putzke
Departments of Mathematics and Biology

Traditional development models for poikilotherms assume that development rates depend on temperature, but do not allow rates to vary as an individual ages within a life stage. We designed experiments to test this assumption using bean beetles. Our hypothesis is that the time that bean beetle embryos are exposed to a period of higher or lower temperature will impact their development time. According to the age-independent model, embryos spending the same amount of time at each temperature, regardless of when they are exposed to those temperatures, will take the same amount of time to develop. Our preliminary results suggest that this is not the case, supporting the possibility of age-dependent aging.

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

Do Students in Upward Bound Have an Increase in GPA?

Grace Wiesner

Mentors: Drs. Brian Yurk and Airat Bekmetjev
Department of Mathematics

This research was supported by the Howard Hughes Medical Institute.

TRiO Programs were established by President Johnson in the 1960s and aim to serve at-risk students by increasing their educational opportunities. This investigation looks to determine if there is a change in GPA between the fall semester and spring semester for students in Upward Bound. It also analyzes if the average difference in GPA between the two semesters is different between the three schools that the Hope College Upward Bound Program targets. Using a student t-test, the average differences in GPA (spring-fall) for the 88 students participating in Upward Bound during the 2012-2013 school year were analyzed. The results were found to be insignificant as student t-test produced a t-statistic of -0.971 and a corresponding p-value of 0.365. A simulation based multiple means test was also used to analyze the average difference in GPA between the three target schools. These results were also insignificant as the MAD statistic was 0.19 with a corresponding p-value of 0.611. My analysis is very limited as it only looks over a short time frame and does not account for changes in GPA that occur over the four years the students are enrolled in Upward Bound.



Upward Bound Graduates, Hope College, Class of 2012.



NEUROSCIENCE

Identification of Trafficking Motifs in the C-terminus of the Cystine/Glutamate Exchanger, System x_c^-

Nicole Ladd, Elizabeth Unterbrink, Anne Georges and Sara Lang

Mentor: Dr. Leah Chase
Department of Neuroscience

This research was supported in part by NSF-RUI #0848564.

System x_c^- is a heterodimeric plasma membrane transporter, comprised of the proteins xCT and CD98, which facilitates the stoichiometric exchange of extracellular cystine for intracellular glutamate. System x_c^- serves to protect the cell from oxidative stress, and brief exposure of cells to oxidative agents leads to an increase in trafficking of xCT to the plasma membrane. However, little is known about the mechanisms which govern the constitutive and regulated trafficking of xCT. In the present study, we sought to identify trafficking motifs within the C-terminus of xCT that are important in regulating the delivery and internalization of xCT from the membrane. We used a mutagenesis approach combined with cell surface biotinylation assays to identify regions of the C-terminus that are involved in the constitutive trafficking of xCT. Specifically, using site-directed mutagenesis, we identified a tyrosine based motif between positions 464 -486 containing the sequence YYLFII that contributes to the constitutive trafficking of xCT to the plasma membrane. In addition, we created three truncation mutants at positions 469, 484, and 496 of xCT, and found that an endocytic motif(s) must also exist between position 469 and 484. While there are no canonical endocytic motifs within this region, there is a putative ubiquitination site. Since we have recently demonstrated that xCT is ubiquitinated in Cos-7 cells and ubiquitination of membrane proteins is known to regulate cell surface expression, we are currently using site-directed mutagenesis to test the hypothesis that ubiquitination of xCT in this region leads to the increased rate of internalization of xCT.

Identification of Trafficking Proteins that Interact with the C-terminus of System x_c^-

Elizabeth Unterbrink

Mentor: Dr. Leah Chase
Department of Neuroscience

System x_c^- is a transport system that plays an important role in protecting cells from oxidative stress. Previous studies in our lab have demonstrated that its activity is regulated by oxidants such as hydrogen peroxide. Specifically, oxidants cause System x_c^- to localize to the plasma membrane where the transporter functions to import cystine, the rate limiting reagent for the synthesis of the antioxidant, glutathione. In the Chase lab, we are interested in understanding the factors that regulate System x_c^- . Often, the C-terminus of membrane proteins offers binding sites for proteins that regulate trafficking the cell. We hypothesize that a binding site(s) for adaptor protein-2 (AP-2) exists within the C-terminus of System x_c^- , thus allowing System x_c^- to be trafficked from the plasma membrane to the endosomes through clathrin-mediated endocytosis. To test this hypothesis, we have expressed the C-terminus of System x_c^- in bacterial cells. We have developed a purification procedure so that we can use the C-terminus of System x_c^- in a cellular pull down assay. If the C-terminus of System x_c^- interacts with AP-2, we should be able to co-purify AP-2 with the C-terminus. Our initial results suggest that higher levels of our C-terminus will be required to test our hypothesis. We are currently working on increasing our yield in our protein purification.

Comparison of Outcomes in Patients with Femoral Arteriotomy with or without Post-Procedural Anticoagulants

Michael Blok

Mentors: Kara Heck, BSN, RN-BC, CCRN¹ and Barbara Vincensi, PhD, RN, FNP²

¹Holland Hospital and

²Hope College Department of Nursing

Patients with femoral arteriotomy are routinely given post-procedural anti-coagulants, regardless of the method used to achieve access site closure. This project aims to examine the effect of post-procedural anti-coagulants on patient outcomes, focusing on development of complications. The nursing conceptual framework used for this project is Callista Roy's Adaptation model of nursing. The study was conducted using a retrospective chart review. Data was collected for the project using a data collection tool to analyze patient chart records. Use of post-procedural anti-coagulants and development of complications were noted, along with demographic information and other relevant treatment data. The data collected will be subjected to statistical analysis examining correlation using SPSS statistical software. The sample size of the project includes twenty patients, taken from records of in-patient treatment at a hospital in the Midwest. Analysis of the data shows no significant relationships between patient outcomes and post-procedural anticoagulant use. Limitations to this study include the use of patient records, which must allow for possible inaccuracies in charting, as well as a small sample size. Implications of the study include possible changes to medication usage in post-procedural patients.

Sleep Disturbances in the Hospital

Megan Czmer, Mary Gipson and Abigail LaLonde

Mentors: Drs. Barbara Vincensi and Brian Yurk Departments of Nursing and Mathematics

This study was conducted by Professor Vincensi and surrounded the production of the Vital Sleep Band. We investigated the factors contributing to sleep loss in a hospital setting, taking input from both patients and the nursing staff. We used the data collected from a series of surveys given to both nurses and patients to perform a two proportion test for alarms and vital sign sleep interruptions. Our tests gave p-values less than .05, so we can conclude that there is a significant difference between the views of patients and nurses on sleep interruptions.

Comparison of Complications Post Femoral Sheath Removal between Intra-Arterial Devices and Traditional Compression Methods for Patients Following Peripheral Vascular Intervention

Heather Englert

Mentors: Kara Heck, BSN, RN-BC, CCRN¹ and Barbara Vincensi, PhD, RN, FNP²

Complications following femoral sheath removal, including hematoma, bleeding at the site, and retroperitoneal aneurysm, have been linked to increased consumption of healthcare resources, delays in hospital discharge, and patient dissatisfaction. Currently there is no compelling evidence or widely accepted practice guidelines that favor one method of sheath removal over another. The purpose of this study is to compare the frequency of complications between intra-arterial closure devices and hemostatic pads with traditional manual compression after femoral sheath removal. This project was based on the American Association of Critical Care Nurses Synergy Model, which emphasizes optimizing patient outcomes through the synergy of patient needs and nurse competencies. A retrospective chart review was done on 50 patients undergoing peripheral vascular intervention with femoral arteriotomy in a small community hospital in Southwest Michigan. Data collected included patient demographics, procedure details, complications, and length of stay. The data was analyzed with SPSS using a chi-squared analysis of frequencies. Based on the Pearson's Chi-squared Test, with 95% confidence, there was no significant association between closure method and frequency of complications. The implications of this study may be limited by a relatively small sample size, the limited diversity of the sample, and the inclusion of only one hospital. Further

NURSING

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Teamwork Among Nursing Staff in Relationship-based Patient Care

Courtney Mulder

Mentors: Judith Westers, BS, RN¹ and Donna Garrett, MSN, RN²

¹Spectrum Health and

²Hope College Nursing Department

research on this subject could aid in the development of a universal nursing practice guideline that would decrease the frequency of complications for patients post femoral sheath removal.

Nursing staff members encourage teamwork among each other through mutual understanding of patients' acuity, communication, and collective trust. Individual job satisfaction is impacted by a variety of factors including teamwork and individual performance. The purpose of this research was to explore the opinions and attitudes of staff in relation to teamwork. Jean Watson's Theory of Caring emphasizes the importance of interpersonal relationships among nursing staff. These relationships are founded upon trust, communication, and a caring environment. This study was a six-week-long pilot study. Two microteams on two different medical-surgical units in a large teaching hospital in southwest Michigan, consisting of two registered nurses and one nursing assistant, worked a shared schedule for six weeks. Using phenomenological methodology, three structured interviews of each participant were performed by a research assistant and audio-recorded. The data were transcribed and double-checked for errors and validity. Quantitative data were manually collected to determine the number of different staff members each participant worked with over the six-week period. The primary finding from the qualitative component was that the quality of teamwork and teammates decrease workload and work is more stressful when there is minimal support. Findings from the quantitative component found the average number of individuals a participant worked within a shift pre-shared schedule was $M = 3.2165$ ($SD = 1.10139$) and shared schedule was $M = 2.4038$ ($SD = 0.64641$). Teamwork is enhanced with communication; it changes over time. Limitations for this study included the small sample size, one site for data collection, inconsistency with study protocols, and microteam selection. Implications include education for all nursing staff about teamwork and further research with a larger sample size is needed to explore these themes.

Vascular Access Assessment and Device Selection (VAADS) Education

Hannah Rice

Mentors: Amy Kyes MSN, RN, CRNI¹ and Barbara Vincensi, PhD, RN, FNP²

¹Spectrum Health Zeeland Community Hospital and

²Hope College Department of Nursing

Promoting the application of the Infusion Nursing Society's (INS) evidence-based practice standards into clinical practice through education transforms a reactive approach into a proactive approach to vascular access assessment. The purpose of this study is to assess the knowledge of staff nurses regarding appropriate vascular access, pre- and post-education implementation of the Vascular Access Assessment and Device Selection (VAADS) scoring tool, which incorporates INS standards and aims for improved patient outcomes and decreased hospital costs. The study is framed around Kurt Lewin's Change Management Model, which explains change in stages of "unfreezing," "change," and "refreezing." The education aims to make a change in nursing knowledge and practice. The study design is non-experimental and descriptive. A sample of 34 nurses on the Medical-Surgical floor of a 57-bed community hospital in West Michigan received the online education and questionnaire surveys. Scores of pre- and post-tests and other survey questions were analyzed using dependent t-tests, descriptive statistics, and ANOVA tests with IBM SPSS Statistics 19.0. A significant increase was found from the pre-test mean of 9.90/11 to the post-test mean of 10.79/11 ($p = .000$). Nurses' educational degree had significant effect on pre-test scores ($p = .021$) but not on post-test scores ($p = .086$). Education was significantly effective in increasing knowledge of staff nurses regarding appropriate vascular access and device selection using INS standards.

Post-test scores were not affected by previous education level, further supporting education on the use of the VAADS alone as effective in increasing knowledge. Limitations include a small sample size and single setting which restricts generalization of results, and short length of tests and small range of scores. The main implication for this research is support for further education to improve evidence-based nursing practice.

The Impact of the Year of Birth Related to Health Literacy

Domenique Tamminga

Mentors: Susanne Brooks, MSN, RN AOCNS, ACCNS-AG¹ and Donna Garrett, MSN, RN²

¹Spectrum Health and

²Hope College Department of Nursing

It is estimated that more than a third of American adults do not have adequate health literacy to undertake and execute needed medical treatments and preventive health care. Health literacy has been shown to impact readmission rates, be associated with health knowledge, behavior, outcomes, as well as a financial impact. The purpose of this study is to determine the correlation between age and health literacy scores. The Health Literacy Framework shows literacy as the foundation and health literacy acts as the mediator between individuals and health contexts. This is a prospective-correlational study design on comparing health literacy rates to the age of the patient. Data were collected by patient interviews and completion of the short test of functional health literacy in adults and the new vital signs test. The sample size is 159 and consists of patients over the age of 18, English speaking, and able to consent. This study takes place at two hospital settings, on medical-surgical floors, in West Michigan. This nursing study will use a two-tailed t-test on IBM SPSS software 19. The results of this study showed an increase in age was associated with a decrease in health literacy supported by a significance of $p < 0.01$. Limitations of this study include only having representation of patients from West Michigan, and only patients who were willing to contribute. Implications for the future include developing interventions to nursing practice to help increase the knowledge of health illiteracy among patients.

Inter-Rater Reliability of the Vascular Access Assessment and Device Selection (VAADS) Tool

Eric Vachon

Mentors: Amy Kyes MSN, RN, CRNI¹ and Barbara Vincensi, PhD, RN, FNP²

¹Spectrum Health Zeeland Community Hospital and

²Hope College Department of Nursing

Intravenous (IV) access is necessary to deliver medications, fluids, and blood products via venous route. However, staff nurses often do not have adequate education to assure that the appropriate IV-access device is chosen. The purpose of this research is to assess the inter-rater reliability of the Vascular Access Assessment and Device Selection (VAADS) Tool between vascular access team nurses and staff nurses. The tool was developed based on the research literature and Infusion Nurses Society (INS) standards to help nurses select the most appropriate IV-access device, early in a patient's hospital stay. Benner's "From Novice to Expert" theory looks at five levels of nursing experience. Using Benner's theory, the researcher identified the vascular access team nurses as experts in comparison to staff nurses. The study was conducted at a small, midwest community hospital using a prospective, observational design with one venous expert, two staff nurses, and six patients. Cohen's Kappa coefficient was used to measure the inter-rater reliability. The results showed moderate significance (p -value: 0.006, 0.171) in the rater agreement between the expert and staff nurses. The limited data of this pilot study makes conclusions difficult to draw, but further psychometric testing and staff education is needed. Limitations include that the research was conducted at one small, community hospital which also lacked diversity of participants, and a limited amount of data. Not only does the introduction of the VAADS help in assessment of patients' vascular access needs, but with this particular study researchers will be able to identify potential education needs of nurses.



NURSING

The Relationship Between Co-Morbidities and Complications of Femoral Sheath Removal

Cassandra Vanden Bosch

Mentors: Kara Heck, BSN, RN-BC, CCRN¹ and Barbara Vincensi, PhD, RN²

¹Holland Hospital and

²Hope College Department of Nursing

Femoral sheath insertion and removal is a high-risk procedure that is often associated with complications during and after the procedure. The purpose of this study is to determine if there is a relationship between co-morbidities and complications during or after the procedure. The framework applied to this project is Betty Neuman's systems model, as the physiologic variables differ for each patient based on co-morbidities, effecting how the environmental stress of the femoral sheath is handled by each patient. The data was collected by retrospective chart review of 50 adult patients receiving peripheral arterial intervention at a small community hospital in the Midwest. The data was analyzed with SPSS version 19.0 using the chi square test to determine the relationships between co-morbidities and complications. The findings revealed that there is a significant relationship between hypertension and hematoma prior to sheath pull ($X^2 = 9.571$, $p < .01$). Gastrointestinal bleed also showed significant relationships between hematoma prior to sheath pull ($X^2 = 10.421$, $p < .01$), hematoma after sheath pull ($X^2 = 7.983$, $p < .01$), re-bleed ($X^2 = 5.87$, $p < .05$), and overall complications ($X^2 = 7.094$, $p < .01$). These results reveal that co-morbidities do have an effect on patient outcomes following femoral sheath insertion and removal. Limitations of this study include a small sample size, resulting in decreased generalizability and power, little diversity, and one hospital site utilized for data collection. This study will be a guide for future research of the effects of certain co-morbidities and may help to promote safer nursing care in the removal of femoral sheaths.

Evaluation of Gender and Health Literacy

Deborah Working

Mentors: Susanne Brooks, MSN, RN, AOCNS, AACNS-AG¹ and Donna Garrett, MSN²

¹Spectrum Health, and

²Hope College Department of Nursing

More than one third of adults have limited health literacy in the United States. Poor health literacy is associated with higher rates of hospitalization and mortality, and therefore plays a significant role in the outcomes of patients. The purpose of this research project was to evaluate the correlation between gender and health literacy scores. The theoretical framework used was the Health Literacy Framework. The methodology of the project was an interview style survey. This prospective, descriptive study compared gender, the Newest Vitals Sign, and the Short Test of Functional Literacy in Adults (STOFHLA). The randomized sample size was 148 patients who are 18 years of age or older, alert and oriented, English speaking, and capable of giving informed consent from several inpatient medical/surgical units of a hospital in the Midwest. Frequency, correlation, and independent sample t-tests were used to analyze the data with the statistical software SPSS version 19. The conclusions of this study are that the results were only statistically significant, and not clinically significant, as the mean score for each gender fell within the same health literacy range. This indicates that gender is not a useful clinical predictor of health literacy proficiency. Limitations of this study were a lack of diversity, which decreases the generalizability of the study, and a small sample size. Implications of this research may allow nurses insight into how gender relates to health literacy, guide future research, and to continue to develop appropriate nursing interventions.

Construction of a Cosmic-Ray Veto Shield for the Summing Na(Tl) Detector

Jaclyn Brett

Mentor: Dr. Paul DeYoung
Department of Physics

Cosmic rays, which are constantly penetrating the SuN detector, produce signals in SuN similar to the γ radiation SuN is designed to detect. A cosmic-ray veto detector was built in order to identify these signals and remove the background from SuN data. The veto detector consists of nine scintillator bars with a photomultiplier tube on each end. These bars were mounted horizontally and will be placed above the SuN detector in order to detect cosmic rays before they penetrate SuN. Data will be taken with the SuN and the veto detector simultaneously and the cosmic ray events will be removed offline. The first experiment with SuN and the veto will be in the spring of 2014.

Differential PIXE Analysis of Acrylic Samples to Parameterize Bremsstrahlung Background

Jarrhett Butler

Mentors: Drs. Paul DeYoung and Graham Peaslee
Department of Physics and Chemistry

Particle Induced X-ray Emission (PIXE) analysis of thick acrylic samples is complicated by bremsstrahlung radiation. PIXE utilizes a particle beam to analyze the elemental composition of a sample. Differential PIXE (dPIXE) is the varying of beam energies to penetrate into different depths of a sample. In order to meticulously characterize the bremsstrahlung background, thick acrylic samples were constructed with a low concentration of heavy elements. With quantification of the background, a more accurate computation of concentrations can be achieved in regions where both bremsstrahlung and characteristic elemental peaks are present in auto paint samples. Data show a correlation between the beam energy and the width and center of the bremsstrahlung peak. The quantified parameters make for straightforward fits of the bremsstrahlung on all spectra of elemental peaks within bremsstrahlung region.

This work is supported by the National Science Foundation under NSF-REU Grant No. PHY/DMR-1004811, and under NSF- Grant No. PHY-0969058.

Analysis of Thin Semiconducting Films' Thickness and Stoichiometry

Zachary Diener and Matthew Weiss

Mentors: Drs. Paul DeYoung and Stephen Remillard
Department of Physics

The electrical properties of a semiconductor can only be determined if the sample's thickness and stoichiometric makeup are known. The composition of thin films can be measured using Energy Dispersive X-ray Spectroscopy (EDS) in a Scanning Electron Microscope (SEM). However due to the low stopping power of electrons, EDS is limited to analysis of the surface. When compared, EDS results are complementary to those determined by Rutherford Backscattering Spectroscopy (RBS). RBS provides depth-sensitive compositional analysis due to the large stopping power of alpha particles compared to protons. Unlike EDS, RBS allows for the simultaneous analysis of both the stoichiometric makeup and thickness. Semiconducting thin films composed of $\text{AgIn}_{1-x}\text{Ga}_x\text{Se}_2$, CuGa_xSe_2 and $\text{Ag}(\text{InGa})_5\text{Se}_8$ deposited on glass or silicon substrates through a variety of techniques were analyzed. Modeling of some samples was straightforward; however in other samples the modeling was complicated due to various inhomogeneities.

This work was supported by the National Science Foundation under grant no. PHY-0969058 and by the Hope College Division of Natural and Applied Sciences.

Area and Capacitance Characterization of Nickel, Cobalt, and

Many catalysts in energy production, specifically hydrogen and methanol fuel cells, use platinum as an effective catalyst. Platinum used in these fuel cells is uneconomical causing any energy production mechanisms that use platinum to be cost ineffective. There have been many studies with different combinations of platinum with different metals such as nickel, copper, iron, and cobalt to lessen the



PHYSICS

Nickel-Cobalt Electrodeposited Thin Films

Matthew Gira

Mentor: Dr. Jennifer

Hampton

Departments of Physics and Chemistry

amount of platinum needed. However, these studies have relied on platinum being in the thin film electrodes. Through the use of electrodeposition, nickel, cobalt, and nickel-cobalt thin films were created with controlled potential electrolysis without the need of platinum. Characterization of these thin film electrodes were done with cyclic voltammetry and atomic force microscopy. With these methods, the electrochemical area, capacitance, and roughness factor of each thin film electrode were able to be determined. Correlation of these data and the significance of these measurements help to determine the effectiveness that these thin film electrodes could have as catalysts or in other energy applications.

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Compton Scattering Cross Sections in Strong Magnetic Fields: Advances for Neutron Star Applications

Jesse Ickes, Matthew Eiles, Matthew Baring and Zorawar Wadiasingh

Mentor: Dr. Peter Gonthier
Department of Physics

Telescopes including RXTE, INTEGRAL, Suzaku, and *Fermi* have detected steady non-thermal X-ray emission in the 10 - 200 keV band from strongly magnetic neutron stars known as magnetars. Magnetic inverse Compton scattering is believed to be a leading mechanism for the production of this intense X-ray radiation. Generated by electrons possessing ultra-relativistic energies, this leads to attractive simplifications of the magnetic Compton cross section. We recently addressed such a case by developing compact analytic expressions using correct spin-dependent widths acquired through the implementation of Sokolov & Ternov (ST) basis states, focusing specifically on ground state-to-ground state scattering. Such scattering in magnetar magnetospheres can cool electrons down to mildly-relativistic energies. Moreover, soft gamma-ray flaring in magnetars may well involve strong Comptonization in expanding clouds of mildly-relativistic pairs necessitating the development of more general magnetic scattering cross sections, where the incoming photons acquire substantial incident angles relative to the magnetic field of the magnetar in the rest frame of the electron, with the intermediate state being excited to arbitrary Landau levels. Throughout this research, we highlight results from such a generalization using ST formalism. The cross sections treat the plethora of harmonic resonances associated with various cyclotron transitions between Landau states. The Compton cross section is developed for photon polarization dependence and includes the correct spin dependent widths. Comparing correct QED cross section to the traditional nonrelativistic magnetic Thomson cross section, it is apparent that these lead to significantly different results, especially near the resonance peak demonstrating the necessity to develop the correct formalism of the Compton cross section in strong magnetic fields using correct spin-dependent widths of the resonances.

This work is supported by the National Science Foundation (grants AST-1009731 and REU PHY/DMR-1004811), the NASA Astrophysics Theory Program grant NNX09AQ71G, and the Michigan Space Grant Consortium.

Population Studies of Radio and Gamma-ray Normal Pulsars

Andrew Johnson

Mentor: Dr. Peter Gonthier

Department of Physics

Collaborator: Dr. Alice

Harding, NASA Goddard

Space Flight Center

We present the preliminary results of the latest population synthesis of radio and gamma-ray normal pulsars from the Galactic disk. The *Fermi* Second Pulsar Catalogue has provided over eighty gamma-ray normal pulsars that can be used to improve and constrain current emission models. We use a Markov Chain Monte Carlo method to create cumulative distributions of radio and gamma-ray pulsar characteristics to compare to measured distributions. Empirical radio and gamma-ray luminosity models are included that are period and period derivative dependent with freely varying exponents. During the simulation, the period and period derivative exponents as well as the magnitudes of model luminosities are varied to reproduce the number and birth rates of normal pulsars in the Galaxy. The simulation is normalized to the number of radio pulsars detected in ten radio

This work is supported by the National Science Foundation (Grant No. RUI: AST-1009731), the NASA Astrophysics Theory and Fundamental Program (NNX09AQ71G and 12-ATP12-0169), the Michigan Space Grant Consortium, and Hope College Physics Department.

Analysis of ^{13}Be Created by a Charge Exchange Reaction

Braden Marks

Mentor: Dr. Paul DeYoung
Department of Physics

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surveys. Recent studies suggesting the necessity of magnetic field decay have motivated the implementation of a magnetic field decay model, similar in character to the model used in our previous studies. This addition has improved the funnel shape of radio pulsars in the period derivative – period diagram, however none of our changes were able to replicate the group of young high period, high period derivative normal pulsars seen by *Fermi*. The latest model was also able to improve the overall age of *Fermi* gamma-ray pulsars, but the simulated distribution has a wider range over the period than the observed distribution. The enigma remains of not being able to account for both *Fermi* and radio pulsars from the same group of present-day neutron stars with the same birth characteristics. We intend to focus our future effort on addressing this issue.

The traditional way of creating neutron-unbound nuclei involves the removal of one or more nucleons from a fast beam. This method often results in a background that makes it difficult to identify the particle of interest. This process also requires starting with beams that are heavier than the particle of interest, which are unstable, difficult to make, and have low-intensities. To avoid these obstacles, experiments can be done with a more unorthodox entrance channel as was done in the present work. Here, ^{13}Be was produced via a charge exchange reaction. A beam of ^{13}B ions at 75 MeV/u was produced by the cyclotrons and A1900 fragment separator at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University. When this ^{13}B beam hit the 47 mg/cm² ^9Be target many reactions occurred including a charge exchange reaction that made ^{13}Be . The ^{13}Be decayed to $^{12}\text{Be} + n$ in approximately 10⁻²⁰s. The neutrons were detected by either the Modular Neutron Array (MoNA) or Large multi-Institution Scintillator Array (LISA), and the ^{12}Be fragment nuclei's paths were directed by a 4T superconducting sweeper magnet through an array of charged particle detectors. The two four-momentum vectors (for the fragment nucleus and the neutron) are calculated to determine the decay energy of ^{13}Be which will be compared with previous results. The cross-section for the charge exchange process will be calculated from the number of ^{13}Be events.

The Electrodeposition and Dealloying of NiCu Films for Catalytic Methanol Oxidation Activity

Matthew Milliken

Mentor: Dr. Jennifer Hampton
Department of Physics

Catalytic nanostructures have seen a surge of interest in the past decade. With Scanning Electron Microscopy (SEM) and Energy Dispersive x-ray Spectroscopy (EDS), the surface area, topography, and composition of these nanostructures can be characterized. The accessibility of these instruments has generated interest involving the interactive effects of surface topography and catalytic activity of binary alloys. The research conducted involved electrodepositing, dealloying, and characterizing various nickel-copper binary alloys for methanol oxidation applications. By dealloying copper out of the sample through Controlled Potential Electrolysis (CPE), a high-surface nanoporous material was fabricated. Utilizing Cyclic Voltammetry (CV), the oxidation of methanol was analyzed before and after dealloying to determine whether porosity enhanced the catalytic efficiency. These samples were also characterized via SEM/EDS before and after dealloying.

This material is based upon work supported by the National Science Foundation under NSF-RUI Grant No. DMR-1104725 and NSF-MRI Grant No. CHE-0959282.

PHYSICS

Electrodeposition and Dealloying of Nickel-Cobalt Thin Films

Benjamin Peecher

Mentor: Dr. Jennifer

Hampton

Department of Physics

This material is based upon work supported by the National Science Foundation under NSF-REU Grant No. PHY/DMR-1004811, NSF-RUI Grant No. DMR-1104725, and NSF-MRI Grant No. CHE-0959282.

A nanoporous thin film's high surface area allows it to act as a particularly efficient capacitor and gives it enhanced catalytic properties. This project focuses on the electrodeposition and dealloying of nickel-cobalt thin films with the purpose of creating such a nanoporous structure on the surface of the film. Using an electrochemical cell and a three-electrode system nickel-cobalt films of various ratios were deposited onto gold substrates. A scanning electron microscope (SEM) with an energy dispersive x-ray spectroscopy (EDS) attachment was used to observe and characterize each sample's appearances, structures, and compositions. The depositions were remarkably uniform and smooth. The only defining characteristic was a large number of tiny holes measuring fractions of a micron scattered across the surface in varying concentrations. Analysis of the data gathered from the EDS showed that the percentage of cobalt in the film averaged nearly double that in the solution, suggesting that, when the two are deposited together, cobalt deposits at a much higher rate than nickel. Select samples were then dealloyed in the same electrochemical cell. This was achieved by reversing the potential across the electrodes, and, since cobalt re-oxidizes at a lower potential, it should strip off first, leaving behind an especially nanoporous surface. Preliminary results from the EDS suggest that dealloying cobalt from a nickel-cobalt sample is more likely with a higher cobalt to nickel ratio on the film.

Differential PIXE of Multi-layered Auto Paint

Christina Sarosiek

Mentors: Drs. Paul

DeYoung and Graham

Peaslee

Department of Physics and Chemistry

This material is based upon work supported by the National Science Foundation under grant No. PHY-0969058.

Analysis of multi-layered samples can be time-consuming and destructive. Current processes use techniques to separate the paint and chemically dissolve each layer individually. Particle Induced X-ray Emission (PIXE) uses high-energy particle beams created by a particle accelerator to obtain a chemical analysis of a sample without destroying it. As the beam passes through the sample, it emits x-rays of various energies which correspond to different elements. Differential PIXE involves varying the beam energy so that it stops in each of the layers, emitting x-rays from only those layers in which the beam has passed through. With GeoPix, our spectra peak fitting program, we are able to vary the thickness of each layer according to measurements taken from a Scanning Electron Microscope (SEM) to get concentrations of each element in an individual layer. This new technique has been proven to be comprehensive and non-destructive in controlled samples and is proving its worth on weathered, non-controlled samples.



Katelyn Dickerson casing study site at Kitchel Lindquist Hartger Dunes Preserve, 2013.

An Organizational Approach to Platform Fundraising

Ryan Campbell

Mentor: Dr. Jayson Dibble
Department of
Communication

Nonprofit organizations (NPOs) must connect with donors in order to function. The digital age affords many new ways of reaching donors, and these new ways may or may not be preferred over traditional modes of connection (e.g., mailed letters). Thus, the determination of the best means for NPOs to reach their donor bases is critical and worthy of discussion. The current research is a pilot study designed to explore how NPOs utilize social media and other Internet-based platforms to connect, share, inspire, and/or solicit. In-depth interviews will be conducted with employees and administrators of NPOs to learn information regarding the approaches, ideas, mistakes, and observed impacts of various approaches, from the perspective of the NPO. Results will be used to inform NPO practices and direct further research.

Validating the Unidimensional Relationship Closeness Scale Through Behavioral Indicators

Ryan Campbell, Elizabeth Eader and Sarah Schuiling

Mentor: Dr. Jayson Dibble
Department of
Communication

The Unidimensional Relationship Closeness Scale (URCS; Dibble, Levine, & Park, 2012) is a new measure of relationship closeness. The purpose of this study is to provide additional construct validation for the measure by determining whether the scale predicts closeness-related behaviors. For example, closeness and physical proximity are positively related. This study tests the proposition that higher scores on the URCS will correspond with shorter distances between two participants. After completing the URCS, participants will engage in a short dyadic conversation with either a friend or a stranger. The distance between the participants' chairs will be measured. These interactions will be videorecorded, and the videos will be coded for verbal and nonverbal indicators of closeness (e.g., body orientation, eye contact). To the extent that URCS scores predict behavioral indicators of closeness, more confidence can be placed in the measure.

Can People Infer the Valence of a News Message Based on the Delay Before the Sender Shares It?

Ryan Campbell, Elizabeth Eader and Sarah Schuiling

Mentor: Dr. Jayson Dibble
Department of
Communication

At some point in their lives, people find themselves in the position of having to share bad news. Prior research suggests that, compared with good news, people will delay the onset of bad news. Prior research also suggests that this delay might convey information about the news valence (whether the news is good or bad) to the receiver. The current research explores whether receivers of news can infer the valence of the news based on the length of time a sender waits before sharing the news. We begin by testing whether people in general tend to attach valence judgments to delays of varying lengths. Participants will listen to a pre-recorded message of a test-scorer who is in the process of communicating to a test-taker a score on an important exam. The messages will be manipulated to feature either a ten-second or two-second delay before the test results begin to be shared. Participants will judge whether the score about to be shared will be high or low. If people in general tend to associate longer delays with bad news and shorter delays with good news, participants should rate the ten-second delay messages as signaling lower test scores relative to the two-second delay messages.

COMMUNICATION

Facebook: Friend or Foe for Self-Esteem and Happiness?

Ashley Fraley, Gloria Holder and Allison Vanderveld

Mentor: Dr. Deirdre Johnston
Department of Communication

The purpose of this study is to explore Facebook's role in social comparison, including the relationship between social media behavior and self-esteem, and the interaction of social media behavior and self-esteem in individualistic and collectivistic cultures. In a world that puts a high emphasis on connecting through Facebook, it is important to understand the role the site plays on one's self-esteem and social comparison. We hypothesized that Facebook behaviors would be significantly related to Self Esteem and Happiness. We also hypothesized that students from individualistic cultures (USA) would rank lower on Self Esteem and Happiness than university students from collectivistic cultures (Morocco & Other). Internet surveys were administered in English to 90 USA university students, and 29 Moroccan university students. Regardless of culture, students are using Facebook to communicate, compare and connect with one other. The results indicate that students with high SE engage in more PSC and disapprove of NSC. Students with high SE are less like to worry about how others perceive them on Facebook and genuinely portray themselves on Facebook. These findings have important implications for understanding the impact of Facebook on the wellbeing of young adults. By observing the relationship between happiness, self-esteem, and Facebook, we can better understand the implications Facebook has on student's views of themselves, their peers, and their overall happiness.

Cultural Storytelling and Life Satisfaction: Storytelling Practices in American, Japanese, and Slovakian College Students

Sarah Manke

Mentor: Dr. Deirdre Johnson
Department of Communication

Communication through stories and narratives is universal, and current research posits personal stories and gossip make up 65 percent of our daily conversation (Dunbar, 1997). In addition, studies show a connection between storytelling and the creation of strong communities (Carr, 1986; Ball-Rokeach, Kim, and Matei, 2001), and strong communities in turn are known to have a lasting increase on life satisfaction (Meyer, 1992; Haidt, 2006; Diener and Biswas-Diener, 2008). Therefore, the purpose of this study is to explore the relationship between culture, storytelling practices, and life satisfaction. The research for this study came from three countries: Japan, Slovakia, and the United States. Japan and the United States respectively represent high and low context cultures, and Slovakia fits in between the two (Hofstede, 1980). It was expected that lower context cultures would see storytelling as more pertinent to building and maintaining social relationships – thus important to one's happiness – than higher context cultures.

Family Matters: The Impact of Culture on Family Interactions, and of Family Interactions on Peer Relations

Kathryn Acker and Katherine Pitchford

Mentor: Dr. Deirdre Johnston

Interpersonal relationships are inextricably linked to a person's overall sense of well-being (Seligman, 2011). However, previous research has often neglected to examine variance in the quality of communication within these relationships. The purpose of this study is to compare communication patterns of American and Japanese students within their family and peer group, to see if Family Intimacy and Family Cohesion affect Peer Intimacy and Family Cohesion. Japan is traditionally a collectivistic culture, characterized by strong family ties and deep connections between friends, while America is characterized by individualism, an emphasis on personal accomplishment, and looser interpersonal ties. The hypotheses of this study are that (H1) there is a positive correlation between Family Intimacy and Peer Intimacy, and (H2) the quality of these relationships is positively correlated with overall Life Satisfaction. Data was collected via an online survey administered to



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American college students, and a translated survey administered to Japanese university students. The survey results were compiled into three different scales: Cohesion-Intimacy, Conflict Resolution, and overall Life Satisfaction. The last section of the survey measured respondents' level of overall life satisfaction. The results suggest that positive family relationships are important in developing positive peer relationships.

Community Involvement, Culture and Happiness

**Haley Donahue, Christine
Miller and Lydia Wathen**
Mentor: Dr. Deirdre
Johnston
Department of
Communication

Research in positive psychology suggests that relationships and giving are key predictors of happiness across collectivist and individualist cultures (Myers, 1993 & Putnam, 2000), but little research has explored the impact of community involvement on happiness. The purpose of this study is to explore whether community involvement is more predictive of happiness in a collectivist nation (Lebanon), than an individualist nation (United States). The hypotheses of this study are that the level of happiness increases when there is more community involvement, and that community involvement will be a stronger predictor of happiness within the more collectivistic culture. In addition, we explore whether different motivations for community involvement might be differentially effective in increasing happiness. Results demonstrate that there are significant differences between the United States and Lebanon in the levels of participants' happiness, community involvement, motivation for personal development, motivation for relationship development, motivation for volunteering, and enmeshment with community. ANOVA shows the average scores for United States participants are higher on all of these variables. Regression analyses reveal that the motivation for personal development is the best predictor of subjective happiness. The hypothesis that community involvement would be a stronger predictor of happiness in a collectivistic culture was not supported. This study is important because previous research has suggested that community involvement predicts happiness (Putnam, 2000), but it has not examined what motivations for community involvement actually improve happiness, or whether these relationships are consistent across cultures. This study raises new questions regarding previous research that identifies giving and relationships as predictors of happiness, given that in this study, community involvement and volunteering were not the best predictors of happiness. Rather, results revealed that community involvement was not as important to overall happiness as the motivation for why the individual chose to be involved with their respective community.

ECONOMICS, MANAGEMENT, ACCOUNTING

The Impact of Minimum Wage on Unemployment at the State Level Using Fixed Effects

Timothy Bodine

Mentors: Drs. John Lunn,
David Phillips and Todd
Steen

Department of Economics,
Management and
Accounting

This paper discusses the relationship between unemployment and the minimum wage using regression analysis. If the Obama administration increases the minimum wage to \$9.00 in 2015, will the unemployment rate increase? According to beginning economics courses, the answer to this question is yes. Unfortunately, economics is slightly more complicated and this topic has been the source for serious debate among economists for decades. There have been reasonable arguments and numerous studies for support for both sides and the question is still left unsolved. This paper analyzes this relationship between unemployment and minimum wage using several empirical models. They are based off other economists' empirical models and provide different results. I look at the simple relationship between unemployment and minimum wage for the last 12 years at the state level. My data consists of yearly unemployment rates for each state in a given year and inflation adjusted minimum wages for each state in given years. After using different empirical models and running various regressions, I decided the model with a regression that provided statistically significant results and best fit the data is a fixed effects model. At first, explanatory variables seemed to be necessary to control for bias. But the available explanatory variables I used proved to be unnecessary and the fixed effects controlled for omitted variable bias. I have concluded increasing the minimum wage decreases the unemployment rate. This negative correlation is small but shows that a 10 percent increase in minimum wage will result in a 1.52% decrease in unemployment.

The Effect of Public Lands on Property Taxes in Minnesotan Counties

Adriane Burmester

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Department of Economics
Management and
Accounting

About twenty-five percent of Minnesota land is publicly owned, much of it resulting from private owners failing to pay taxes on their landholdings during the Great Depression. There has been a longstanding debate about whether continued public ownership or private ownership would generate a heavier tax burden for county residents. This paper investigates whether or not public land ownership affects the county tax rate by comparing total tax levies with the proportion of publicly owned land in Minnesotan counties. By using a series of linear regressions, I found that public ownership of land did not cause a significant increase or decrease in the tax levies of county inhabitants. While there was no significant correlation between tax levies and the proportion of publicly owned land within a county, the income level and distance away from Minneapolis were found to have a significant impact on the tax levies of Minnesotan counties. While my findings affirm results from previous studies, the complexities of the situation allow for ample future research possibilities.

ECONOMICS, MANAGEMENT, ACCOUNTING

Effective Childrearing of Young School-Aged Children: Evidence from College-Enrolled Mothers

Kaitlyn Chiazza

Mentor: Dr. Sarah Estelle
Department of Economics,
Management and
Accounting

A large amount of research relates a mother's education and child academic achievement, but little has focused on the timing of a mother's college enrollment. Previous research (Estelle 2011) finds significant gains in children's reading scores when a mother is enrolled in college during the child's kindergarten year. The cause of those gains are unknown. This collaborative economic research project focuses on father involvement to determine if the presence of a father figure in the household affects child academic achievement. If so, and if father involvement also increases during a mother's enrollment, we would consider fathers to be an important mechanism of the maternal enrollment benefit for children.

Violent-Crime Rate and House Value in Detroit, Holland, and Jackson, Michigan

Andrew Larson

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

Many different variables help determine the value of a house; including number of bedrooms, bathrooms, square feet of the house, location, etc. This study attempts to determine what, if any, impact the violent crime rate of a city has on the value of houses located within said city. Using a semi-log regression in STATA to analyze the data it is determined that the number of bathrooms, square footage of the house, and percentage of the population affected by violent crime, all significantly affect the list price of each individual house price.

Are Rising Healthcare Costs in Ohio a Direct Result of Increasing Litigation Rates?

Catherine Martin

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

The United States has been at the forefront of the healthcare world for years. With a system that is ever changing, keeping up with the healthcare industry can be difficult. Many argue that recent increases in healthcare cost can be attributed to the recent shift from offensive to defensive medicine. As a major transfer in the way that healthcare is being distributed in the country, defensive medicine takes the patient and their wellbeing out of the forefront of the medical industry, and places fear of malpractice litigations at the center. With increasing costs of litigations becoming a common occurrence in the United States, it is undeniable that the effect plays out in the way doctors deliver care. It is hard to deny that the effectiveness (and therefore the cost) is becoming higher than it used to be. A question that this raises, and one that I will attempt to answer is: does the increase in closed litigations (and therefore defensive medicine) drive up the cost of healthcare in the state of Ohio? The study used the Ohio closed-claim reports from 2005-2011 to analyze and draw conclusions about the litigation rates and healthcare prices in Ohio. Ohio served as the perfect testing ground, as it is internationally known for having two of the top 25 hospitals in our country—each with at least one number-one ranked program. Research suggested that defensive medicine driving up healthcare costs could be the case, but because of the small sample size that was being drawn from, the results were inconclusive. Further studies would be suggested on a national scale to see the effect of litigation behavior on per-capita spending in healthcare.



EDUCATION

An Examination of Teacher Candidates' Beliefs, Assumptions and Attitudes on the Use of Digital Technologies for Writing in Elementary Classroom Settings

Zachary Adams

Mentor: Dr. Tony Donk
Department of Education

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

Innovations in digital technology are currently being incorporated into elementary classrooms. This has sparked discussions about the appropriate use of digital devices, as well as the dispositions of teachers who will incorporate them into their work with children. This study explored the beliefs, attitudes and assumptions that current teacher candidates hold about the use of digital devices for the teaching and learning of writing in kindergarten through fifth grade (K-5). We began with a review of the literature at the intersection of technology, schools, teacher candidates and writing pedagogy. Using an on-line survey of undergraduate teacher candidates, we examined the belief systems that may influence how these candidates will consider the use of technology in their own teaching of writing. Some participants also took part in focus groups to further excavate their thinking. Our initial findings suggest that current teacher candidates fit the technical definition of “digital natives.” From their earliest memories of schooling, they recalled the use of digital devices, thus they experienced “apprenticeships of observation” that were inclusive of technology. Most participants indicated that K-5 students should compose texts using digital devices. Their responses also suggested a “digital immigrant stance” based on this same “apprenticeship.” A majority of participants were limited to desktop computer technology, used primarily for word processing and gaming activities. Technologies currently available in schools were not part of their experience as K-5 students. While participants expressed support for the use of digital devices for composing texts, they frequently indicated a preference for the use of “paper and pencil” for their own future K-5 students. Thus, teacher candidates’ own beliefs, attitudes and assumptions about the use of digital technologies for K-5 writing efforts largely reflect a digital immigrant stance, despite evidence that puts them into the category of digital natives.

Teens and Texts: Exploring the Literary Practices of Church-Going Teens

Megan Ahlquist and Sara Sanchez

Mentor: Dr. Deborah Van Duinen
Department of Education

The purpose of this Phase 1 study was to explore adolescents’ faith-related literacy practices and thus build on a growing field of research on adolescents’ religious experiences (Smith and Denton, 2003; Dean, 2010). To collect data, we designed an online survey consisting of both qualitative and quantitative questions. The 37 participants, two-thirds of them female, were recruited from youth groups in and around a small midwestern town. 91% of the respondents reported that they attended youth group on a weekly basis. As a whole, we discovered that most adolescents seem to identify more with the relational aspect of their faith than they do with traditional religious literacy practices such as reading a Bible and devotionals on a regular basis. Faith-related literacy practices, for the teens we surveyed, seemed to be mostly social in purpose, function, and motivation.

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

CASA Tutors' Perceptions of an After School Academic Program

MacKenzie Brady and Alexandria Klomparens

Mentor: Dr. Jane Finn
Department of Education:
Special Education

The purpose of this research was to determine how Children's After School Achievement (CASA) tutors perceived the quality and effectiveness of the CASA program. CASA is collaboration between Hope College and area elementary schools in Holland, Michigan that focuses on assisting at-risk school-age students by providing free after-school tutoring. CASA tutors are undergraduates attending Hope College who are paired with at-risk students to work on reading, math, school assigned homework, as well as life skills. Mixed methods were used to evaluate the tutors' perceptions, and this paper will focus on the quantitative measures. One hundred and nine tutors completed a survey containing 14 questions regarding interactions with CASA students along with assessment of the program. Data analysis using a one-sample t-test revealed that CASA tutors believed the CASA program built positive relationships, students wanted to read and spend time on homework with the tutor, and that this program met the tutor's expectations. However, results showed that many believed that the life skills components of the program were not as positively received by students compared to other aspects of the program. A two-way contingency table analysis also revealed that tutors who participated in CASA for college credit benefited more than tutors who did not receive credit. Females enjoyed tutoring to a greater degree, while also recommending the CASA program to a greater degree than males.

Tutor Perceptions of Their Participation In the CASA Program: Qualitative Data Analysis

Megan Farwell

Mentor: Dr. Patricia Griffin
Department of Education

The present study collected survey data about tutors' perceptions of their participation in the CASA program. Leaders in the Children's After School Achievement (CASA) program sought data to inform and facilitate program improvement. The CASA program provides free after-school tutoring and other programs to benefit school-age, at-risk children. The CASA tutors provide tutoring services voluntarily, without pay. Nearly all of the CASA tutors are students enrolled in the local undergraduate college. Data collection was accomplished through the administration of an anonymous survey, created with input from CASA supervisors. The survey collected both quantitative and qualitative data. This report focuses on the qualitative data analysis, drawn from brief participant responses to ten open-ended questions that followed up initial responses, rated by participants using a Likert scale. Preliminary data analysis was focused by question and analyzed across all respondents to identify consistencies and differences. Major themes included that CASA tutors found benefits for themselves and the CASA students. Tutor benefits included personal growth and enjoyment, relationships with students and improved knowledge and skills for future career and educational endeavors. Student benefits included relationships with tutors and peers, enjoyable interactions and improved behavior, academic achievement, ability to focus and desire to learn. CASA tutors also identified challenges to program participation including the twice-weekly time commitment, concerns about their effectiveness in working with students and frustration with student's sporadic attendance. Tutors also recommended shortening, revising and differentiating the current *Life Skills* content of the CASA Program to better meet student's needs and interests.

EDUCATION

Ready For Life Mentors' Perception of a Special Education Inclusion Program

Alyssa Hillman and Kaitlin Cress

Mentor: Dr. Jane Finn
Department of Education:
Special Education

Ready for Life is a program designed to provide opportunities for academic, social, and transitional experiences to students with developmental disabilities in higher education that otherwise might not be obtainable. A three-part research project has been initiated that discovers the perceptions of this unique program from the perspective of (a) Hope College student tutors, (b) Ready for Life participants, and (c) Hope College professors. This particular qualitative study reports on the Hope College volunteer tutors discernment of this program that focuses on responsibility of the Hope College tutors, time spent in the program, activities performed, and attitudes of these volunteers.



Ready For Life tutors, 2013-2014

Back row from left: Ree Desai, Skye Inniss, Carley Hall, and Mary Kelso.

Front row from left: Liz Mummeret, Anna Beilfuss, and Kurt Cunningham.

Thinking Twice: Redefining the Collaborative Relationship Between K-12 Schools, Teacher Preparation Programs, Student Teachers, and the New Teacher Evaluation System

Collin McGran and Aubrey Holzinger

Mentors: Drs. Kimberly
Arsenault and Laura Pardo
Department of Education

According to Michigan State legislation, student growth and assessment data will comprise a percentage of the annual teacher evaluation beginning with 25% in the 2013-2014 school year and increasing to 50% by the 2015-2016 school year. Due to these changes in the teacher evaluation system in Michigan, teachers and administrators are increasingly concerned about how to show quantifiable evidence of student growth. This study explored the potential and perceived impact the new teacher evaluation system may have on Michigan teachers. It also investigated a correlating impact on teacher willingness to mentor a student teacher completing their pre-service training in a teacher preparation program. Through the analysis of surveys completed by 172 K-12 local teachers in multiple West Michigan schools, as well as a follow-up survey completed by 108 teachers in the same sample, trends in reactions and implications emerged. Coding revealed fragmented understanding of the new teacher evaluation system among those surveyed, possibly indicating varied levels in the implementation of the state legislation. Second, although many teachers expressed willingness to give back to the teaching community by mentoring a pre-service teacher, they voiced hesitancy to transfer control of content delivery and student growth completely to a student teacher. The findings of this study suggest that further research is needed to explore alternative mentor-teacher/student-teacher relationships in response to the challenges posed by the new teacher evaluation system.

The Validity of VO₂max Testing Modalities in Running, Cycling and Swimming Populations

**Dana Almaraz, Michael
Fries and Kaylee Kiogima**
Mentor: Professor Kyle
Morrison
Department of Kinesiology

While it is generally accepted that the treadmill and cycle ergometer are valid modalities of testing maximal oxygen uptake (VO₂max) in athletes, the reasoning behind this assumption is largely unknown. Numerous studies have shown significant differences in VO₂max between various athletic populations due to the demands of their sport and training habits. As a result of these variances, the question has been raised as to how valid testing results are for different modalities in various athletic populations. Therefore, the purpose of the research project will be to determine the validity of two VO₂max testing modalities (treadmill and cycle ergometer) in swimming, running, and cycling populations. The main question this project aims to answer is which modality will provide a better measure of VO₂max for swimmers based on the differences between a whole body workout (treadmill) and a region specific workout (cycling). Fifteen healthy, untrained, college-aged participants with experience in running, cycling or swimming took part in the study. Participants were randomized and completed two VO₂max tests (treadmill and cycle ergometer) on separate occasions. Results from individual participants testing will be analyzed to determine differences between modalities. Participants will be grouped by history of running, cycling or swimming and then results will be analyzed to determine significant differences between groups. Results from testing are forthcoming.

The Effects of Caffeine Supplementation on Endurance Performance and Heart Rate in the Non-Athlete

**Jourdin Barkman, Rebekah
Blasen, Lauren Kooy and
Rachel Rebhan**
Mentor: Dr. Maureen Dunn
Department of Kinesiology

Caffeine is one of the most commonly ingested supplements, as it is found in many drinks including coffee, tea, soda, and foods containing cocoa. Previous research indicates that caffeine may act as an ergogenic aid, meaning that it is a supplement that may enhance athletic performance, stamina, or recovery. However, the majority of prior studies have investigated the effects of caffeine on athletes; limited attention has been given to these potential effects in the sedentary population. Therefore, the purpose of this study was to test the effect of caffeine supplementation on exercise endurance and heart rate during running in the non-athlete. A non-athlete was considered to be a person who exercises less than 150 minutes per week. All subjects participated in three trials: a familiarization trial and two experimental trials. Each trial consisted of a fifteen minute run, during which participants were asked to run at maximum effort to complete as many laps of the indoor track as possible. Heart rate was assessed manually and through heart rate monitors before, during, and after each run. Participants were asked to rate exertion using a Rate of Perceived Exertion (RPE) scale at five-minute increments throughout each trial. One hour prior to each experimental trial, participants were administered either five mg/kg body weight of caffeine or a placebo using a double-blind procedure. Participants who received the caffeine in the first trial were then given the placebo for the second trial and vice versa. This study is ongoing, and results will be presented at the Hope College Research Celebration. If caffeine is shown to enhance performance in the non-athlete, this may suggest that caffeine should become a viable supplement to increase the frequency and duration of physical activity in this population.



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The Effect of High Intensity Training on Cardiovascular Endurance and Body Composition in Non-Athlete College Women

**Kimberly Boerigter,
Micaela Brillinger,
Rachelle Havenaar and
Tara Schoemaker**
Mentor: Professor Kyle
Morrison
Department of Kinesiology

Common forms of aerobic exercise consisted of running, swimming, or biking through the mid-1970s; however, aerobic-style workout videos become popular toward the end of that decade. Within the last decade, cross training and interval training have taken hold as popular exercise methods for athletes and non-athletes alike. Previous studies have demonstrated improved VO₂max (aerobic fitness) values via high-intensity interval training interventions within as little as two weeks. Recently, many DVD-based high-intensity exercise training (HIET) programs have been released. One such program, P90X3, claims an average fat loss of 34% following program completion (90 days), yet no study to date has actually tested this or any other claims the exercise program has made. This study will determine how P90X3, a high-intensity training program, may affect lactate production, VO₂ max, and body composition in non-athlete college women who use the program three times per week for four weeks. Twenty healthy, female college undergrads took part in the study; none of the participants were competitive athletes. Each participant took part in baseline testing which included assessment of height, weight, waist and hip circumference, body composition using the BodPod, VO₂max, and maximal lactate production. During the intervention phase all participants will complete three 30-minute workout sessions per week for four weeks. However, ten participants will be in the control group completing standard aerobic exercise with resistance training and ten will be in the P90X3 experimental group. These groups were randomly selected based on baseline VO₂max values. Each participant will complete post-testing to assess the effectiveness of the P90X3 program in comparison to the control-group program. Results from the intervention are forthcoming.

Distal Radial Fractures

Austin Brown
Mentor: Dr. Kirk Brumels
Department of Kinesiology

The distal radius is the most common fracture site in the upper extremity. Because the distal end of the radius comprises roughly 80% of the articular surface of the wrist, proper diagnosis and treatment of distal radial fractures is essential in order to maintain proper function. Unfortunately, there is very little high-level evidence available for practitioners in current literature to guide treatment. Due to the intricacy of the involved structures, the variation of fracture classification models, and the lack of high-level evidence from research, there is a high potential for mismanagement. The purpose of this project was to present a case study of a distal radial fracture and use it to evaluate different fracture classification models, overview the diagnostic process, and outline treatment options and prognosis of those treatments in order to guide future clinical practice.

A Study of Effectiveness of a Five-Week Wii Fit Yoga Training Program on Flexibility and Balance in College-Aged Females.

Jessica Christie, Shawn Jackson and Jocelyn Sloan
Mentor: Dr. Maureen Dunn
Department of Kinesiology

This study was designed to determine if five weeks of Wii Fit Yoga training would result in significant improvements in flexibility and balance. It was hypothesized that Wii Fit Yoga training (WII, n=8), which required the completion of 12 yoga poses (30 minutes) on each of three days per week for five weeks would result in greater improvements in flexibility and balance than no training (CON, n=7). All participants were assessed for flexibility and static balance before and after the five-week program. Following training, both groups improved in the following measures: sit and reach flexibility (pre: 39.77 ± 2.35 cm, post: 42.34 ± 1.98 cm, $p=.014$), left hip extension (pre: $32.63 \pm 2.56^\circ$, post: $38.36 \pm 2.5^\circ$, $p=.018$), left shoulder extension (pre: $54.34 \pm 3.4^\circ$, post: $60.85 \pm 3.23^\circ$, $p=.005$), and balance as assessed by center of pressure path length during quiet standing on two feet with eyes open (pre: 46.98 ± 2.65 cm, post: 47.0 ± 2.48 cm, $p=.014$). The only measurement that resulted in a greater improvement in the WII group (pre: 177.5 ± 0.98 , post: $179.25 \pm 1.00^\circ$), compared to CON (pre: 180.0 ± 1.05 , post: $179.29 \pm 1.07^\circ$) following the training period was left shoulder flexion ($p=0.012$). Therefore, Wii Fit Yoga training was not shown to improve balance or flexibility (with the exception of right shoulder flexion) compared to no training. For future research, it may be beneficial to better familiarize the participants with the assessment procedures to minimize learning effects, and to have the study last longer than five weeks.

A Humeral Head Stress Fracture in a Young Active Female

Cara Conrad
Mentor: Dr. Kirk Brumels
Department of Kinesiology

Stress fractures are a relatively common injury among athletes, most often affecting the lower extremity region, such as the tibia and metatarsals. Stress fractures in the thoracic and upper extremity are less common. They are often found within a specific sports population that requires more stress on the upper extremity. The case study of a twenty-one-year-old female gymnastics coach, who was diagnosed with a humeral head stress fracture, is an example of this atypical stress fracture site. This presentation discusses general causes of stress fractures, various diagnostic methods used to identify a stress fracture, and this specific individual's road to diagnosis and a four month recovery.

Effects of Kinesiology Taping on Static and Dynamic Ankle Balance in Individuals Aged 18-22

Tyler Cronin
Mentor: Dr. Kirk Brumels
Department of Kinesiology

Ankle-taping techniques are the primary means for preventing injury in athletes. In recent years, kinesiology tape, (including but not limited to Kinesio™ tape, Cramer Sports Motion Tape, KT tape etc.) has grown in popularity, offering a variety of alleged therapeutic benefits unmatched by traditional white tape. These tapes, which are comprised of elastic material enabling it to be stretched to as much as 140% of its original length, provide similar therapeutic benefits which may include: assisting weakened muscles by correcting their action, improving circulation by lifting the skin from the fascia allowing the muscle to "pump" debris from the injured area, decreasing pain, relieving unwanted tension that is ever present in unstable joints (Hettle, Kase et al). It has also been suggested that the presence of this tape on the skin can elicit stimulation of mechanoreceptors, causing an increase in joint proprioception as a result (Murray and Husk). The purpose of this study was to determine the efficacy of KinesioTape based products, namely Cramer Sports Motion Tape, on static and dynamic balance of the ankle joint.



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Recognition and Management of Lisfranc Midfoot Injuries

Tyler Cronin

Mentor: Dr. Kirk Brumels
Department of Kinesiology

Although encompassing a very small area of bony and ligamentous anatomy, Lisfranc injuries can be very detrimental to those who experience them. These injuries often vary from simple Grade I sprains to more serious fracture-dislocations, and given the fact that they are not commonly seen by medical professionals, there is a high risk for misdiagnosis and mismanagement. Practitioners should be cognizant of the mechanisms contributing to these injuries, as well as the associated signs and symptoms that may appear during a clinical examination. The purpose of this case study on Lisfranc pathologies is to ensure that all medical professionals are aware of the main symptoms and chief complaints exhibited by patients, to outline proper diagnostic techniques, as well as proper management strategies to facilitate appropriate clinical practice.

Management Techniques for Patellofemoral Pathologies

Joshua Driesenga

Mentor: Dr. Kirk Brumels
Department of Kinesiology

Patellofemoral pain is the syndrome that is the most common cause of anterior knee pain. Patellofemoral pathologies are injuries to the patellofemoral articular surface which can be chronic or acute in nature. These pathologies are a result of overuse, malalignment, structural inefficiency, or trauma. In order to differentiate between these pathologies there are multiple special tests that can be done. History of what the patient has been experiencing day to day is also very important during the differentiating process. Most physicians will suggest conservative treatment before going through the different surgical options. The object of this presentation is to explain various patellofemoral pathologies, understand the importance of getting a thorough history, discuss conservative treatment options, and discuss surgical techniques.

Knee Internal Derangement in a 19-Year-Old Collegiate Football Player: A Case Study

Colin Drinkard

Mentors: Dr. Kirk Brumels
and Professor Timothy
Koberna
Department of Kinesiology

Football is comprised of intense, high-velocity movements that result in relatively high injury rates at all levels of athletics. Knowledge of how to adequately prevent, evaluate, treat, and rehabilitate sports related injuries is imperative for medical professionals, especially athletic trainers. Specifically, knee internal derangement is a common set of pathologies in football athletes; the structures involved mainly include ligamentous and cartilaginous structures. In our case, a 19-year-old collegiate football player experienced a Grade-III PCL sprain, Grade-I MCL sprain, tear of the posterior horn of the medial meniscus, and a lateral tibial plateau fracture with accompanying traumatic synovitis, all in response to a hyperextension mechanism. Internal knee derangement is commonly associated with a hyperextension mechanism; however, the specific combination of structures involved in this case is quite unique, allowing for in depth discussion on the intricacies of knee anatomy and biomechanics as discussed in peer reviewed research. Further, our case's specific combination of pathologies complicates the injury evaluation, treatment, and rehabilitation phases of care. This case highlights the role of athletic trainers in diagnosis and how to adequately prioritize care for an athlete suffering from multiple concurrent pathologies; each varying in their severity, ability to heal through natural processes, and timeline for return to play. Through applying the principles and take home points of this case, medical professionals may further prevent, evaluate, treat, and rehabilitate sports related injuries.

The Effects of Post-Activation Potentiation on Vertical Jump and EMG in Collegiate Football Players

Adam Drooger, Laurel Mattice and Brandon Robinson

Mentors: Professor Kyle Morrison

Department of Kinesiology

Post-activation potentiation is the notion that power in an athlete will be increased for a period of time after a near-maximal lift. Such increases in power can provide an athlete with improved performance. This study was designed to determine if performing a near-maximal squat improved an athlete's vertical jump and increased electrical activity in the rectus femoris. 17 collegiate football players performed baseline testing which included: vertical jump (VJ) with assessment of muscular electrical activity using electromyography (EMG) followed by determination of back squat one repetition maximum (1RM) weight. Participants were then randomly assigned to perform either their 3RM or 5RM back squat prior to VJ testing the next week. These maxes were calculated based on their 1RM. Following completion of their 3RM or 5RM, participants would passively rest for four minutes before performing their first VJ. Each participant was allowed three trials to accomplish their highest jump. The participant would then passively rest for another four minutes and jump again at eight minutes post-squat. During the final testing session participants completed the other remaining squatting protocol (3RM or 5RM) that they had not yet completed prior to VJ testing. It was hypothesized that both 3RM and 5RM would improve the participants' VJ and increase electrical activity in the rectus femoris compared to baseline. Further, it was hypothesized that the 3RM would improve performance the most. Results of the study are forthcoming.

Effects of a Four-Week Stand Up Paddleboard Program on Static Balance in College Students

Austin Elling, Joshua Kranz, Anna Leikert and Thomas Tresh

Mentor: Dr. Maureen Dunn
Department of Kinesiology

Stand Up Paddleboarding (SUP) is a new sport that requires balancing on a 12-14 foot board while paddling in a river, lake, or pond. SUP involves a great amount of balance in order to stay upright on the board and in the proper position to paddle. Previous research has suggested that SUP may enhance balance, but a training study has not yet been conducted. Therefore, the purpose of this study was to examine the training effects of SUP on static balance in college-age individuals. Twenty-four college students were assessed for static balance using both a force plate and a HUMAC balance board. Tests were done on dominant single-leg static balance with eyes open for 30 seconds, eyes closed for 10 seconds, and two-legged on a bosu ball for 30 seconds. Participants were matched for both gender and height, and then divided into two groups of twelve. The participants in the experimental group met three times per week for a four-week period to paddleboard in the Dow pool at Hope College. Paddleboard training occurred for 15-20 minutes each session, for a total of twelve sessions over the four-week period. The control group maintained habitual activity. It was hypothesized that the experimental group would experience improvements in static balance over the control group. Significant results would allow SUP to be recommended as an effective mode for improving balance in this population. This study is ongoing, and results will be available during the poster celebration.



Participants of the stand-up paddleboarding experiment, 2014.

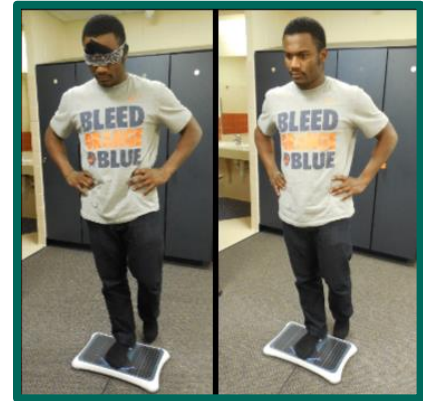
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The Effect of a Four-Week HUMAC Balance Training Program on Unilateral Static Balance Among Recreationally Active College Students

Keenan Erickson, Michael Harper, Jessica Kohlhoff and Acacia Nevenzel

Mentor: Dr. Maureen Dunn
Department of Kinesiology

Exergaming balance boards may have potential for improving balance in orthopedic and neurological patients. Examples are the Nintendo Wii Balance Board and Wii Fit software, which include balance training opportunities for the consumer. This study was designed to determine the effect of a four-week HUMAC Balance Board training program, three times per week, for 30 minutes per session on static balance in recreational college students (experimental, $n=9$). It was hypothesized that training with the HUMAC Balance System would significantly improve unilateral static balance compared to a control group ($n=8$). Following training, no significant differences were seen between groups in stability scores obtained during 30 seconds of quiet unilateral standing with eyes open (experimental, pre: $91.7 \pm 2.7\%$, post: $91.2 \pm 3.2\%$; control, pre: $91.0 \pm 2.6\%$, post: $91.7 \pm 2.5\%$; $p = .614$) or eyes closed (experimental, pre: $80.1 \pm 5.5\%$, post: $77.4 \pm 6.7\%$; control, pre: $79.8 \pm 3.7\%$, post: $83.5 \pm 3.0\%$; $p = .058$). Center of pressure path lengths during quiet standing were also not different between groups following training with eyes open (experimental, pre: 36.4 ± 4.9 , post: 36.9 ± 4.4 ; control, pre: 36.5 ± 9.3 , post: 36.0 ± 7.7 ; $p = .631$) or eyes closed (experimental, pre: 87.8 ± 25.5 , post: 93.3 ± 37.4 ; control, pre: 83.6 ± 21.3 , post: 75.1 ± 13.8 , $p = .193$). Conducting unilateral pre- and post-testing balance assessment with a bilateral training program was considered a major limitation in our results and should be taken into account for future studies.



Unilateral Pre/post Testing With and Without a Blindfold



Bilateral Video-game Balance Training

The Effect of Four Weeks of "Fat Gripz" Training on Grip Strength in Male Collegiate Athletes

Nicholas Heyboer, Christian Leathley and Matthew VanZytveld

Resistance training is one of the most important aspects for athletic improvement in every level of athlete. With respect to resistance training, there has been much controversy regarding the effectiveness of different training techniques. Collegiate athletes often have limited time for resistance training. To be successful, athletic programs must maximize effectiveness with the short amount of time available. This study aims to compare the effects of four weeks of pull-up training using Fat Gripz vs. standard Olympic bar training in male collegiate athletes. Fat Gripz are removable rubberized bar attachments that increase the standard Olympic bar to over double its thickness. The purpose of this study is to determine whether forearm grip strength and/or upper-body functional strength will differ with training between

Mentor: Dr. Maureen Dunn
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groups. Each group will perform three sets of pull-ups, three times a week, for four weeks. Each set of pull-ups will be completed to failure with a two minute rest between sets. For both pre and post training measurements, a hand dynamometer will be used to measure grip strength and a one rep-max lat pull down will be used to assess upper body functional strength. We hypothesize that there will be a greater increase in both forearm grip strength and one rep-max lat pull down in the Fat Gripz group compared to the standard group. If the results show greater strength gains for the Fat Gripz group then this training can be recommended to improve performance in athletes

Road to Recovery: A Case Study on Lower Back Pain

Riley Hoernschemeyer
Mentors: Dr. Kirk Brumels
and Professor Margaret
Frens
Department of Kinesiology

A significant percentage of the United States population experience or will experience lower back pain within their life. Symptoms can originate from several different pathologies and/or circumstances resulting in a debilitated lifestyle. Many of the people living with pain associated with the lower back are not found within youthful Americans. In this case study, we trace the journey of a 21-year-old collegiate non-athlete across a variety of medical consultations in pursuit of answers to her severe lower back pain. Over a 15-month span, the patient investigated multiple different treatment options and medical opinions in an attempt to decrease the pain she was experiencing in order to return to activities of daily living. Unfortunately no conservative treatment plan produced a resolution in her symptoms and the patient entertained surgical options. Through much consideration, our patient decided to proceed with an Anterior Lumbar Interbody Fusion (ALIF) procedure. This presentation will provide an explanation of the anatomy associated with various common lumbar spine pathologies, as well as an in-depth description of the ALIF procedure.

“It’s Just a Bruise...Right?” Identification, Management, and Treatment of Osseous Contusions

Alexandra Hoyt
Mentors: Dr. Kirk Brumels
and Professor Margaret
Frens
Department of Kinesiology

An osseous contusion, more commonly known as a bone bruise, is caused by a macro-trauma or multiple micro-traumas to the bone. Bone bruises often accompany soft tissue damage associated with joint injury and therefore go unnoticed and untreated since the primary concern is the soft tissue damage. Complications can occur when treatment for the soft tissue injury is ineffective due to the undetected bone bruise. The gold standard test to identify a bone bruise is an MRI, and after one is obtained, there is a better understanding of steps to take in order to treat the entire injury. Bone is highly vascularized and the spongy/trabecular bone is the damaged structure. Subperiosteal hematoma, interosseous bruise, and subchondral bruise are the three different types of bone bruises which differ by the location of the hematoma. Recovery can take anywhere between four months and one year, and pain is often present for the majority of the healing process; this is longer than the recovery time of most soft tissue injuries. Bone bruises commonly occur during an ACL reconstruction, but are not included in the protocol for rehabilitation. Through awareness of osseous contusions, practitioners can have a better understanding of a patient’s pain and necessary recovery time. In this study, a specific case of an osseous contusion is examined and used as an example to present the identification process, treatment options, and management decisions.

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Compression Garments and Performance

Daniel Hursh, Jesse Richards and Michael Rosso

Mentor: Dr. Kevin Cole
Department of Kinesiology

This study assessed Under Armour's (UA) claim of increased power output and decreased rate of fatigue while wearing their long compression shorts, compared to off brand compression shorts and no compression shorts. The study was made up of male participants ($n=12$) who are recreationally active and formerly varsity athletes between 18 and 22 years of age. Peak power was assessed through a vertical jump test and rate of fatigue was assessed through three repeated sprints with 30 seconds of recovery between each bout. Participants were randomly assigned to one of three groups, each group underwent three different conditions (1=UA, 2=Placebo, 3=no compression [NO]). Each group underwent a different condition every testing day. They were tested once per week for three weeks with an added familiarization week at the beginning. It was hypothesized that UA will significantly decrease rate of fatigue and increase peak power. By running a univariate test peak power(UA= 5494.55 ± 512 , Placebo= 5493.23 ± 595 , NO= 5495.99 ± 591 , $p=.998$), duration of the third sprint(UA= 34.99 ± 2.91 , Placebo= 36.36 ± 2.62 , NO= 36.81 ± 3.87 , $p=.101$), and the difference between sprint three and sprint one(UA= 3.49 ± 1.79 , Placebo= 5.29 ± 2.75 , NO= 5.00 ± 3.62 , $p=.181$). While total sprint time was significant between the three groups (UA= 100.87 ± 5.03 , Placebo= 101.23 ± 4.57 , NO= 103.76 ± 6.99 , $p=.047$). There is a trend that long compression shorts decrease rate of fatigue which could lead to an increase in sport performance.

Effects of a Six-Week Static Stretching Program on 40-yard Dash Time, Power, and Flexibility in Collegiate Level Lacrosse Players

Emmanuel Pagkanlungan, Sutton Williams, Michael Schofield, Courtney Earles and Patrick Bloemendaal

Mentor: Dr. Kevin Cole
Department of Kinesiology

Static stretching routines may have the potential to increase power, flexibility, and speed. Therefore the purpose of this study is to determine whether or not performing static stretching over a six-week period will improve 40-yard dash time, vertical jump height, and range of motion in lower extremities for collegiate men's lacrosse players. To test for this relationship, this study implemented a six-week static stretching routine for male collegiate lacrosse players. Participants in the experimental group were instructed to perform a lower-leg stretching protocol three times a week while the control group did not participate in any stretching. Speed was assessed via a 40-yard dash, power was assessed via a vertical-jump test, and flexibility assessed via a sit and reach test and joint flexibility via goniometer measurements. It was hypothesized that improved power, flexibility, and speed would be seen in the experimental group (six-week static stretching routine) compared to the control group (no stretch). Following the six-week experimental condition treatment, no significant results were found between the two groups. Main effects were found in the vertical jump ($p=0.052$, pre: 25.5 ± 2.7 , post: 24.6 ± 2.9) and the 40-yard dash ($p=0.000$, pre: $5.20 \pm .29$, post: $5.31 \pm .26$). Sit-and-reach showed marginally significant results with an increase in flexibility for the experimental group and a decrease in flexibility in the control group. These results demonstrated the benefit to flexibility a longitudinal static stretching routine has as well as demonstrated that longitudinal static stretching does not improve performance on high power activities.

The Effect of Music Tempo on Cycling Performance in Female College Students

Studies have demonstrated that fast tempo music improves performance on the treadmill, however there is a lack of research on this topic using cycle ergometers. This study was designed to determine the effects of music tempo on cycling performance. Participants ($n=12$) were recruited through word of mouth and completed a maximal oxygen consumption test (VO_2 max) on a cycle ergometer. VO_2 max results were used to determine resistance for the following trials using 65% of the power output, which was converted to kiloponds. Subjects

Julie Beaumont, Maggie Deaton, Megan Schowalter and Kali Van Dyk

Mentor: Dr. Kevin Cole
Department of Kinesiology

then completed a familiarization trial that was eighteen minutes including a three-minute warm up. Subjects were told to cover as much distance as possible in the allotted time. The participants completed one trial each week for three weeks, each trial was eighteen minutes including a three-minute warm up, with either fast music (FM), slow music (SM) or no music (NM) playing. Every three minutes throughout the trials heart rate (HR), distance covered, and rate of perceived exertion (RPE) were measured. It was hypothesized that the FM would yield the best performance (the most distance covered). There was no significant difference in distance covered ($p=0.431$) or HR ($p=0.180$) at the end of the trials, however SM yielded a significantly lower RPE than FM or NM ($p=0.015$). The average distance covered in NM was $8.01\text{km}\pm 1.43$, SM $8.28\text{km}\pm 1.54$, FM $8.33\text{km}\pm 1.38$. The average HR in NM was $172.5\text{bpm}\pm 19.45$, SM $169.58\text{bpm}\pm 19.08$, FM $159.75\text{bpm}\pm 21.77$. The average RPE at the end of the trial in NM was 15.33 ± 1.68 , SM 14.67 ± 1.61 , FM 16 ± 1.68 . It was concluded that slow music resulted in a lower perception of effort when covering a similar distance compared to no music or fast music.



Jaclyn Van Dyk performing a maximal oxygen consumption test administered by Megan Schowalter.

Hitting the High Notes: The Effects of Expiratory Muscle Strength Training on Lung Function and Musical Performance in Collegiate Wind Instrumentalists

Miranda Orlando, Megan Skinner, Julia Slesinski, Jessica St. Clair and Natalie Woodberry

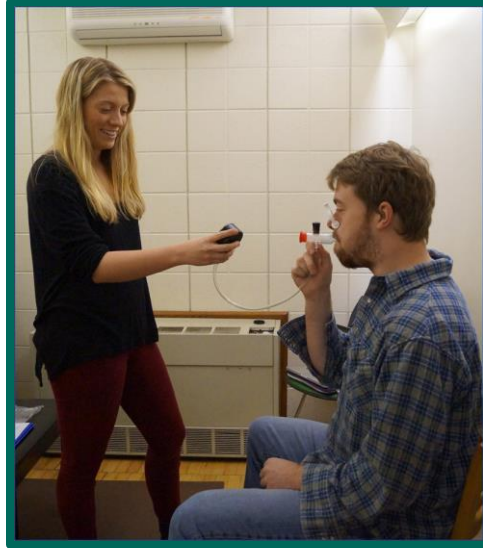
Mentor: Dr. Maureen Dunn
Department of Kinesiology

Expiratory muscle strength training (EMST) has been associated with increased maximum expiratory pressure (MEP). Since wind instrumentalists depend on sufficient pressure production for optimal musical performance, it is possible that EMST might improve musical performance in this population. Therefore, the purpose of this study was to determine if four weeks of EMST would improve instrumental performance in relation to MEP in college-level wind instrumentalists. All participants (9 females, 10 males) were pre-tested on lung capacity, including measures of MEP (inH_2O), as well as musical performance measures related to loudness (dB) and duration (sec) of the play for the maximum pitch on their instrument. A performance score ($\text{dB}\cdot\text{sec}$) was calculated by multiplying the longest duration trial (sec) by the corresponding loudness (dB). Following pre-testing, participants were divided into groups matched by gender, instrument and MEP. The experimental group ($n=12$) trained four times per week for four weeks at 75% MEP which was reassessed each week. After four weeks, all participants were post-tested. MEP increased significantly in the training group (pre: 49.50 ± 14.41 ; post: 83.17 ± 22.47 inH_2O) compared to control (pre: 50.29 ± 7.76 ; post: 53.14 ± 11.89 inH_2O , $p<.001$). There were no significant musical performance improvements following training, but the performance scores for the high-pitch/high-loudness note showed a slight trend for improvement in the experimental group (pre: 1618.17 ± 270.5 $\text{dB}\cdot\text{sec}$; post: 1824.75 ± 294.82 $\text{dB}\cdot\text{sec}$) compared to the control group (pre: 2304.43 ± 354.17 $\text{dB}\cdot\text{sec}$; post: 2103.86 ± 386.01 $\text{dB}\cdot\text{sec}$, $p=.280$). Although no performance results were statistically significant, improvements were practically significant, indicating that EMST may be a viable option for performance

This research was supported by a private grant from Drs. Paul and Kathleen Davenport.

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improvement. Future research is needed to determine how EMST might affect performance characteristics in specific instruments, as well as other ways for musicians to improve and measure performance.



*Maximal expiratory pressure testing.
Jessica St. Clair, Evan Chalmers.*

Long Thoracic Nerve Palsy in a 21-year-old, Collegiate Softball Player: A Case Study

Rachel Slotman

Mentors: Dr. Kirk Brumels
and Professor Margaret
Frens

Department of Kinesiology

Long Thoracic Nerve Palsy is a unique condition amongst athletes that negatively affects normal shoulder motion and function. The long thoracic nerve innervates the serratus anterior muscle, which functions to keep the scapula positioned against the thorax during scapular movement. If the function of the long thoracic nerve is compromised, such as in long thoracic nerve palsy, scapular winging and decreased range of motion will be present. In general, nerve palsy tends to recover on its own three to six months after the injury with a treatment and rehabilitation program. This case is unique because the typical signs were masked by symptoms of other possible injuries which confounded the assessment process. During the assessment period, the athlete performed a rehabilitation program that mimicked that of a long thoracic nerve palsy program, but she did not increase in function due to the injured nerve. Also, the nerve did not recover until eight months after the injury. Once the nerve recovers and neural impulses to the serratus anterior resume, a continued strengthening program should be maintained to facilitate full function of the serratus anterior allowing normal resumption of activities during daily living and athletics. Patience is imperative when nerves are injured. It takes time for the injury to present itself, for it to heal, and for the athlete to regain strength.

A Study of the Relationship Between Community Factors and Childhood Obesity in the United States

Caitlin Schwark
Department of Political
Science

*This research was supported by
the Earhart Foundation –
Emerging Scholar Program.*

Childhood obesity is a serious medical condition which puts the child on a path towards serious health problems. Obesity is defined as having a Body Mass Index (BMI) at or above the 95th percentile for the child's age and sex. This study seeks to answer the question of which community factors, at the state level, are correlated with the prevalence of childhood obesity. The research looks at multiple factors, such as unemployment rates, education statistics, and health care availability to determine which can be associated with childhood obesity. The data utilizes a most-different case study. States were chosen for the study based on the prevalence of childhood (ages 10-17) obesity. The eight states with the highest and lowest prevalence were chosen for the study. The research will show whether economic, education, or healthcare factors are most related to the problem of childhood obesity. The results will be able to provide insight as to where we should be focusing our efforts in order to reduce to problem of childhood obesity in our country.

U.S. Liberals in a Realist World: Suggestions from 1776-1939 Introvert Phases for the Coming Two Decades

James Teaford
Mentor: Dr. Jack Holmes
Department of Political
Science

If the U.S. Foreign Policy Moods projected by Klingberg (1952) and Holmes (1985) continue, the next two decades are likely to feature a return to American introversion. This is likely to take place during a time of power transition when the power of Asian nations is likely to be rising. We argue that long-term as well as short-term considerations need careful attention. Our hypothesis is that examination of American business-liberal and reform-liberal thinking during introvert times in the pre-1940 timeframe utilizing a realist perspective will provide useful long-term suggestions for American policy makers. To be sure, each era is different, but past trends remain relevant. At this point, there is not much recent research about American Foreign Policy Moods except that of the primary author (2011). If past trends prevail, a transition from extroversion to introversion will take place in the next few years. Observers are likely to be as surprised as they were in 1968, the time of the last extrovert to introvert change. This research suggests that, based on past trends, the American transition to introversion could be led by a president who could receive low posterity ratings later on. The U.S. could be divided increasingly by domestic issues which could make it difficult to concentrate on international issues.

The major conclusion of this research is the suggestion that the U.S. might be one of the least understood powers because of its shifting moods and lack of comfort with realism and non-western cultures. Maintaining peace will be a major challenge and the time to start considering the implications of theories is now. This study suggests the need to bridge the gap between long-term and short-term analysis. The proposed research continues recent studies by the primary author on American Foreign Policy.

PSYCHOLOGY

Do Standards Matter? A Priori Standards, Partner Perceptions, and Relationship Evaluation

**Demelza Alfonso, Lauren
Girard and Sarah Peterson**
Mentor: Dr. Carrie Bredow
Department of Psychology

Past research has found that greater consistency between mate standards and perceptions of one's romantic partner (i.e., standards-perception consistency) predicts higher relationship quality (e.g., Eastwick, Finkel & Eagly, 2011; Fletcher, Simpson, & Thomas, 2000; Zentner, 2005). However, most of this research has assessed people's standards when they were already in a relationship; only one study of speed-daters has provided evidence that standards reported prior to relationship formation (i.e., a priori standards) predict later relationship evaluations (Eastwick et al., 2011). Our study aims to replicate these findings while also examining standards reported prior to relationship formation (i.e., a priori standards) as well as potential moderators of this association. We hypothesized that the greater the match between individuals' a priori standards and their partner perceptions, the higher relationship quality they will report (H1). Additionally, we expected the association between a priori standards and partner perceptions to be more important for relationship quality when people are in committed versus casual relationships, report higher standard salience, and have higher mate value and greater access to potential mates (H2-H5). A sample of 79 participants recruited from various settings completed two waves of an online survey assessing their standards (T1), partner perceptions (T2), and relationship quality (satisfaction, commitment, and ambivalence), among other things. Regression analyses revealed higher standards-perception consistency predicts higher relationship quality when using the pattern metric rather than the level metric. However, regression analyses examining potential moderators of this relationship (e.g. relationship type) were insignificant. This suggests that individuals may uniformly experience greater relationship quality when their partner reflects the *pattern*, but not necessarily the *level*, of traits they seek in a partner.

The Effects of Priming Humility on Defensive Reactions Following Criticism of One's Cherished Values

**Abigail Bohler, Joshua
Stafford, Sabrina Hakim
and Paige Garwood**
Mentor: Dr. Daryl Van
Tongeren
Department of Psychology

This study examined the role of humility in moderating defensive reactions following criticisms of one's cherished values. Previous research has found that humility involves an accurate view of oneself and openness to new ideas, contradictory information, and advice (Tangney, 2000; Exline, 2009), as well as an appreciation of how different people and varying perspectives can contribute to the world (Tangney, 2000). We predicted that humility would result in reduced defensiveness when people were confronted with an opposing viewpoint. 124 undergraduates participants wrote essays on a cherished social or cultural issue and were told it would be swapped with another participant. Following the essay, participants were implicitly primed with humble, arrogant or neutral words, using a subliminal priming induction (flashing construct-relevant words on a computer for 20ms). They were then given a fixed essay that was critical of religion and told it was from a fellow participant. Participants were then given fixed negative feedback on their own essay and given the opportunity to rate the fixed essay. Lastly, participants were given the opportunity to administer hot sauce to the fake participant after being told that the critical partner did not like spicy food. We predicted that participants in the humility condition would rate the fixed-essay author more favorably and show less behavioral aggression by administering less hot sauce. Although priming condition did not affect essay ratings, there was a significant effect on the amount of hot sauce administered. Participants primed with humility administered significantly less hot sauce than those in the neutral condition. The arrogant priming did not vary significantly from either condition. It appears that humility may help reduce defensiveness.

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Do Unique Mate Preferences Matter? Comparing the Predictive Validity of Individual Versus Consensual Standards for a Romantic Partner

Kara Dunn, Nicole Hames and Ivy Keen

Mentor: Dr. Carrie Bredow
Department of Psychology

Although past research has shown that there is considerable consensus in people's standards for a long-term romantic partner, most researchers have assumed that people's individual standards are of utmost importance in predicting their partnering behavior. But is this really the case? Despite evidence that greater correspondence between people's mate standards and their partner's characteristics is reliably associated with higher relationship quality, no one has examined the extent to which people's standards simply reflect a common prototype of a prototypical "good partner". Accordingly, our research examines (a) the extent to which people's individual standards reflect a consensual standard prototype, and (b) whether the similarity between a person's standards and his/her partner's characteristics predict relationship satisfaction above and beyond the similarity between the "prototypical good partner" and the partner's characteristics. To test these questions, 339 unmarried individuals were recruited from a variety of academic and nonacademic settings and completed an online questionnaire as well as a nine-month follow-up survey. Our results indicated that people's individual standards were moderately to strongly correlated with the consensual prototype of a good partner (avg. $r=.57$). When examining the match between standards and people's partner characteristics, we found that greater individual standard-partner match and greater prototype standard-partner match both independently predicted greater relationship quality. However, when the two variables were examined simultaneously, the match between people's individual standards and partner characteristics, but not between their partner's characteristics and the prototype, predicted their relationship commitment, ambivalence, and marital expectations. Interestingly, relationship satisfaction was simultaneously influenced by both variables – people experienced greater relationship satisfaction to the extent that they had a partner who met their own standards as well as reflected the prototypical "good partner."

The Effects of Threats to Meaning on Attitudes Toward Evolution

Paige Garwood, Lauren Janness, Joshua Stafford, Sabrina Hakim and Lauren Wade

Mentor: Dr. Daryl Van Tongeren
Department of Psychology

Humans have an innate need to make sense of the world and give it meaning (Heine, Proulx, & Vohs, 2006), and do so by creating and defending cultural worldviews (Solomon, Greenberg, & Pyszczynski, 2004). Threats to meaning cause existential anxiety, and to protect ourselves from this existential fear, we reject, eliminate, or avoid threats to our cultural worldviews (Schmeichel & Martens, 2005). In addition, following threats to meaning, we compensate by showing aggression towards those who are dissimilar (Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989). Science and religion are two prominent cultural worldviews that can provide meaning. We predict that following a meaning threat, participants high in religious fundamentalism would report a less favorable attitude toward evolution than those low in religious fundamentalism. Sixty introductory self-identified religious students at Hope College participated in this study. Participants first completed a measure of religious fundamentalism. They were then randomly assigned to complete a writing task based on condition: meaning challenge (writing about life's lack of meaning), meaning affirmation (writing about how they find meaning in life), or neutral (writing about their plans for next week). Finally, they read an essay that presented mixed evidence about evolution and rated the essay and their views on evolution. Data were analyzed using an ANOVA examining the interaction between religious fundamentalism and priming condition on attitudes toward evolution. We found a significant interaction showing that religious fundamentalists were more critical of evolution when their meaning was

This work was supported by a grant from The John Templeton Foundation.

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challenged. Given that religious fundamentalists have been found to hold negative attitudes toward evolution (Poling & Evans, 2004), meaning threats may enhance these negative attitudes as a way of regaining meaning. These results highlight that individuals bolster different sources of meaning that are aligned with their values.

The Extent to Which Mate Standards are Stable Over a Nine-Month Period

Nicole Hames, Erin Farrell and Sam Horsch

Mentor: Dr. Carrie Bredow
Department of Psychology

The goal of the current study is to explore factors that may help explain for whom and under what conditions mate standards are stable. Building on several of the major theories of mate selection we hypothesized that—at a sample level—standards would remain fairly stable over time. However, we expected people who were continuously single, older, had more relationship experience, were lower in marital urgency, and had higher standard salience to report more stable standards than their counterparts. A sample of 343 unmarried, heterosexual adults completed an initial online survey and a follow-up nine months later. Although participants' Wave 1 and 2 mate standards were correlated fairly strongly, paired-sample *t*-tests revealed significant changes over time, such that individuals tended to raise their standards over the nine-month period. Individuals who were continuously partnered, older, and lower in marital urgency had more stable standards when measured using a level approach. Continuously single and older individuals had more stable standards when the pattern metric was used. Taken together, these results show that despite a trend of general stability over time, some change in standards did occur, particularly for individuals who were younger, who reported lower marital urgency, and who experienced a relationship transition over the nine-month period.

Examining the Interactive Effects of Group Status and Perceived Morality on Personality Judgments

Sabrina Hakim, Joshua Stafford, Paige Garwood and Abigail Bohler

Mentor: Dr. Daryl Van Tongeren
Department of Psychology

This research was supported by a grant from The John Templeton Foundation.

We have a tendency to show a preference towards those who are most similar to ourselves. Most commonly, these biases feed into the perceived ideas that those similar to us (the in-group) are good and that those different from ourselves (the out-group) are bad (Rosenbaum & Holtz, 1985). In addition, Ruthland et al. (2010) demonstrated that the morality bias (i.e., preferring those that are good) often is stronger than the group bias (i.e., preferring the in-group); that is, moral preference is given priority over group membership. We sought to understand the interaction between how Christian participants perceive and rate individuals varying in group status (Christianity: in-group vs. Muslim: out-group) and morality (good vs. bad). The 118 participants were assigned to one of four conditions: moral/in-group, immoral/in-group, moral/out-group, and immoral/out-group. They completed a series of religious questionnaires, including quest religiousness, which is the perception of religion as a journey. Those who endorse quest religiousness indicate that they have a high tolerance for religious doubt and uncertainty. The participants were presented with descriptions of a fictitious individual that matched their condition and rated the individual on personality descriptor and interests to interact. A main effect revealed a preference for moral over immoral targets. However, a significant three-way interaction between quest religiousness, target morality, and group status revealed that when rating moral individuals, those high in quest religiousness rated the out-group member more favorably, and those low in quest religiousness rated the in-group member more favorably. This interaction indicates that a potential reverse of in-group bias occurs in those who view religion as a quest: such individuals rate more favorably those who are moral and religiously dissimilar than those who are moral and religiously similar.

One Triflin' Research Project: The Study of the Word *Triflin'* and its Implications in African American Vernacular English

Sarah Harvin and Mariana Thomas

Mentor: Dr. Sonja Trent-Brown
Psychology Department

The present study seeks to explore aspects of African-American figurative language and styles of presentation and how factors of ethnicity, language background, cultural participation, and cultural contact contribute to awareness of African-American English figurative language use. The metaphoric use of the cultural phrase, *triflin'*, has been chosen as the exemplar for this study. Respondents will participate in an associative memory task to attempt to prime the target exemplar. Additionally, participants will answer comprehension questions following oral and written presentations of literary scenarios selected from both American and African-American literature sources in which the metaphoric use of *triflin'* would be a potential response option. The hypothesis indicates that we expect significantly more accurate *triflin'* response outcomes for participants of African-American ethnicity, for experience with African-American Vernacular English, for cultural identification as a participant in the African-American community, and for individuals with more diverse cultural cohort contact, regardless of ethnicity. Studies like this one strive to communicate the validity and cultural significance of linguistic structures in African-American Vernacular English. By identifying the metaphoric use of *triflin'* as one example of figurative language specific to African-American Vernacular English, we hope to communicate the value of incorporating AAVE into school curriculums to aid in the education of students who were reared with extensive exposure to AAVE. Implications of this work are important for the awareness of educators, administrators, curriculum developers, and educational policy makers.

The Effect of Parent Education on Children's Activity Preference, Self-Efficacy, and Screen Time

Mary Kelso

Mentor: Dr. Sonja Trent-Brown
Department of Psychology

Parents and children must be engaged in dialogue about health, exercise, and activity to combat the inactive lifestyle contributing towards the obesity epidemic. A direct relationship exists between inactivity and the time children spend using a screen each day, whether through TV, video games, or the internet (Rideout & Hamel, 2006). Prior research has shown that the education level of parents can have a significant effect on their child's development and self-efficacy (Bandura et. al, 2001). Rideout and Hamel (2006) stressed the influence of parent education on a child's media use, suggesting that on average, a child with parents who have a high school diploma spend significantly more time watching TV in a typical day than children whose parents are college graduates. The purpose of the present study was to identify the relationship between parents' level of education and their children's activity preference, self-efficacy, and screen time, and to discuss the implication that parent education serves as a preventive and vital step in achieving a healthier lifestyle. Kindergarten and first-grade children and their parents participated in the study. Parents' education and children's screen time per day were collected using a parent survey. Activity preference and self-efficacy were measured using worksheets completed by children in the classroom. Mothers' education was found to be significantly positively correlated with children's activity preference. Overall, highest parent education was significantly negatively correlated with children's screen time. It was also found that children's self-efficacy was significantly negatively correlated with children's screen time, which was an unexpected result. Implications of this research are that improving parent education may be a beneficial and preventative measure in striving to improve the physical and mental health of children.

This research was funded by a grant from The Kellogg Foundation.

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Relationships and Transgressions: The Impact of Offender Relationship and Forgiveness on Written Language, Mental Health, and Flourishing

Brittany Lawson, Cainnear Hogan and Sydney Timmer

Mentor: Dr. Lindsey Root Luna

Department of Psychology

This research was supported by The Carl Frost Center for Social Science Research.

Transgressions within relationships impact an individual's daily life. When an offense occurs, forgiveness toward the offender is shown to have positive influences on the victim's mental health and flourishing. This study is designed to further examine the impact of the victim's relationship with the offender on forgiveness, as well as the effect of forgiveness on written language, mental health, and flourishing. Questionnaire and free response writing methods were employed for data collection. Participants came in for two sessions spaced one week apart and completed a survey at each visit. The surveys included questions about a particular offense, their relationship to the offender, levels of depression and anxiety, flourishing, and satisfaction with life. Discussion of the offender relationship included questions about closeness, commitment, and importance of the relationship. In addition, subjects engaged in mental imagery about the offense. Following the imagery, they described their thoughts, feelings, physical reactions, and what they would want to do or say in response to the offense and offender. We predict that the levels of closeness, commitment, and importance in the offender relationship will predict levels of forgiveness. We then expect that relationship characteristics will be related to written language use and changes in mental health. We hypothesize relationship characteristics will positively predict changes in flourishing and words conveying positive affect, social orientation, benefit-finding, forgiveness, and gratitude. Conversely, we expect relationship characteristics to negatively predict changes in anxiety, depression, and words conveying negative affect and cost. Furthermore, we predict that forgiveness will mediate the effects of relationship characteristics on written language, and relationship characteristics on mental health.

An Analysis of the Association of Ethnicity and Religion Among the Holland Middle School Student Population in 2005

Haley Lynch

Mentors: Drs. Lorna Hernandez Jarvis, Brian Yurk, and Airat Bekmetjev
Departments of Psychology and Mathematics

This paper gives a further look into what aspects of religion are associated with ethnicity by testing whether or not there is an association between ethnicity and how often a person goes to church, and ethnicity and the importance of religion to a person. Previous research conducted on the topics of ethnicity and religion has found what seems to be an association between the two variables. This experiment took that possibility and applied it to the Holland area or, more specifically, to the population of middle school students based off of data collected from a survey in 2005. Two different ANOVA tests were done to analyze these associations. Significant evidence was found to be in favor of an association between ethnicity and how often a person goes to church. There was, however, no significant evidence indicating an association between ethnicity and how important religion is to a person. These results call for a follow up analysis on what it means to be religious for different ethnic groups and how different ethnicities show this importance or if they even feel the need to.

This research was supported by a Howard Hughes Medical Institute grant.

The Effect of Automatic and Controlled Processing Metaphorical Sentences on the N400: An Event Related Potentials Study

Felicia Mata, Lauren Janness and Jenna Sutton
Mentor: Dr. Gwenda Schmidt-Snoek
Department of Psychology

This research was supported in part by Howard Hughes Medical Institute Research Scholars Award to Lauren Janness, Howard Hughes Medical Institute Faculty Development Research Award to Dr. Schmidt-Snoek, and Psychology Department funds.

We compared automatic and controlled processing of metaphors using literal and metaphorical sentences, a varied inter-stimulus interval (ISI) and related and unrelated word pairs. To assess the difference between automatic and controlled processing, we manipulated the ISI, which was either 100 ms (short) or 1400 ms (long). Previous research has shown that an ISI of 100 ms elicits automatic processing while an ISI of 1400 ms elicits controlled processing. Stimuli were literal sentences (The penetrating needle was painful) or metaphorical sentences (The principal's eyes were knives) paired with a related word (pierce) or unrelated word (rosy). Literal sentences paired with related words were the control sentences. We examined the differences using event-related potentials (ERP) derived from an electroencephalogram (EEG), which measures electrical activity at the scalp. The dependent measure was the amplitude of the N400, a negative waveform that occurs approximately 400 ms after the presentation of the stimulus. A larger N400 amplitude indicates greater difficulty in understanding the semantic context of the target word stimulus. We hypothesized that metaphorical sentences with an ISI of 1400 ms will have a larger N400 than literal sentences with an ISI of 100 ms because both controlled processing and processing of metaphors require greater cognitive effort. These findings will help us understand the differences in automatic versus controlled processing of figurative language in college controls. We plan to extend this study to participants with autism in order to better understand the literal bias of autism spectrum disorder.



Lauren Janness, Jenna Sutton, Felicia Mata and Miriam Thomas prepare a lab member, Danielle Meyer, for pilot test in the EEG lab.

Does Meaning Affirmation Reduce Defensiveness? The Role of Recalling Cherished Relationships.

Felicia Mata, Joshua Stafford, Kelvin Peprah, Sabrina Hakim and Lauren Wade
Dr. Daryl Van Tongeren
Department of Psychology

This work was supported by a grant from The John Templeton Foundation.

Humans desire meaning. Drawing from Terror Management Theory (Greenberg, Pyszczynski, & Solomon, 1986) and the Meaning Maintenance Model (Heine, Proulx, & Vohs, 2006), we examined potential buffers for threats to meaning. According to TMT, people find meaning in cultural worldviews. When people are faced with challenges to their worldviews, they defend their worldview to regain meaning. Similarly, the MMM suggests that various sources of meaning (belonging, self-esteem, certainty, symbolic immortality) are interchangeable; affirming one domain may reduce the reliance on another source of meaning (Van Tongeren & Green, 2010). Based on this, we predicted that bolstering someone's meaning through meaning affirmation would buffer them a subsequent meaning threat (e.g., criticism of their beliefs). We hypothesized that those who affirmed their meaning would be less defensive than those who had not been affirmed. Participants were 79 self-identified Christian students who participated in a between-subjects design, randomly assigned to a relationship affirmation, self affirmation, or neutral condition. Next, participants were asked to write a short essay about an issue important to them. They were then told their essay would be exchanged with another participant's essay but instead were given a fixed essay that was critical of religion and fixed negative feedback on their own essay (i.e., a meaning threat to religious participants). Next, participants were given a chance to the rate the author



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of the fixed essay they read. There was a significant effect of priming condition on author rating, supporting our hypothesis that participants in the relationship affirmation condition rated the author's essay significantly higher than participants in the neutral condition. This suggests that relationship affirmation can buffer from meaning threats and reduce worldview defensive.

Acoustic and Perceptual Variation Across Hindi, Spanish, American English, and German Vowels

**Danielle Meyer and
Alejandra Guzman**
Mentor: Dr. Sonja Trent-
Brown
Department of Psychology

This study explores the impact of language background and experience on listener perceptual accuracy. The languages of interest, Hindi, Spanish, General American English, and German, were selected because they distinctly correspond to the Indo-Iranian, Italic, and Germanic language categories on the Proto-Indo-European family tree, whose branches are determined by shared lingual characteristics. This project included both an acoustic and a perceptual study. For the acoustic analysis, adult speakers of each language were recorded producing vowels in neutral consonantal context. Praat analysis software for speech was utilized to compare vowel target formant frequencies across these languages of interest to measure differences in acoustic space and temporal qualities. Listeners were monolingual General American English speakers and bilingual individuals. These participants listened to the recorded words and were asked to identify the vowel they heard in the target word. Following the categorization of the vowel, the listeners were asked to rate the vowel sound they heard regarding goodness of fit in that category, using a seven-point Likert-type scale. Given the variance in language experience, we expect listeners with a language background (individuals that have studied a foreign language for at least two years, or are bilingual) to have a higher vowel identification accuracy than those who do not. We predict that individuals with a foreign language background will have the highest vowel identification accuracy in the language(s) in which they are most familiar. Concerning unfamiliar languages, individuals with multilingual experience will be more accurate in identifying vowels, due to cross-language facilitation, than individuals with monolingual experience. We hypothesize that of the non-English languages, monolingual English speakers will more accurately identify vowels in Spanish and Hindi, as they are syllable-timed languages in which vowels are less reduced as opposed to English and German, which are stress-timed languages that do experience vowel reduction.

Religiosity, Body Image, and Perfectionism

Kelvin Peprah
Mentor: Dr. Mary Inman
Department of Psychology

Media images of thin women present a challenge to women's body esteem. This study examined the relationships among religiosity, perfectionism, basing self-worth on beauty, and body esteem in college women. We expected to see the groups most threatened after viewing images of thin models to be heavy women, women who based self-worth on beauty, and perfectionist groups (i.e., people who heavily weigh others' opinions of them). Individuals high in religiosity (i.e., basing self-worth in God, high religious commitment) should not be as affected by seeing thin models. We also examined the extent to which people preserved self-worth by shifting importance to other non-threatening domains. We report our preliminary analysis of 55 women from Hope College.

Weighty Decisions: The Effect of Weight Bias on the Selection and Election of U.S. Senate Candidates

**Alexis Sears, Ivy Keen,
Regina Guerra and
Camerra Lightbourn**
Mentor: Dr. Patricia
Roehling
Department of Psychology

Weight discrimination is well documented in employment, social, educational, and medical settings (Puhl and Heuer, 2009). This study uses data from 2008 and 2012 U.S. Senate elections to examine the relationship between the perceived weight of a political candidate and election outcome. We hypothesized that heavier candidates would be underrepresented in the candidate pool and that heavier candidates would receive a smaller percentage of votes than thinner candidates. In addition, we hypothesized that overweight female candidates would experience a greater weight penalty than male candidates. Thirty undergraduate students used photographs of 190 Senate candidates from the 2008 and 2012 primary and general elections to rate the size of the candidates. We also collected information regarding candidate age, gender, political party affiliation, whether the candidate was from the same political party as the state's winning presidential candidate, incumbency status, and candidate's vote share. This study offers evidence that weight is related to the political election process. Obese individuals were rarely chosen as major party candidates for the Senate, only 1% were judged to be obese. Overweight women are also less likely to be selected to run for U.S. Senate (only 16%). Regarding voting behavior, the heavier candidate is likely to get a smaller vote share than his/her thinner opponent. More research is needed to examine the mediating processes related to candidate's weight and resultant stereotypes that affect voting behavior. Further research is also needed to examine the factors that affect the selection process for Senate candidates.

Impacts of Acceptance and Reappraisal Training on Physiology, and Self-Reported Emotions, Mental Health, and Flourishing

**Sydney Timmer and
Katrina Cuison**
Mentor: Dr. Lindsey Root
Luna
Department of Psychology

A growing field of research has examined emotion regulation in a variety of settings. Specific emotion regulation strategies are more adaptive than others, eliciting decreased physiological responses, fewer psychopathological symptoms, and increased positive functioning. In the context of an interpersonal transgression, emotion regulation strategies are linked to increased flourishing and forgiveness. Our study examined training in and implementation of acceptance and reappraisal strategies in response to an interpersonal transgression. Participants were randomly assigned to one of three conditions (reappraisal, acceptance, or control). Participants completed two visits, one week apart. During both visits participants were asked to think of an interpersonal transgression and complete questionnaires, which measured emotion regulation, forgiveness, anxiety, depression, satisfaction with life, and flourishing. Each participant completed five imagery trials (120 s) consisting of pre-trial baselines, rumination and implementing an emotion regulation strategy if in the acceptance or reappraisal conditions. During each trial, heart rate, heart-rate variability, blood pressure, and facial EMG were measured. Following each trial participants completed written responses and ratings on current emotional states. Preliminary results indicated that the acceptance group endorsed greater positive affect (e.g., peace, happiness) and lower negative affect (e.g., sadness), than those in the control or reappraisal groups. Additionally, there were significant decreases in rumination and anxiety and significant increases in satisfaction with life and acknowledgement of the impact of the event across all three groups. Physiologically, participants in the acceptance group experienced a significant decrease in heart rate from rumination to imagery trials; no significant differences were found for participants in the reappraisal or control groups. Overall, initial analyses indicate that acceptance increased positive affect and decreased negative affect and heart rate for participants.

*This research was supported by
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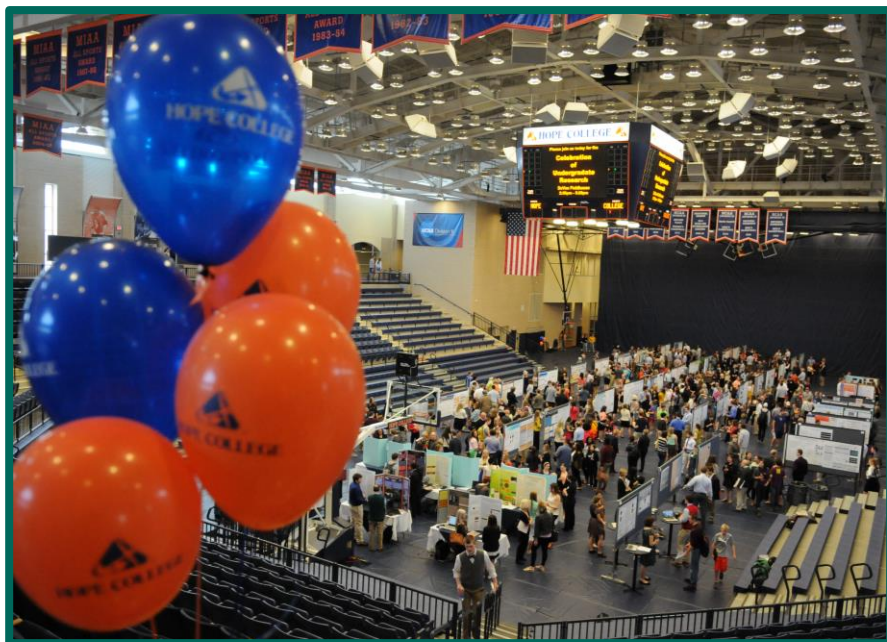
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Influence of Self-Reported Standards on Romantic Mate Choice

Alison VanLoon and Kara Dunn

Mentor: Dr. Carrie Bredow
Department of Psychology

Past research on mate standards has generally focused on identifying people's reported standards, with the assumption that these reports accurately predict later partnering behavior. However, only a handful of studies have examined this assumption directly, most of which have involved either speed-dating contexts where stated preferences do not appear to predict initial mating judgments (e.g., Eastwick & Finkel, 2008), or relational contexts where standard-partner consistency is assessed in already established relationships (e.g., Fletcher, Simpson, & Thomas, 2000). The goal of our research was to assess unmarried individuals' previously reported (i.e., a priori) standards and investigate the conditions under which these standards predict the characteristics of the partners people choose in subsequently formed relationships. We used a sample of 79 unmarried adults to test our hypotheses that people would choose a mate who more closely matched their a priori standards when they had higher mate value and mate availability, reported being in a committed rather than casual relationship, and indicated higher current desire for marriage (i.e., marriage imminence) and standard salience. Our results indicated found that higher minimum standards for physical attractiveness and vitality did predict becoming involved with a partner who was higher in these traits. Also, as predicted, participants with higher standard salience were more likely than participants with a lower standard salience to enter a relationship with someone who more closely matched their a priori standards on status/resources, trustworthiness, and total mate standards. Contrary to our hypothesis, we found that people with lower mate availability were actually partnered with people who *more closely* reflected their standards for physical attractiveness. Mate value, relationship type, and marital imminence did not moderate any of the associations examined.



Milk and Medicine Evaluation

**David Blystra and
Samantha Hartman**

Mentors: Drs. Dennis
Feaster and Deborah
Sturtevant

Department of Sociology

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work supported by Amway
Corporation, the Alliance for
Children Everywhere, and The
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Science Research.*

The HIV and AIDS epidemic sweeping through Africa has taken an especially hard hit on Zambia. The disease has played a dramatic role in this nation's identity and future, leaving many children orphaned. According to the Central Statistical Office of Zambia, 54.2% of children aged 3-59 months were considered malnourished in 2006. 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 over 300 children in this AIDS-stricken region of the world. The longitudinal nature of the data set and a series of in-person interviews with program participants and leaders provided the grounds for a comprehensive analysis of the program and its benefits. The research findings will enable CACZ to adjust and continue their program as necessary in order to fully support these vulnerable children.



Dr. Deb Sturtevant, students David Blystra and Samantha Hartman, and Dr. Dennis Feaster at the House of Moses in Lusaka, Zambia.

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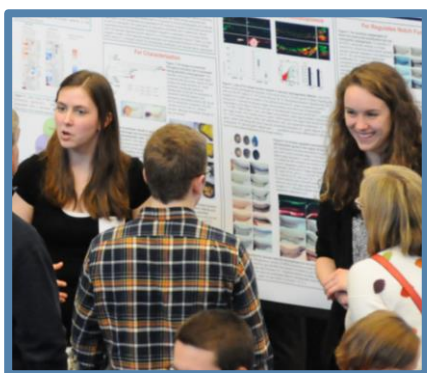
Greg Olgers, Lynne Powe and Tom Renner, Public Relations

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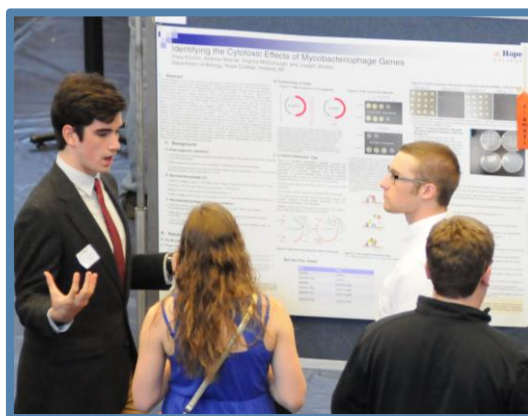
This book as well as a sampling of posters from the Celebration can be viewed on [Hope's Digital Commons Repository](http://digitalcommons.hope.edu/) on the Van Wylen Library website, <http://digitalcommons.hope.edu/>.

We also encourage you to view a [short video](http://youtu.be/fDZx8ZI3vkM) about the Celebration of Undergraduate Research and Creative Performance on Hope's YouTube Channel <http://youtu.be/fDZx8ZI3vkM>, produced by Rick VanGrouw of Ridgeline Video Communications.

For more information about each year's Celebration, view the [Celebration website](http://celebration.hope.edu/) at <http://celebration.hope.edu/>.



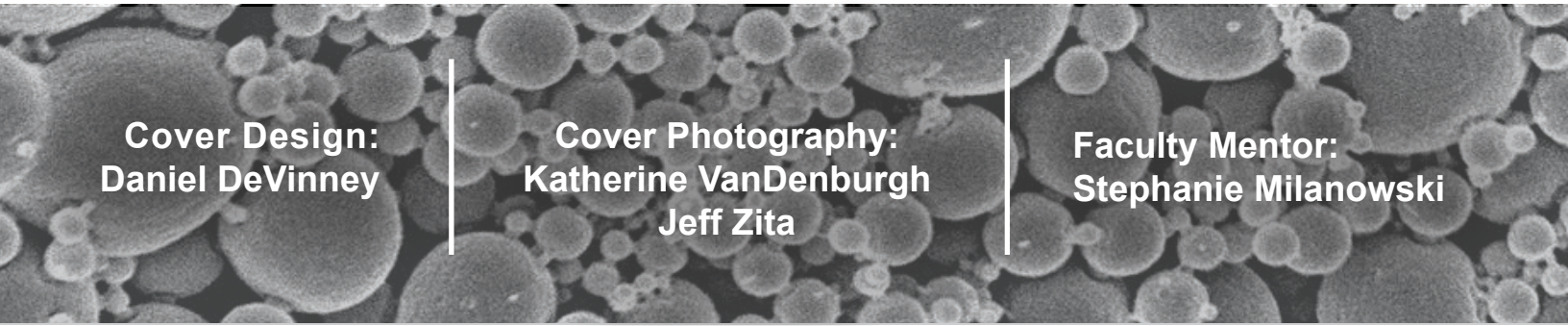
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