CELEBRATION OF UNDERGRADUATE SCHOLARSHIP

MAY 2, 2015
VALPARAISO UNIVERSITY
CELEBRATION OF UNDERGRADUATE SCHOLARSHIP
May 2, 2015
Harre Union Ballrooms

8:00 a.m. – 3:00 p.m.  Posters on Display
9:00 a.m. – 11:00 a.m.  Poster Presentation Judging
9:00 a.m. – 12:30 p.m.  Oral Presentation Judging
10:00 a.m. – 3:00 p.m.  Open Viewing for Campus Community
12:00 p.m. – 1:30 p.m.  Lunch for Student Presenters & Judges
2:30 p.m. – 3:00 p.m.  Awards Presentation
3:00 p.m.  Students Take Down Posters

Deans’ Choice Presentations
Harre Union Ballroom C
3:00 p.m. – 5:15 p.m.

<table>
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<tr>
<th>Time</th>
<th>Speaker/Title</th>
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<tr>
<td>3:00 p.m.</td>
<td>Mark Biermann, Provost</td>
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<tr>
<td>3:10 p.m.</td>
<td>Cynthia Rutz, Director of the Celebration of Undergraduate Scholarship</td>
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<tr>
<td>3:15 p.m.</td>
<td>Chloe Lash and Laura Polakowski</td>
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<td>3:30 p.m.</td>
<td>Jonathan Mack</td>
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<tr>
<td>3:45 p.m.</td>
<td>Taylor Thompson and Jessica Mueller</td>
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<tr>
<td>4:00 p.m.</td>
<td>Sarah Black</td>
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<tr>
<td>4:15 p.m.</td>
<td>Nadia Atassi</td>
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<tr>
<td>4:30 p.m.</td>
<td>Aaron Roggow, Danielle Desmond, Chase Greenhagen, and Timothy Krentz</td>
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<tr>
<td>4:45 p.m.</td>
<td>Alexandra Caruthers</td>
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<tr>
<td>5:00 p.m.</td>
<td>Nandin-Erdene Munkhbat</td>
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## Oral Presentation Schedule

**Saturday, May 2, 2015**  
**Harre Union**  
**9:00 a.m. – 12:00 p.m.**

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<thead>
<tr>
<th>Time</th>
<th>Alumni Room</th>
<th>Heritage Room</th>
<th>Ballroom C</th>
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<tbody>
<tr>
<td>9:00 a.m.</td>
<td>Lauren Hargrave &amp; Max Carpenter</td>
<td>Julian Fischer</td>
<td>Nandin-Erdene Munkhbat</td>
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<tr>
<td>9:25 a.m.</td>
<td>Michelle Sopetti &amp; Lauren Hargrave</td>
<td>Hannah Heagy</td>
<td>Alexander Uryga</td>
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<tr>
<td>9:50 a.m.</td>
<td>Benjamin Hoemann</td>
<td>Nicole Thompson</td>
<td>Alexander Uryga</td>
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<tr>
<td>10:15 – 10:25 a.m.</td>
<td>10 MINUTE BREAK</td>
<td>10 MINUTE BREAK</td>
<td>10 MINUTE BREAK</td>
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<tr>
<td>10:25 a.m.</td>
<td>Erica Gilbert</td>
<td>Jonathan Mack</td>
<td>Alexander Uryga</td>
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<tr>
<td>10:50 a.m.</td>
<td>Emily Knippenberg, Jamielynn Tinkey, Vanesa Abad, Megan Heinz, &amp; Katelyn Mesalam</td>
<td>McKenzie Cobban</td>
<td>Caleb Rollins</td>
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<tr>
<td>11:15 a.m.</td>
<td>Grace Roman</td>
<td>Charlotte Lindstrom</td>
<td>Sarah Black</td>
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<td>11:40 a.m.</td>
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<td>Kelli Chavez</td>
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Overview of the
Celebration of Undergraduate Scholarship

The Celebration of Undergraduate Scholarship (CUS) is a conference that allows undergraduate students to showcase their creative and/or scholarly work and research in a professional format. The Celebration began in 1998 as an idea from an interdisciplinary group of faculty who had attended national meetings on the role of undergraduate research in the college experience.

One of the many joys of completing a research project or creative endeavor is to share the results with others. In a typical year, the Valpo CUS brings together more than 150 students and 45 faculty sponsors to share their research experiences with the campus and local community. Students who have worked on class projects, senior projects and theses, or independent scholarship are encouraged to participate. At the conference, all students present their work in a poster or oral presentation format. In addition to poster and oral presentations, the Deans of Valparaiso University’s five undergraduate colleges select students to represent their colleges at the Deans’ Choice Presentations, and these students give oral presentations in an afternoon program.

Students and faculty are encouraged to read the poster presentations guidelines and oral presentation guidelines on the Undergraduate Research website (http://valpo.edu/research/) for guidance on the development of their presentations. Faculty sponsors also provide guidance and support for their students, both in developing the original research and in transmitting that research to a poster or oral format.

Supporters of Valparaiso University’s Undergraduate Scholarship

The Valparaiso University Guild
Office of the Provost
Committee for Creative Work and Research
Valparaiso Institute for Teaching and Learning

Thanks to all who participated in the planning of this event.

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CHRIST COLLEGE

Catholic Youth Organizations Resistance and Collapse during the Nazi Regime

Sarah Black

Within the recent history of the Catholic Church, no period has been more critically scrutinized than the 1930s and 40s, especially with respect to the actions of the Pope vis-à-vis the Nazi regime in Germany. However, less well known and examined are the conflicts that arose regarding Catholic rights for church youth organizations in Germany at that time. Very little research has been done by English-speaking scholars on this issue and the pertinent German research has largely not been translated into English. While there has been growing interest in post-war German Catholicism, including the revitalization of Catholic youth organizations in the 1950s and 60s, little attention has been given to these organizations in the Nazi period itself and to the challenges they faced in those years. Individual Catholic youth organizations flourished in Germany as mostly independent groups in the early decades of the twentieth century. These organizations helped to instill Catholic teachings and values among the youth and became centers of vibrant Catholicism in Germany at that time. With the rise of Nazism and the Hitler Youth, however, these organizations came under pressure and even overt threat, despite the protections given to the Catholic Church in the Concordat that was ratified between Germany and the Vatican in 1933. In the face of these political and ideological threats, leaders in the Catholic Church in Germany argued that these Catholic youth organizations were protected under the Concordat. This paper evaluates the varying degrees of success Catholic youth organizations resisted Nazi pressures before their obliteration in 1939 by unearthing forgotten works by German scholars and synthesizing their findings with more recent research.

Information about the Author:
Sarah Black is a senior at Valparaiso University, majoring in biology and Spanish, as well as an associate from Christ College. While taking her theology class, “Christians in Nazi Germany,” she was inspired to investigate her religious heritage by studying the Catholic youth movement during the Nazi period.

Faculty Sponsor: Matthew Becker
Student Contact: sarah.black@valpo.edu

Still Seeing Color: Post-Racial Sentiment and the Continuing Struggle for Freedom within the African American Community

Kelli Chavez

America is often considered to be a post-racial society where race is no longer a significant contributing factor to a person’s ability to lead a successful life. The 2008 election of Barack Obama has been championed as the official end of widespread racial discrimination, especially for the African American community. Since an African American has been able to ascend to the highest position in American society, many White Americans have erroneously assumed that the success of an individual African American is not hindered by race and that any variation in success between Whites and African Americans is due to personal factors. When analyzing the current socioeconomic, educational, and legal barriers that continue to limit the freedoms of African Americans, it becomes clear that America’s post-racial society has fallen short of its aim to rid the country of racial intolerance and privilege and has perpetuated inequality among African Americans. If African Americans are to achieve the freedom they were promised at the end of the Civil Rights Movement, America must discontinue its push to be a post-racial society.

Information about the Author:
Kelli Chavez is a senior sociology/criminology major who has been interested in social justice issues throughout her time here at Valpo. This project was inspired by the events in Ferguson, MO that occurred during the summer of 2014. Upon graduation, Kelli will be attending the University of Chicago’s School of Social Service Administration, where she hopes to receive an AM degree in social work administration.

Faculty Sponsor: Samuel Graber
Student Contact: kelli.chavez@valpo.edu

Behind the Bars: Prison Narratives as Basis for Reform

Michele Fredlake

My project focuses on the importance of first person prison narratives as a means of generating prison reform. Going to prison changes someone’s life forever and oftentimes conditions in prisons are less than ideal. Many prisons suffer from problems such as overcrowding, limited funding, irresponsible leadership, and unhygienic conditions to name a few. These problems can be seen in multiple narratives
from various periods, proving that they are continuing through time. Clearly, reform needs to happen but in order for it to generate enough popular support, the general public needs to be made more aware of the poor conditions of American prisons. This paper argues that prison narratives should play a larger role in this process. Through analyzing prison narratives, researching data on prisons, and examining the social and economical effects of being incarcerated, it presents these stories as essential in the prison reform process. By demonstrating the need for reform, narratives can help ensure that prisons become places of rehabilitation rather than punishment, giving inmates a better chance of moving past their criminal histories and decreasing the overall number of people who are incarcerated.

Information about the Author:
Michele Fredlake is a senior English and humanities double major who is also pursuing a Christ College Scholar degree. She is a four-year starter on the women's tennis team in both singles and doubles. Wanting to challenge the idea that prisons are a necessary evil in society, she researched the true state of America's prison system throughout history. Future goals include working in the publishing industry and furthering her education.

Faculty Sponsor: Samuel Graber
Student Contact: michele.fredlake@valpo.edu

Neuroimaging: An Ethical Approach

Benjamin Hoemann

Due to the heavy momentum of neuroscience, a conversation must begin on the ethical issues found in neurotechnology, specifically neuroimaging. Brain imaging has been used to predict mental health, academic success, and even violent behavior. If neuroimaging can help predict these important current issues, should the technology be used to predict one’s future behavior? Would such intervention be an intrusion of one’s mind? Unregulated intrusion of one’s brain could easily violate one’s mind and even ultimately, one’s self. Failure to recognize the ethical implications of brain imaging will result in moral injustices. These injustices encompass violations of privacy and manipulation of the mind (such as neuroprofiling or neuromarketing). I will argue that neuroradiology must be heavily regulated when it finds a comfortable spot in the public domain because of its ability to infringe upon the “sanctity” of the mind. This “sanctity” stems from a sense of privacy of one’s mind; that the mind possesses an innate integrity that must not be violated. Thus, neuroradiology possesses a strong potential for vicious action and the principle of informed consent becomes indispensable. In this paper, I will give a brief historical context followed by the many potential uses of neuroradiology. I will use virtue ethics in order to examine the bioethics of neuroimaging and the societal vices that will also become commonplace if the science is not controlled. A virtue ethics approach reveals how one might encourage vicious action in an individual by habituating his or her primal appetites through neuroimaging.

Information about the Author:
Benjamin Hoemann is a junior biochemistry major from St. Louis, MO. His long term career goal is to become a physician at a teaching hospital. He became interested in neuroscience during his time in the freshman program and he has continued to pursue it as a possible specialty.

Faculty Sponsor: Edward Upton
Student Contact: benjamin.hoemann@valpo.edu

Mount Rushmore: A Tomb for Dead Ideas of American Greatness

Caleb Rollins

The Mount Rushmore National Memorial stands in the Black Hills of South Dakota as a symbol of American greatness. However, the public perceptions of the greatness represented in this memorial do not take into consideration the ideals held by the three main contributors to the development of the mountain, Doane Robinson, Peter Norbeck, and Gutzon Borglum. An exploration into the lives and beliefs of these three men reveals that they possessed a specific definition of America greatness exemplified in the white male farmer of the American West. The four former presidents selected for carving symbolize a general American greatness, but more importantly they epitomize the specific version of greatness championed by the planners of the memorial. Yet, from the earliest perceptions of Mt. Rushmore, the public saw only the representation of a general American greatness that included all members of the nation and eventually the entire world. Visitors to Mount Rushmore do not see the specific ideas of American greatness intended by the planners of the memorial and these ideas of American greatness are now dead.

Information about the Author:
Caleb Rollins is a senior studying international service and the humanities. This paper was written in
a history class at Valparaiso University entitled "U.S.: Empire for Liberty?" The author's interest in this topic began from several personal trips to Mount Rushmore, but was developed by further study of historical monuments and the meaning that they originally conveyed, once conveyed, and convey today. While the author does not intend to pursue this topic in further research or schooling, he encourages all to consider the varied meanings and contexts of historical monuments and memorials, especially when they are attempting to present a patriotic message. The author hopes to pursue work in social ministry and perhaps continue his education at a later date.

Faculty Sponsors: Margaret Franson, Heath Carter

Student Contact: caleb.rollins@valpo.edu

Acts of Defiance: Symbols of Liberty

Alexander Uryga

Major national symbols that represent both freedom and United States identity include the Declaration of Independence, the Constitution, and the Fourth of July. Yet acts of defiance against these obvious national symbols also provide the public with important symbols of American liberty. Failing to consider these more complex symbolic acts leaves out a large part of what makes liberty truly liberty and America truly America. Studying such defiant acts allows people to understand the powerful status of the destructive acts as symbols of freedom, and the special image that America has as a bastion of liberty. The acts of defiance by William Lloyd Garrison and Frederick Douglass against the Constitution and the Fourth of July, for example, are significant symbols of freedom that enhance that image of the United States. This paper will show how Garrison's and Douglass' disobedient acts against the Constitution, as well as Garrison's "Address to the Colonization Society" and Douglass' "What to the Slave is the Fourth of July?" which criticize Independence Day, paradoxically serve as symbols of American liberty by attacking those chief symbols of liberty and America.

Information about the Author:
Alexander Uryga is a Christ College Honors College Scholar and previous president of the student body. He will be receiving his Bachelor of Arts in political science and history this May. He has always been interested in the concept of liberty, and he had the chance to study symbols of liberty for his honors thesis in Samuel Graber’s American Identities Christ College course.
The Late Van’s Voyage: An In-Depth Analysis of the Usage of Valparaiso University Auxiliary Transportation Services over the 2014-2015 Academic Year

Rudolph Grasha, Kedar Puvar

Departmental Affiliation: Auxiliary Services

Valparaiso University offers free alternative transportation services to students every evening. This service comes in the form of one or two vans that are dedicated to provide safe and reliable transportation to VU students and faculty from 6 p.m. to 2 a.m., 7 days per week. Students wishing to use Transportation Services must call the hotline and a dispatcher will direct the van to their location providing that it is within the transport boundaries. The frequency and location of calls to Transportation Services varies depending on several factors, including time of week, time of day, weather, events, and emergencies. By logging the frequency and location of calls over the course of the 2014-2015 academic year, we hope to further our understanding of the factors that affect the usage of VU Transportation Services, and lead to improvements in the training of staff, dispatching, and overall efficiency of the transportation services of Valparaiso University and other universities nationwide. When a call is made to Transportation Services for a pick-up, the time of the call and the location of the pickup will be noted. The frequency of calls as well as the location will be compared against various parameters, such as outside air temperature, precipitation, time of day, time of week, the presence of VU night classes, special events, and emergency incidents. All data will be kept anonymous and confidential.

Information about the Authors:
Rudolph Grasha is a sophomore computer engineering major. He works as a dispatcher for Valparaiso University Transportation Services. Kedar Puvar is a senior biochemistry major and has used VU Transportation Services all throughout his time as a student.

Faculty Sponsor: N/A

Student Contact: rudolph.grasha@valpo.edu

Does PKC-Beta II Modulate Colon Cell Growth?

Lauren Hargrave, Max Carpenter

Departmental Affiliation: Biology

It has been shown that Protein Kinase C Beta II (PKCβII) is over expressed and more active in colon carcinoma tissues in comparison to surrounding non-involved tissues. A study is being conducted to determine if PKCβII is a causative step in or effect of colon tumor formation. The PKCβII deoxyribonucleic acid (DNA) sequence has been sub-cloned into an Entry vector with an inducible promoter. Site-directed mutagenesis had been carried out on the PKCβII kinase domain in order to allow for studies to be conducted on the role of PKCβII kinase activity in colon tumors. The PKCβII has been sub-cloned from the Entry vector into a pT-Rex-DEST31 vector also with an inducible promoter. KPNI restriction enzyme has been used to verify that PKCβII is present in the correct locations of the pT-Rex-DEST31 plasmid.

Information about the Authors:
Lauren Hargrave is a biology major, chemistry minor, and Christ College associate. She hopes to attend graduate school to become a physician assistant. Max Carpenter is also a biology major, chemistry minor. He assists in the Chemistry Department as a laboratory assistant and hopes to attend dental school after graduation.

Faculty Sponsor: Beth Scaglione-Sewell

Student Contact: lauren.hargrave@valpo.edu

Bird Dispersal of Native and Non-Native Fruiting Plants in a Northwest Indiana Nature Preserve

Chloe Lash, Laura Polakowski, Laurie Eberhardt

Departmental Affiliation: Biology

Non-native plant species have gained much attention in recent years because they often compete with native plants and overtake landscapes. Birds act as vectors to disperse non-native seeds, which might perpetuate the spreading of non-native plant species. In this study, we tested the dispersal rates of native and non-native fruiting plant species by small perching birds at a nature preserve in Northwest Indiana. To conduct this study, we collected fecal material weekly from fecal traps set in meadow landscapes near forested areas. The material was then analyzed by counting seeds and seed numbers were compared to what was available in the landscape from fruit surveys conducted in mid-October and late
November. We collected over 482 fecal samples from 16 traps from early September to mid-December. This fecal material contained 888 seeds and 98% of these seeds were identified to species. Early in the fall season (Oct.), strong preference was shown for native fruiting species compared to what was available for consumption, especially for *Parthenocissus quinquefolia*. Late in the season (Nov.), a preference was still shown for native fruits, but the preference was not as strong. This research has implications for managing the spread of invasive species.

**Information about the Authors:**
Chloe Lash is a senior biology and chemistry double major from Plain City, OH. She has plans to attend graduate school to pursue a PhD in ecology, and then she wishes to pursue an academic career that enables her to both teach and conduct research. She is interested in bird behavior, which grew out of an internship at the Smithsonian National Zoo. Additionally, she is interested in invasive species research, which grew out of a NSF REU experience. She loves field work and learning about the complex interactions that animals have with their environments. Laura Polakowski is a senior biology major and chemistry and psychology minor from Libertyville, IL. She has plans to attend graduate school and pursue a master’s in physician assistant studies. Laura is excited by the research opportunity that this project provided. She is passionate about research and learning new techniques and principles. She knows it allowed her to expand her knowledge in ecology and field studies. Dr. Laurie Eberhardt is an associate professor of biology at Valparaiso University.

**Faculty Sponsor:** Laurie Eberhardt

**Student Contact:** chloe.lash@valpo.edu

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**Somite-Notochord Spreading in Xenopus laevis**

Sophia Robinson

**Departmental Affiliation:** Biology

The vertebrate embryo's first organ is the notochord, a stiffening rod later replaced by the backbone. Cells fated to become notochord first rearrange themselves extensively as their array changes from wider than long to much longer than wide. The cause of this presumptive notochord elongation was investigated in gastrulating frog embryos. Somite-notochord spreading (SNS) theory suggests that presumptive notochord cells and neighboring presumptive somatic cells will rearrange to increase their cell-to-cell contact with one another. If so, destroying the middle but leaving the notochord-somite boundaries intact should not inhibit gastrulation. This is in opposition with the theory of convergent extension (CE), which suggests that directed cellular migration of notochord cells toward the midline drives the gastrulation process. If so, destroying the target of directed migration (the midline) should inhibit elongation. When 29 embryos had the central presumptive notochord cells scratched out with a needle, there was a 76% survival and a 100% elongation of those 76%. Moreover, three embryos formed double notochords, producing doubled nervous systems. Such data argues against centralized CE theory and in favor of the double-sided SNS theory.

**Information about the Author:**
Sophia Robinson is a junior biology major from Downers Grove, IL. She is interested in developmental biology and this project allowed her to gain a deeper understanding of the gastrulation process. Sophia plans to pursue a career in medicine after graduating from VU.

**Faculty Sponsor:** Grayson Davis

**Student Contact:** sophia.robinson@valpo.edu

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**Endurance of SYBR Safe in Agarose Gel Electrophoresis**

Michelle Sopetti, Lauren Hargrave

**Departmental Affiliation:** Biology

SYBR Safe is used for the detection of DNA. SYBR Safe is a safe alternative to ethidium bromide and it is more cost effective. The endurance of SYBR Safe is of special interest to teaching labs, like Valparaiso University. 0.7% agarose gels were poured with SYBR Safe, electrophoresed, and examined under Ultraviolet light to detect fluorescent DNA bands. When poured under ambient light, all of the bands could be visually detected up to three days after a gel was poured. When poured in the dark, all DNA bands were detectable for up to five days after the gel was poured. On a SYBR Safe gel that was electrophoresed immediately after pouring and setting one hour, in ambient light or in the dark, the entire amount of DNA loaded onto the gel was detected under UV light. After 24 hours (+/- 1 hour) of storage at approximately 4°C Celsius, some DNA bands were undetectable, as degradation increased daily. It is necessary to capture a photograph of data immediately to ensure that all DNA bands are visible. Gels poured at 4°C had tighter bands, but had lower
intensity under UV light than gels poured at room temperature (24°C).

**Information about the Authors:**
Michelle Sopetti is a biology major, psychology minor, Christ College associate. She will be attending IUPUI in the fall to become a doctor of physical therapy. Lauren Hargrave is a biology major, chemistry minor, and Christ College associate. She hopes to attend graduate school to become a physician assistant.

**Faculty Sponsor:** Beth Scaglione-Sewell

**Student Contact:** michelle.sopetti@valpo.edu

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**Impact of Pratt Industries on Water Quality of Salt Creek**

Jon Bicanic

**Departmental Affiliation:** Chemistry

Initial samples have been taken in order to measure the impact on Salt Creek of the additional water use and discharge resulting from Pratt Industries $290 million expansion of their recycled cardboard facility located near the Porter County Fairgrounds. The impact will be evaluated by testing water samples from Salt Creek both before and after the expansion is put into production. The expansion will produce ~700,000 gallons per day of waste water that will be treated by the Valparaiso Water Treatment Plant and released into Salt Creek. There is concern that this waste water will impact the ecosystem and environmental well being of Salt Creek. The magnitude of this impact will be assessed by looking for differences in a range of parameters including: temperature, pH, color, ammonia concentration, flow rate, recalcitrant concentrations, and phosphorous levels before and after the new facility is put into production. Initial samples have been taken from two sites at various times and weather conditions, and have been analyzed to gain a standard for Salt Creek before the expansion. These results will be shared with Pratt Industries, the Valparaiso community, and Valparaiso University.

**Information about the Author:**
Jon M. Bicanic is a senior double major in chemistry and mechanical engineering and is interested in either going to graduate school or pursuing a career in materials research and analysis. He was interested in this research because it's a project that has the potential to protect Salt Creek and affect the entire Valparaiso community – all while remaining firmly rooted in analysis and analytics.

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**Spectroscopic Determination of the Binding Constant and Thermodynamic Values of a Host-Guest System**

Erica Gilbert

**Departmental Affiliation:** Chemistry

A host-guest system occurs when a guest molecule, in this case Brooker’s merocyanine (BM), enters the host molecule, beta-cyclodextrin (B-CD), to form a complex. The equilibrium of a host-guest system becomes established through weak intermolecular interactions when the guest molecule binds to the host. The strength of the interactions can be studied using the equilibrium binding constant. By altering the structure of the B-CD through modifications of the chemical substituents along the outer rims of the B-CD cavity, we can better understand the different types of interactions between host and guest, such as hydrogen bonding and van der Waals forces. The determination of the binding constant at different temperatures also allows for further understanding of these complexes. To determine the binding constant, the Benesi-Hildebrand equation can be used to analyze data collected using fluorescence spectroscopy. The binding constant of B-CD complex does appear to be temperature dependent, so the thermodynamic values of ΔG, ΔH, and ΔS were calculated and compared to theoretical models. However, the binding constants for some of the modified B-CDs do not appear to exhibit a strong temperature dependence. Determining the temperature dependence of these complexes allows better insight into how strong the modified B-CDs will bind to a guest molecule, which allows for better predictions of their behaviors under different conditions.

**Information about the Author:**
Erica Gilbert is a senior chemistry and sociology double major from Wheatfield, Indiana. After graduation, she hopes to find work related to forensic chemistry in either a government laboratory or a police department laboratory.

**Faculty Sponsor:** Jennifer Holt

**Student Contact:** erica.gilbert@valpo.edu
Spectroscopic Determination of Binding Constants And Isomerization Behavior of Brooker’s Merocyanine within Modified β-Cyclodextrins

Carly Hanson

Departmental Affiliation: Chemistry

Host-guest complexation occurs when a guest molecule is held inside a host molecule through weak intermolecular forces, without actually forming bonds. β-cyclodextrin, a host molecule, has a variety of uses and can be used in pharmaceuticals; therefore, a fundamental understanding of how intermolecular forces affect complexation is significant. Binding constants of host-guest complexes of Brooker’s merocyanine and various modified β-cyclodextrins (2-hydroxypropyl-β-cyclodextrin, sulfated β-cyclodextrin, and methyl-β-cyclodextrin) were studied using fluorescence and UV-Vis spectroscopy to determine the strength of interaction between the host molecule and the most stable form of the guest molecule. By modifying the β-cyclodextrin, the effect of ionic interaction, hydrogen bonding, and steric hindrance were compared. It was determined that β-cyclodextrin modified with sulfate groups had a much lower binding constant than the other modified β-cyclodextrins, which could be due to a combination of ionic interactions and steric hindrance. The isomerization behavior of the guest molecule within the modified β-cyclodextrins can also be affected by various forces, specifically steric hindrance and hydrogen bonding. Depending on the desired properties of the host-guest complex, a particular binding strength and isomeric form of the guest molecule may be preferred. A comparison of these results to the theoretical models will lead to verification of the effect of these forces on binding and the isomerization behavior.

Information about the Author:
Carly Hanson is a senior chemistry major with a German minor. She began research related to host-guest complexation under the supervision of Dr. Holt in the summer of 2013. She is currently planning on attending graduate school in pursuit of her doctorate degree in chemistry. She ultimately hopes to obtain a career as a cosmetic chemist. She originally was interested in host-guest complexation due to the variety of uses of the chosen host molecule.

Faculty Sponsor: Jennifer Holt

Student Contact: carly.hanson@valpo.edu

Synthesis and Characterization of Non-Natural Fluorescent Amino Acids

Benjamin Hoemann

Departmental Affiliation: Chemistry

In the past decade, fluorescent proteins (FPs), such as GFP, have revolutionized the study of microscopic and nanoscopic biology. The past twenty years has focused on producing many derivatives and analogs of FPs that have allowed biologists to enter into the cellular world. Similar work has been completed on the synthesis of non-natural fluorescent amino acids (NFAAs). A long term goal of our research is to create a cellular screening mechanism that could use tRNA/aaRS pairs that could incorporate NFAAs into CooA that could serve as a carbon monoxide detector in neurobiological environments. CooA is a heme-containing carbon monoxide (CO) sensor from the bacterium Rhodospirillum rubrum. Carbon monoxide has long been known to be an important neurotransmitter in brain cells. When CooA binds carbon monoxide, it undergoes a conformational shift. If a NFAA were incorporated into CooA via a cellular screening mechanism, the protein will could expose NFAA to the cellular environment and fluoresce. Thus, carbon monoxide activity could be visualized in vivo instead of in vitro. The focus of this paper’s research is the synthesis and characterization of L-alanine,3-[7-nitro-2,1,3-benzoxadiazol-4-yl], a NFAA analog of tryptophan. The synthesis followed Katritzky and Narindoshvilli’s 2009 procedure. After an initial round of synthesis and characterization, we found results that suggested our synthesis was successful and that L-alanine,3-[7-nitro-2,1,3-benzoxadiazol-4-yl] was present in the product solution. Future work requires further analysis and characterization, as well as repeated syntheses.

Information about the Author:
Benjamin Hoemann is a junior biochemistry major from St. Louis, MO. His long term career goal is to become a physician at a teaching hospital.

Faculty Sponsor: Thomas Goyne

Student Contact: benjamin.hoemann@valpo.edu
Explorations in Real-Time Polymerase Chain Reactions

Claire Mammoser

*Departmental Affiliation:* Chemistry

Polymerase Chain Reaction (PCR) is a method by which a specific segment of DNA can be replicated for further analysis or to ascertain the presence of that sequence. Real-time (or quantitative) PCR allows researchers to view the amplification of the DNA segments both quantitatively and in real-time, providing faster results and an idea of the process and rate of the reaction. This real-time information is gathered using fluorescence detection, as fluorophores attach to the amplifying, double stranded DNA segments. The fluorescence detected is proportional to the amount of DNA replicated. We have used both conventional and real-time PCR to test the identity and genetic composition of various food samples, and to learn more about the process of PCR and its uses in research. First, we used a BioRad Fish DNA Barcode kit to test the identity of five fish samples. From this experiment, only one sample was successfully amplified and sent for sequencing. Next, we used a kit that tests for the presence of genetically modified genes in plants (GMO Test kit), also from BioRad, to test commercially available corn-based snack foods for the presence of GMOs, using SYBRgreen as the fluorophore for the real-time PCR reaction. The results from this genetically modified food experiment positively identified GMO genes in a Doritos™ sample, and gave expected control values which indicated a reliable analysis. In the future, we will use these tests as the basis for developments of new protocols for use in the classroom or in research.

*Information about the Author:* Claire Mammoser is a freshman chemistry student at Valparaiso University. Her future goals include graduate school, possibly in the area of food chemistry. This project relates to these goals because of its applications to the food industry. Claire is looking to continue her research in this area in future years and hopefully connect it to other projects in the Chemistry Department.

*Faculty Sponsor:* Laura Rowe

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Spectroscopic Study of Dye Isomerization in a Host-Guest Complex

Miroslava Repak

*Departmental Affiliation:* Chemistry

Host-guest complexes are systems in which a guest molecule binds to a host molecule through weak intermolecular interactions. β-cyclodextrin, the host molecule, is a seven-membered ring with a hydrophobic inner cavity and a hydrophilic outer surface. Brooker’s merocyanine, the guest, is a dye molecule with a photo-induced isomerization cycle. The isomerization of Brooker’s merocyanine was analyzed using UV-Vis spectroscopy to understand differences in the behavior of the dye in the solution and within modified β-cyclodextrin cavities. The molecule in solution undergoes minimal isomerization from the trans to cis configuration unless UV light is added. However, when the deprotonated dye is complexed with β-CD, it undergoes extensive isomerization without UV light exposure to relieve the strain inflicted by the cavity. Different chemical modifications, such as methyl β-CD, hydroxypropyl-β-CD and hydroxyethyl-β-CD, to the outer surface of the cyclodextrin have been studied to see how these modifications might affect this unique isomerization behavior. Further studies are being conducted to examine the binding of the different isomers of Brooker’s merocyanine to the modified β-cyclodextrins. By understanding guest behavior in the cavity, a molecular level understanding of host-guest chemistry will help to improve the practical applications of these materials.

*Information about the Author:* Miroslava Repak is biochemistry major from Schererville, IN. She will be attending Rosalind Franklin College of Medicine and Science in North Chicago to pursue a PhD in an interdisciplinary program in biomedical sciences. Her ultimate career goal is to work in a pharmaceutical industry.

*Faculty Sponsor:* Jennifer Holt

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Synthesis and Characterization of an Unnatural Fluorescent Amino Acid

Blagojce Trimoski, Yeongseo An

Departmental Affiliation: Chemistry

The goal of this project is to chemically synthesize a fluorescent amino acid that will later be used to build a protein that glows in the dark. Glow-in-the-dark proteins are of great value to biologists because fluorescent microscopy can then be used to observe the protein’s spatial and temporal location within a living cell. The specific objective of this project is to synthesize a 4-(N, N-dimethylamino) phthalimide-based environment-sensitive fluorescent amino acid. This will be accomplished by synthesizing two separate building blocks, 4-N, N-dimethylaminophthalic anhydride and allylN-α-Fmoc-N-β-L-diaminopropionate, coupling them together and finally removing a protecting group. Standard spectroscopy methods [nuclear magnetic resonance (NMR) and mass spectroscopy (MS)] will be used to characterize the synthetic intermediates and the final product. As soon as this fluorescent amino acid is in hand, we will use a screening system to determine whether or not it can serve as a building block for proteins.

Information about the Authors:
Yeongseo An was born on April 3, 1995 in Gwangyang, South Korea. She came to the United States as an international student during her sophomore year of high school. She graduated from Illiana Christian High School in Lansing, Illinois, in 2013, with high honors. She started her undergraduate career at Valparaiso University in the fall of 2013 in pursuit of a BS in biochemistry. She hopes to attend medical school immediately afterwards to obtain his MD/PhD.

Faculty Sponsor: Thomas Goyne

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Power, Collectivism, and the Failure of the 1911 Revolution: A Cultural Analysis

Jonathan Mack

Departmental Affiliation: Chinese and Japanese Studies

This paper contends that an awareness of China's national culture, particularly one informed by the use of a specific model like Geert Hofstede's cultural dimensions theory, provides valuable insight on complex issues in Chinese history. Although Hofstede's theory has been extensively studied, discussed, and cited by academics in other fields, it has yet to be widely applied by historians. This paper serves as an argument of relevance for Hofstede's theory to historical research in general, and represents a case study in using cultural models as a means of understanding history. To demonstrate the value of this approach, I will discuss the application of Geert Hofstede's cultural dimensions theory in explaining the failure of the 1911 Revolution. This popular revolution marked the end of the Chinese dynastic system and the establishment of a Republican government in China. However, the revolution was undermined by a series of political compromises and the endurance of power structures from earlier times. This paper uses cultural dimensions theory to explain these compromises and the deeply entrenched power structures that the revolution failed to overthrow.

Information about the Author:
Jonathan Mack is a senior at Valparaiso University studying Chinese and Japanese studies and accounting. His personal focus is on international business and cross cultural management. Always an avid lover of history, he has previously participated in a historical research trip to Shanghai. While there, he studied the experience of Jewish refugees in the city and authored an article entitled “Guardians or Traitors? A Study of the Jewish Pao Chia in Shanghai.”

Faculty Sponsor: Yun Xia

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"DO NOT HIDE" Campaign Against Sexual Harassment

Julian Fischer

Departmental Affiliation: Communication

Sexual harassment on university campuses is an issue with increasing relevance giving the shocking number of incidents reported each year. The actual number of assaults, however, is a lot higher than the amount of reported incidents. The “DO NOT HIDE” campaign aims to encourage victims of sexual assault to speak out and seek help. Six poster designs attract the viewers attention and inform and encourage victims to find help from Valparaiso University’s confidential Title IX coordinator. All poster designs follow the same principles and the similarities among each design help to profit from a high recognition value. The basic design of each poster relies heavily on imagery, depicting both male and female victims who express their shame and despair. Underneath the large copy is the contact information for victims to find help. The color scheme represents the seriousness of this topic and also catches the viewers attention. The black and white images transmit the victim’s emotional state while the bright yellow letters draw attention to the poster. When choosing the color scheme, the designer used the official colors of Valparaiso University to match the university’s style guide and coincide with its corporate design.

Information about the Author:
Julian Fischer, 22, is an exchange student from Germany, majoring in marketing. His strong interests in photography and graphic design led him to expand his creative horizons in the College of Arts and Sciences at Valparaiso University. Previous recognitions include the Scholastic Art & Writing Award by the Alliance for Young Artists & Writers in 2010 for his photography. Following his graduation in 2016, he plans to pursue a master’s degree in international marketing.

Faculty Sponsor: Yeohyun Ahn
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Sexual Harassment on Campus

Madeline Harty

Departmental Affiliation: Communication

Sexual harassment on college campuses has become a hot button topic as of late. Many universities are facing investigations into the various crimes that have been reported and neglected by officials. The purpose of this project is to address those statistics and the definition of sexual harassment in a university setting as well as to inform the viewer of the proper steps to report an incident. Using the information given by Title IX and the SAAFE office here on Valpo's campus, these posters will attempt to portray the information in an easy to read manner that is eye catching to college-aged students.

Information about the Author:
Madeline Harty is currently a junior studying digital media arts. She first became interested in this project when her professor selecting it as the topic for her final. However, as she researched the statistics involving sexual harassment on college campuses, she felt it was very important to communicate this information to the student body.

Faculty Sponsor: Yeohyun Ahn
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Removing the Stains of Dictatorship: Memory and Progress in Modern Chilean Cinema

Hannah Heagy

Departmental Affiliation: Communication

Chilean film production is intertwined with the events throughout the history of the country. The amount and types of films produced at different periods in Chilean history reflect social and political changes as well as the level of government support for the film industry. A period of oppressive censorship occurred from 1973 until 1990, during the dictatorship of Augusto Pinochet. Under this regime, many political dissidents fled the country, lost their lives, or simply "were disappeared." Chilean films since 1990 have addressed the traumatic themes of the dictatorship both directly and indirectly. Modern Chilean cinema can be seen as Chile’s journey to restore lost collective memory and find a national identity to project to the world through its films. The films in this project, all set in urban areas, explore their protagonists' search for identity and their relationship with their surroundings and society. A frequent theme in Chilean films since the end of the Pinochet regime is the loss of identity at the individual city and national levels. Viewers all over the world can be drawn into Chilean films by the relatable characters and learn about Chilean history and life in the process. Chilean film viewers both in Chile and all over the world have a chance, through films, to discover pieces of history that were censored in the past and reach towards a recovered collective
memory and new national identity.

Information about the Author:
Hannah Heagy is a senior German and Spanish double major and a humanities minor. She is a member of Christ College. Her interest in Chilean culture began in the summer of 2012 when she served as an intern with the YMCA in Valparaíso, Chile. Hannah spent her junior year studying in Tübingen, Germany and plans to pursue a career in teaching world languages.

Faculty Sponsor: Peter Lutze
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Male Rape Victims
Timothy Richmond

Departmental Affiliation: Communication

Sexual assault happens across the world and affects people across many different age groups and both genders. Often, male victims are overlooked. This is because of the negative stigmas of being a victim. I have created a couple of posters trying to raise awareness for those who are victims and for those who have interacted with victims. The campaign theme uses the ideas of speaking up, listening, and believing your peers.

Information about the Author:
Timothy Richmond is a communication major in his junior year. He is interested in using his creative talents in many ways including, but not limited to, playing instruments, creating projects in Photoshop, and writing.

Faculty Sponsor: Yeohyun Ahn
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Indie Labs
Jessica Sunblade

Departmental Affiliation: Communication

My submission is a website entitled Indielabs.com. The purpose of the website is to display projects being developed by engineers on a single website. This site serves to be a platform in which engineers from Valparaiso University can collaborate on their designs/projects. Also, it can display student projects and serve as an example to what prospective student engineers can expect. Much like Facebook, groups and projects will have their own profile pages to display their projects. Within these profile pages, students will display videos, summaries, and photos of their work as well as kick-start links to make contributions to the projects. The goal is obtain sponsorship for the innovative work being done on the site.

Information about the Author:
Jessica Sunblade is a junior from Chicago, Illinois. Her majors are digital media and journalism.

Faculty Sponsor: Yeohyun Ahn
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107 Seconds
Haylee Westendorf

Departmental Affiliation: Communication

107 Seconds is an art project stretching over many mediums and academic disciplines. Every 107 seconds, an American is sexually assaulted. My project, 107 Seconds, will bring awareness to the issue of sexual abuse and assault on the campus of Valparaiso University. Detailing faces of sexual abuse victims, this interactive installation will create a murmur around campus about this issue. Evolving from sketches, into illustrations, vectors, and then patterns, the final product will be a laser-cut acrylic tiled wall, with the intention of exhibition on campus. The installation will be supported by a well-designed handout explaining the project, statistics, and personal testimonials regarding the issue of sexual harassment and assault, especially within the campus of Valparaiso University.

Information about the Author:
Haylee Westendorf is a junior with a double major in communication and art digital media. This project stemmed from interaction with representatives of the SAAFE Office after an in-class presentation. The office’s main focus is bringing awareness and creating a dialogue about the issue of sexual harassment and assault on the campus of Valparaiso University. My project, 107 Seconds, is aimed at creating a platform for which students can communicate and discuss the issue, while sparking interest through a unique and attention-grabbing medium.

Faculty Sponsor: Yeohyun Ahn
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Determinants of Family Size

Hannah Dorman

Departmental Affiliation: Economics

A major concept in economics is the law of supply and demand, and individuals demand families. The average family size in the United States is 3.12; however, there is much variation from family to family in regions across the United States. In this project, I perform an econometric analysis to find the determinants of family size. The most prominent variable in determining family size is the size of the family in which an individual was raised.

Information about the Author:
No information provided.

Faculty Sponsor: Sara Gundersen

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Sales in India: An Econometric Regression Analysis

Zachariah Hughes

Departmental Affiliation: Economics

India has a labor force of almost 500 million, yet has an unemployment rate of approximately 8.8%. Forty-five million people are unemployed; therefore, making it important to examine what makes a company profitable. Using data provided by an Enterprise Survey questionnaire given to firms in 2006, I evaluate what effects the volume of sales on a firm level. Using SPSS, a theoretical model was tested and then modified to eliminate problems such as heteroskedasticity, multicollinearity, and serial correlation. I find that years in business and access to security have a positive, statistically significant impact on sales, while the firm being located in the owner's house has a negative, statistically significant impact on sales. I argue that the biggest ways to increase sales would be to register the firm with the government, increase employee compensation, and ensure that the firm will have some form of security to protect its assets. If Indian firms are able to become more profitable, the unemployment rate will decrease over time.

Information about the Author:
Zachariah Hughes is interested in two fields of economics - development economics and financial economics. In the Fall of 2014, he was given the opportunity in econometrics to perform a regression analysis on any set of data. He chose to combine his two passions and examine financial information and use it to predict profitability of a firm in India.

Faculty Sponsor: Sara Gundersen

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The Determinants of the Household Savings Rate in Ghana

Nandin-Erdene Munkhbat

Departmental Affiliation: Economics

This study tests for the determinants of the household savings rate in Ghana. The dataset that was used to run the regression analysis was drawn from the Ghana-Living Standards Survey 2005-2006, which was provided by the World Bank. Due to the nature of the data, the task to determine the factors of the household savings rate was not an easy one, but there were several useful things to conclude from this research paper. The total number of household residents and total household income were statistically significant in determining the household savings rate. On the other hand, age, gender, and marital status were not statistically significant.

Information about the Author:
Nandin-Erdene Munkhbat is from Ulaanbaatar, Mongolia. She is a senior, economics major and mathematics, French and Japanese minor. She speaks Mongolian, Russian, French and Japanese and studied abroad in Paris, France in 2013. The reason she chose this topic was because she was initially interested in the determinants of the household savings rate in Mongolia, but due to the lack of the data to define the savings rate, she chose Ghana instead.

Faculty Sponsor: Sara Gundersen

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From Epistolary to Narrative Novels: Truth and Self-Perception in Victorian Literature

Nadia Atassi

Departmental Affiliation: English

When the novel rose to prominence in the eighteenth century, it often employed the epistolary form, telling its story through letters and other written documents.
As it developed throughout the next two centuries, the narrative style changed, but the role of the letter still maintained an important role, albeit in different ways. This essay explores the relationship between letters and identity in Victorian literature, by analyzing novels from both before and after one of the greatest instances of postal reform: the Uniform Penny Post (1840). In this essay, the author explores how the role of letters changed in British society from the eighteenth to the nineteenth centuries; as the post expands its reach to all of England, and eventually the world, the factors affecting British identity change, as new world-views and ways of experience are introduced into the British psyche. This creates a parallel shift in the literature: before the expansion of the post, the novel deals with individual characters, their interior selves, and the truth of individual experience. As the post grows to allow communication across the country, the novel begins dealing with characters' relationships to the nation and new themes and ways of knowing and experiencing. And when the post reaches more parts of the world, the novel's scope expands to deal with new factors influencing, and undermining, identity. In each case, primary emphasis is placed on the form and content of the letter and its role in analyzing the British understanding of the self in Victorian literature.

Information about the Author: Nadia Atassi is a senior majoring in English literature. This project was born out of her initial interest in how letters serve to enhance the experience of reading a novel, based on her own experience, and as the Victorian era is one of her principal research interests, and the century that saw the novel come into its own, she brought these two ideas together to analyze the fascinating Victorian world and sense of self.

Faculty Sponsor: Sara Danger

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The Topsy-Turvy Gender Carnival: The Use of Humor in Little Women

Nicole Thompson

Departmental Affiliation: English

Louisa May Alcott’s Little Women depicts the transitions from adolescence to womanhood of Jo March and her three sisters. This transformation demands self-sacrifice and self-denial as the girls cultivate the ideal feminine virtues of piety, purity, submissiveness, and domesticity. And yet, as often as the rhetoric of the text advocates woman’s self-negation, the rhetoric also unveils women’s resistance to prevailing gender norms through its portrait of the tomboyish Jo. Many critics believe that Jo’s explicit voicing of anger regarding gender constructions of femininity is the key to understanding her resistance; however, explicit displays of temper only reveal half of Jo’s defiance. Jo also utilizes humor as another way to subversively question gender ideals. In particular, Jo harnesses what M.M. Bakhtin calls carnivalesque humor as means of destabilizing and even overturning culturally imposed gender restraints. Jo’s comedy articulates her battle against domesticity by inverting the societal expectations of femininity and thereby resisting them. By the end of the novel, Jo has to accept more of a domestic role: however, the carnivalesque humor in the text does not altogether disappear. Instead of the overt verbal humor seen in Jo’s dialogue, Alcott’s narrator continues to utilize ironic and subversive humor to cast a negative light on society’s gender ideals.

Humor needs to be read as one of the most essential sources of subversive social criticism in Alcott’s famous portrait of girlhood.

Information about the Author: No information provided.

Faculty Sponsor: Sara Danger

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Beauty and the Beast in Cinema: A Challenge to Gender Roles

McKenzie Cobban

Departmental Affiliation: Foreign Languages and Literatures

La Belle et la bête, better known as Beauty and the Beast, was written in 1756 by a French author, Madame Leprince de Beaumont. Many adaptations have appeared since, but two of significance are by French director Jean Cocteau in 1946 and by American Disney directors Gary Trousdale and Kirk Wise in 1991. The protagonist, Belle, challenges gender roles in both these film adaptations and the original. In the 18th century when Leprince wrote the original fairy tale, women were considered inferior to men. As a rare female author, she wanted to teach both genders that women do not need to marry because it is expected of them; they should marry for love. This story thus marks the birth of romantic love. In the WWII era adaptation by Cocteau, men were in charge and women were supposed to obey. However, Cocteau made Belle the head of the household, and
the beast was subservient to her. This role reversal represented his own challenge to tradition as a homosexual man. The Disney adaptation came about during the third wave of feminism. Modern women wanted a new type of princess: one who is intelligent, independent, and not concerned with marriage. Leprince, Cocteau, and Disney use literature and film to challenge gender roles in their cultures. Each portrays Belle as the opposite of what society deems as a traditional female, whether she marries for love, disobeys commands, or is intelligent and independent.

Information about the Author:
McKenzie Cobban is a senior French and international economics and cultural affairs double major. Studying French and spending a semester in Paris, she has developed a passion for French language and culture. Combined with her love for fairy tales and passion for gender equality, the challenge of gender roles in a French fairy tale was the perfect topic for her French senior seminar paper. Also, working to promote human rights is a possible career path.

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Perceval for All Time: Searching for the Holy Grail in Literature and Film

Charlotte Lindstrom

Departmental Affiliation: Foreign Languages and Literatures

Perceval, the last romance of medieval poet Chretien de Troyes, recounts the adventures of a young knight who stumbles upon a mysterious castle with even more mysterious objects inside, one of which he later learns is the Holy Grail. He leaves the castle before he can even ask about these objects and is then resigned to wandering the forests in search of them. Because Chretien left this work unfinished, we don't know if Perceval finds the grail again, though several authors have written continuations of the story, and it continues to fascinate authors as well as filmmakers today. This paper examines two particular adaptations, Eric Rohmer's 1978 Perceval le Gallois and Terry Gilliam's 1991 The Fisher King and how they adapt their scripts to the unfinished nature of the original story. Though very different from each other, both films present an understanding of the story. Rohmer's adaptation is set in modern times and has a new take on the plot and characters. Both films tackle an unusual task by adapting an unfinished story, continuing our search for the meaning of the mysterious grail.

Information about the Author:
Charlotte Lindstrom is pursuing a bachelor's degree in church music and French language. She became particularly interested in the connections between literature and film while studying the two in the French senior seminar and chose the story of Perceval because of the fascination that continues to surround the story of the Holy Grail (from academic debates to Monty Python, we all love a good quest!)

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Washington Windstorms: Seasonality and Relationship to ENSO

Alexandra Caruthers

Departmental Affiliation: Geography and Meteorology

Powerful windstorms, such as the Columbus Day Storm of October 1962 and the Inauguration Day Storm of 1993, pose a great threat to the state of Washington (WA). The strongest windstorms are those that receive names and have historically occurred during the neutral phase of the El Niño-Southern Oscillation (ENSO). However, there have been too few of these named storms to establish a definitive statistical relationship with ENSO. To examine this issue further, a more rigorous study has been performed using hourly wind observations from 1948-2013 for twelve ASOS stations throughout the state. The seasonality of the wind data was analyzed, as well as the relationship to ENSO. These results indicated that strong winds can occur year-round, especially in eastern WA where the seasonal cycle of winds is less apparent. Using the top 0.1% of all hourly wind observations, different statistical procedures were considered to determine a relationship between wind and ENSO. The analysis revealed a less pronounced relationship between wind storms and ENSO, as the phase of ENSO is an indicator for the likelihood of windstorms at only four of the twelve stations.

Information about the Author:
Alexandra Caruthers is a meteorology and mathematics major with a minor in geography. This work was initially a summer research project at the
A Biogeographic History of the Plains Bison Focusing on Population and Range Dynamics

Grace Roman

Departmental Affiliation: Geography and Meteorology

Early bison originated in Asia and migrated to North America by means of the Bering Land Bridge, which opened around 600,000 years ago. Just after the Wisconsin glaciation (11,700 years ago), there were two allopatric species of bison residing in North America - the plains bison (Bos bison bison), and the woodland bison (Bos bison athabascae). European explorers and settlers recorded incredible numbers of bison in most parts of the present day United States. Bison thrived in North America until the mid-19th century, but experienced a drastic decline in population from about 60 million to only 1,000 as European settlers headed west. Currently, 95% of extant bison are part of industrial corporations that raise them for their meat and other byproducts. This paper explores the natural history, geographic distribution, near extinction, recovery, and current status of the bison within the United States.

Information about the Author:
Grace Roman is currently a sophomore majoring in geography and biology and also pursuing a minor in American Indian studies at Valparaiso University. The purpose of this paper was to fulfill an assignment in a biogeography class this past fall. The topic of this paper was inspired by Grace's minor and the close ties many Native American groups have to the plains bison. Her current pursuits include narrowing her interests within her majors.

Faculty Sponsor: Bharath Ganesh Babu
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The Influence of Climate Patterns on the Wintertime Weather of the Ohio and Tennessee Valleys

Allison Young, Russell Danielson, Katelyn Zigner

Departmental Affiliation: Geography and Meteorology

While the general winter effects of the El Nino-Southern Oscillation (ENSO), North Atlantic Oscillation (NAO), Arctic Oscillation (AO), and Pacific Decadal Oscillation (PDO) in the Ohio and Tennessee Valleys are known, this study digs deeper into the analysis of how the phenomena work in synergy to modulate winter weather conditions in the area. In an effort to develop a climatology-based forecasting tool, historical temperature, precipitation, and snowfall data since 1950 were analyzed in comparison to different phases of these larger circulation patterns. This analysis was performed for 123 Local Climatological Data (LCD) and Cooperative Observer Program (COOP) sites within the area of study. The study utilized many resources, including xmACIS2, the Local Climate Analysis Tool (LCAT), Climate Prediction Center (CPC) database, R statistical software, and ESRI Geographic Information System (GIS) programs.

The first phase of the project calculated standard deviations and averages for each station and weather variable in the study region. Results highlighted the importance of considering the joint effects of larger circulation patterns on seasonal prediction, as they can either reinforce the effects, cancel out the impacts, or have no effect on future prediction. These results fostered a curiosity in quantifying the impact of each larger circulation pattern on the wintertime weather of the Ohio and Tennessee Valleys. We hypothesize that a certain combination of these patterns will be able to give significant indications of the typical weather patterns of the area of interest and any potential for dangerous weather in the upcoming seasons.

This multi-faceted study will allow forecasters to identify upcoming seasonal trends to facilitate a Weather-Ready Nation by answering customer questions as they prepare for unique cyclical weather challenges. In addition, forecasters will be better equipped to anticipate day-to-day weather patterns and storm behavior based on ENSO and NAO phase combinations to enhance user decision support.

Information about the Authors:
This project is an extension of summer research sponsored by the NOAA Hollings Scholarship program and the Data Analysis class that the authors are enrolled in. Allison Young and Russell Danielson are seniors at VU. Katelyn Zigner is a junior.

Faculty Sponsor: Craig Clark
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An Analysis of Tornado Climatology in the United States with Special Reference to the 2013 Event in Moore, OK

Katelyn Zigner

Departmental Affiliation: Geography and Meteorology

One of the most fascinating meteorological phenomena are tornadoes, which are difficult to predict and have the potential to be extremely destructive. By visualizing and analyzing the general spatial and temporal patterns of these convective events, a more complete understanding of their climatology can be gained in order to predict and account for damaging effects. Through exploring questions such as, “Where and when do tornadoes (significant and nonsignificant) occur the most?” and “Is there a spatial pattern to their climatology?” researchers are able to take past records and analyze spatial characteristics. Data from more than 50 years with the geographic location of tornadoes, intensity, path, date, time, etc. were utilized to study tornado climatology in the United States and, in particular, the spatial locations were examined. One specific tornado event from 2013 in Moore, Oklahoma was rated as EF5 and further examined through geospatial analysis and visualization tools.

Information about the Author:
Katelyn Zigner is a junior meteorology and geography double major with mathematics and digital media minors. She is particularly interested in climatology.

Faculty Sponsor: Bharath Ganesh Babu

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Rhetoric of Restoration and Reform: Franklin Delano Roosevelt’s 1932 Campaign for the Presidency

Alexander Uryga

Departmental Affiliation: History

Oftentimes, President Franklin Roosevelt's first One Hundred Days in office and his New Deal are treated as a rupture, according to the most recent histories. But did Franklin D. Roosevelt frame his 1932 campaign for the presidency as a revolution and rupture or a restoration and reforming of the American republic? Therefore, this paper undergoes a thorough rhetorical analysis of speeches made by Franklin Delano Roosevelt during the 1932 campaign as Roosevelt tries to send a message of why the American people should vote for him. This paper will show that Franklin Delano Roosevelt's 1932 campaign for the presidency employed rhetoric of restoration and reform. Firstly, F.D.R. employed rhetoric of restoration as an appeal to nostalgia to persuade the American people in the hopeful promise of restoring the republic to its prior greatness. Secondly, F.D.R. employed rhetoric of reform as an appeal to change to convince Americans in reforming what was wrong within the United States. As a result, Democratic New York Governor Franklin Roosevelt won the 1932 presidential election over incumbent Republican President Herbert Hoover.

Information about the Author:
Alexander Uryga is a Valparaiso University Christ College Honors College Scholar and previous president of the student body. He is receiving his Bachelor of Arts in political science and history in May. After his successful spring 2013 campaign for student body president, his interest in rhetoric and speech skyrocketed. Alex became enthralled with the campaign of Franklin Delano Roosevelt. Someday, he hopes to use history to help him earn a graduate school doctoral degree in political science.

Faculty Sponsor: Heath Carter

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Comparison of Electromyography and Functional Movement Screening as Indicators of Return to Full Activity: A Case Study

James Alessio, Kelly Helm

Departmental Affiliation: Kinesiology

The purpose of this study was to determine the efficacy of combined FMS and EMG measurements as indicators of return to full activity post-arthroscopic knee surgery. The question was: Are there any advantages to using both FMS and EMG as indicators of return to full activity? Prescreening of a physically active female prior to arthroscopic knee surgery included FMS and EMG assessments as well as 30 cm box jumps and LESS jumps. Post-surgery assessments occurred weekly with final assessment collected week nine post-surgery. Nine-week FMS data analysis indicated that full recovery from surgery had been realized. Pre-surgery FMS and nine-week post-surgery FMS scores were both 16. Nine-week EMG data analysis did not indicate that full recovery had occurred. Rectus Femoris activation post-surgery for FMS squat indicated 33% less strength than pre-surgery and 46% more power pre-
surgery than nine-weeks post. EMG and FMS scores combined may be a better indicator of full recovery post knee arthroscopy than either alone. Nine-week FMS score indicated that full recovery from surgery had occurred, nine-week EMG data revealed otherwise. The EMG scores may be better predictors of risk of injury if subject pursues rigorous dynamic activity too soon.

*Information about the Authors:*
No information provided.

*Faculty Sponsor:* Kelly Helm

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**Psychological Impact of Football Related Concussions**

Krista Besser

*Departmental Affiliation: Kinesiology*

Sports related concussions are more prevalent now than ever. This study examines the relationship between collegiate football players who have sustained concussions and their emotional state. The question to be answered is, what is the impact of a sports related concussion on a collegiate football players emotional state? Two attributes central to this study are depression and anxiety. The Beck Anxiety Inventory and Beck Depression Inventory are instruments for data collection and will be distributed to all members of a collegiate football team prior to a Spring practice. Players will not be identifiable and responses will be analyzed according to each scale associated with each instrument.

*Information about the Author:*
The author is an exercise science major with a minor in human biology and psychology. After graduation, the author plans to go to graduate school to become an occupational therapist. This study examines the relationship between body and mind. This study will help with the author’s future plans of study.

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**The Impact of a 5-Week Shoulder Strengthening Program on Division I Swimmers**

Megan Mariani

*Departmental Affiliation: Kinesiology*

Poor shoulder strength in swimming may lead to shoulder injury in swimmers. The objective of this study was to determine the impact of a five-week shoulder strengthening program on division I collegiate swimmers. Eighteen participants from the University men’s and women’s swimming teams participated in a control group (n=8) and experimental group (n=10). Both groups were evaluated pre-exercise program using a shoulder
strength dynamometer designed to measure the strength of shoulder extension and internal rotation. The experimental group was given five exercises to perform three days per week for five weeks. Both groups were evaluated again post-exercise program. All exercises performed by the experimental group were done on the pool deck. Data is still in collection process.

*Information about the Author:*
Megan Mariani is a senior kinesiology major with an interest in a career in physical therapy and sport specific training. She has been a swimmer for 11 years and her interest in shoulder stability and strength was motivated by her own shoulder injury and rehabilitation.

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**Non-Crossing Matchings in the Annulus**

Puttipong Pongtanapaisan

*Departmental Affiliation: Mathematics and Statistics*

The Catalan numbers are a sequence of integers that count various recursively-defined objects, as well as many structures that are important in mathematics and computer science. It is well known that the number of distinct non-crossing matchings on $2n$ points in the half-plane equals the $n$th Catalan number. Our work generalizes this notion of non-crossing matchings, as well as the circular matching of Golbach and Tijdeman, to non-crossing matchings in the annulus. We present results enumerating these annular matchings. We also develop interesting bijections between specific classes of annular matchings and well-studied mathematical objects such as combinatorial necklaces and planar graphs.

*Information about the Author:*
Puttipong Pongtanapaisan is a senior mathematics/music major.

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**Neutral Pion Asymmetries at Intermediate Pseudorapidity in Transversely Polarized p+p Collisions at $\sqrt{s}=200$ GeV**

Samuel Brandt

*Departmental Affiliation: Physics and Astronomy*

Among the unanswered questions pertaining to nucleon spin physics is the origin of large azimuthal asymmetries ($A_N$) found in neutral pions produced at forward pseudorapidity from high-energy transversely polarized p+p collisions. One possible explanation is offered by twist-3 parton distribution and fragmentation functions. In order to test these and other mechanisms, it is important to study how the asymmetry changes over a range of pion kinematics. The STAR Endcap Electromagnetic Calorimeter (EEMC) is the only RHIC detector with the ability to study $A_N$ for neutral pions in the kinematic range available at intermediate pseudorapidity. STAR recently published the first measurement of $A_N$ for neutral pions at intermediate pseudorapidity using data collected in 2006 with collision energy $\sqrt{s}=200$ GeV. In 2012 STAR collected a high-statistics dataset with transverse beam polarization at $\sqrt{s}=200$ GeV. This offers over a five-fold increase in integrated luminosity relative to the 2006 dataset and a chance to enhance the precision of the previous results. The primary objective of this study is to determine the quality of the data from 2012 and to estimate the final statistical uncertainty. Preliminary results from this study indicate a significant improvement over the 2006 results.

*Information about the Author:*
Samuel Brandt is a sophomore physics and humanities major from Portland, OR. He conducted this research over the past summer and presented it at the DNP conference in October. He was drawn to this research by the faculty in the Physics Department and will be interning at Pacific Northwest National Lab this coming summer.

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An Ortho/Para Deuterium Converter for Ultra-Cold Neutron Production at Los Alamos National Laboratory

Adam Clark

Departmental Affiliation: Physics and Astronomy

The production of Ultra-Cold Neutrons (UCN) is essential for a number of experiments whose goal is to make precise measurements of neutron properties. With order-of-magnitude improvements in precision provided through the use of UCN, scientists plan to push towards physics beyond the Standard Model. At Los Alamos National Laboratory (LANL) a solid deuterium target is used for UCN production. As a result of previous studies, it is known that the storage time of UCN is dependent on the spin state of the deuterium target. The spin = 1 state of deuterium (para-D$_2$), in which approximately one-third of the D$_2$ molecules can be found, results in a shorter UCN residence time. Therefore, to lengthen the storage time, a conversion to the ground state (ortho-D$_2$) is required. Because, in a solid sample of D$_2$ it would take months for the sample to spontaneously relax to the required percentage of 99.8% ortho-D$_2$, an Ortho/Para converter is used to accelerate the conversion. This project focuses on the design of a new, improved Ortho/Para Converter. The design requirements for the new Ortho/Para Converter for the LANL UCN system will be discussed.

Information about the Author:
Adam Clark is a senior physics major from New Lenox, Illinois. Upon graduation, he will continue his education and pursue a Ph.D. in nuclear physics. The work presented is for the neutron Electric Dipole Moment collaboration with scientists working at Los Alamos National Laboratory.

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Electrostatic Calculations for a nEDM Experiment

Adam Clark

Departmental Affiliation: Physics and Astronomy

The need for high electric fields not directly obtainable with currently available high voltage power supplies are a concern for a number of nuclear physics experiments. In the search for the neutron Electric Dipole Moment, the precision of the experiment is dependent upon many variables. One such variable is the strength of the electric field that can be produced. In order to overcome the present limitations and obtain an electric potential of ~650kV, a method involving parallel-plate capacitors connected in parallel is under exploration. Approximations based off a number of assumptions for this method have suggested that it is viable. Calculations of the voltage gain produced by the geometry specific to the experiment will be presented.

Information about the Author:
Adam Clark is a senior physics major from New Lenox, Illinois. Upon graduation, he will continue his education and pursue a Ph.D. in nuclear physics. The work presented is for the neutron Electric Dipole Moment collaboration with scientists working at Los Alamos National Laboratory.

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Modeling the Binary Central Star of the Planetary Nebula Lo 16

Brendan Ferris

Departmental Affiliation: Physics and Astronomy

Binary central stars of planetary nebulae (CSPNs) have become increasingly popular in exploring the evolution of planetary nebulae (PN). For this project, I plan to model one binary CSPN in particular, PN Lo 16, using existing light and radial velocity curves. The central star of Lo 16 is an eclipsing binary system and both stars have visible spectral features. These features allow me to determine the physical parameters of the system. From this model I have obtained, for both stars, their effective temperatures (T), surface gravity (log g), radius (R), mass (M), and Luminosity (L). I have also determined the orbital period of the binary (days), orbital separation (a), and orbital inclination (i) of the system.

Information about the Author:
Brendan Ferris is a senior physics major with a minor in mathematics and computer science. The project was inspired by his interest in astronomy and astrophysics and is his senior research project for the department. Currently, Brendan plans to either attend graduate school in condensed matter physics or find a job working in the green energy industry.

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Computational Modeling of Bromide and Chloride Catalyzed Formation of Sulfilimine Crosslinks

Taegyun Kim, Zygmunt Stan, Haiying He, Christopher Morrissey

*Departmental Affiliation: Physics and Astronomy*

A recent experimental study has demonstrated the essential connection between the concentration of ionic bromide (Br\(^-\)) and the effective formation of sulfilimine crosslinks for assembly of collagen IV scaffolds in tissue development and architecture. In contrast, ionic chloride (Cl\(^-\)) is shown to have a stronger preference for the formation of sulfoxide groups with at least 50,000 times less efficiency than Br\(^-\) to catalyze the formation of sulfilimine crosslinks. In this work, we have carried out a comparison study of Br\(^-\) and Cl\(^-\) for sulfilimine and sulfoxide formation reactions using the density functional theory. The NC1 domains of collagen IV scaffolds are modeled by small clusters maintaining key functional groups at residues methionine 93 (Met\(^93\)) and hydroxylysine 211 (Hyl\(^{211}\)). We have searched for the minimum energy pathway for each reaction from a vast exploration of possible pathways in aqueous solution. Our results show qualitative agreement with experiment. The reaction mechanism and the different behavior of Br\(^-\) and Cl\(^-\) in catalyzing these reactions will be discussed.

*Information about the Author:*
Tae gyun Kim is Korean.

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The Dependence of Radon Concentration on Meteorological Phenomena

Kelsey Larson

*Departmental Affiliation: Physics and Astronomy*

Pressure gradients between gas trapped in the soil and the interior air are known to influence the rate at which radon gas enters buildings. These pressure gradients have been experimentally connected with natural fluctuations in atmospheric pressure and other types of meteorological phenomena. Recently, there have been observations in Valparaiso households that the radon concentration fluctuates over a 24-hour period. To determine if changes in atmospheric pressure are responsible for this oscillation, a known radon source was monitored in the lab in conjunction with the interior pressure. From this study, the radon peaks were determined to correspond with decreases in pressure. The study was further expanded to study the radon concentration dependence on atmospheric pressure in three local Valparaiso households over 90 hour intervals. The results of this study will be disclosed in the presentation.

*Information about the Author:*
Kelsey Larson is a chemistry and physics double major pursuing PhD programs in atmospheric/environmental science with a specific focus in atmospheric chemistry and air quality. This specific project was chosen as part of a senior research project that uniquely combined air quality, atmospheric dynamics, and nuclear physics and, as such, is a stepping stone to working with chemical detection/modeling in graduate school.

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Design of a Magnetic Field Mapping Rover System for a Neutron Lifetime Experiment

Matthew Libersky

*Departmental Affiliation: Physics and Astronomy*

The beta decay lifetime of the free neutron is an important input to the Standard Model of particle physics, but values measured using different methods have exhibited substantial disagreement. The UCNtau experiment in development at Los Alamos National Laboratory (LANL) plans to explore better methods of measuring the neutron lifetime using ultracold neutrons (UCNs). In this experiment, UCNs are confined in a magneto-gravitational trap formed by a curved, asymmetric Halbach array placed inside a vacuum vessel and surrounded by holding field coils. If any defects present in the Halbach array are sufficient to reduce the local field near the surface below that needed to repel the desired energy level UCNs, loss by material interaction can occur at a rate similar to the loss by beta decay. A map of the magnetic field near the surface of the array is necessary to identify any such defects, but the array's curved geometry and placement in a vacuum vessel make conventional field mapping methods difficult. A system consisting of computer vision-based tracking and a rover holding a Hall probe has been designed to map the field near the surface of the array, and construction of an initial prototype has begun at LANL. A description of the design and prototype will be presented.
An Examination of STAR 2012 π0 Data with Longitudinally Polarized Proton Collisions at 500 GeV

Stephen Place

Departmental Affiliation: Physics and Astronomy

A recent global analysis of the proton spin has provided evidence for positive gluon polarization Δg(x) for the momentum fraction range of 0.05 < x < 0.20. The region x < 0.05 remains relatively poorly constrained, and may provide a significant contribution to the spin of the proton. The STAR detector can be used to measure the effects of quark and gluon spins in the proton through the measurement of asymmetries in neutral pion production for different polarization states. The Relativistic Heavy Ion collider at Brookhaven National Laboratory is uniquely able to collide polarized protons. Data from the proton-proton run in 2012 has significantly higher integrated luminosity at a higher center of mass energy of 500 GeV than previous datasets, allowing better access to Δg(x) at low x. The STAR endcap electromagnetic calorimeter, or EEMC, is able to detect neutral pions in the range of pseudorapidity 0.8 < η < 2.0, a region at this energy where Δg(x) for x < 0.05 can be examined. Preliminary work on 2012 data will be shown.

Information about the Author:
Stephen Place is a junior physics major.

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Searching for Companion Stars to Planetary Nebula Central Stars Using Near-Infrared Spectroscopy

Hannah Rotter

Departmental Affiliation: Physics and Astronomy

When a star like our Sun dies, it swells into a red giant and then expels its outer layers to form a planetary nebula surrounding the remaining core of the star. The outer layers then disperse into space leaving the core of the star behind as a white dwarf. The cause of the many exotic shapes in planetary nebulae is unknown. However, it is thought that binary stars may play a role in the shaping process. In this project, we are searching for binary central stars in planetary nebulae by near-infrared spectral analysis to detect cool companion stars. A companion can also be detected from Doppler Shifts due to orbital motion. In addition, spectral analysis gives us the stellar temperatures, narrowing the possible parameter space for future modeling of any detected binary systems.

Information about the Author:
Hannah Rotter is a senior physics major at Valparaiso University. She has participated in summer research in astronomy for the past three summers and is expanding on her previous research in her senior research project. She hopes to continue research in astronomy and astrophysics in grad school.

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Accomplished and Noxious: The Legacy and Image of President Richard M. Nixon from 1974 to 2014

Alexander Uryga

Departmental Affiliation: Political Science and International Relations

Overall, what is President Richard M. Nixon's lasting legacy? The public, consisting of historians, journalists, scholars, and other writers, have retrospectively, written about President Richard M. Nixon and what his contribution, impact, or lasting legacy is to America since his resignation over 40 years ago. At one point in time or another, the perception of President Richard M. Nixon has been either good, favorable, and positive because of his fighting instincts, or bad, negative, and unfavorable because of the scandal known as Watergate. But what most of these accounts fail to address is whether or not there has been a change or evolution in the president's legacy across several points or moments in time. Therefore, this paper undergoes a thorough qualitative analysis of articles from six newspaper companies published after Richard M. Nixon's resignation in 1974, almost 20 years after his resignation with his passing in 1994, and 40 years...
after his resignation in 2014. This paper will show how President Richard M. Nixon's lasting legacy is his accomplished and noxious image, which has been perpetuated by the public's perception of him in their minds. As a result, President Nixon is not gone: his legacy lives on.

**Information about the Author:**
Alexander Uryga is a Valparaiso University Christ College Honors College Scholar and previous president of the student body. He is receiving his Bachelor of Arts in political science and history this May. Over the past summer, articles, documentaries, and movies started appearing in anticipation of the 40th anniversary of President Richard M. Nixon's resignation which lead Alex to become intrigued about Nixon's legacy. Someday, he hopes to go to graduate school to earn a doctoral degree in political science.

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**The Effects of Individualism and Collectivism on Memory**

Holly Griskell

**Departmental Affiliation:** Psychology

Harry Triandis (1995) proposed that all people have some level of individualism and collectivism and that these tendencies are either encouraged or suppressed by culture. This study investigates levels of individualism and collectivism (I/C) in undergraduate students at Valparaiso University as well as students' memory for individualist and collectivist words. I/C levels were assessed using the Auckland Individualism and Collectivism Scale (AICS) (Shulruf et al, 2011) and memory for I/C words was assessed using a stimulus word presentation and a free recall task. The results showed that on average, students recalled significantly more individualist words than collectivist words. This study also examined the correlation between AICS score and the I/C word recall in addition to looking at correlations between students' self-ratings of the I/C words and word recall. These correlations were significant for the collectivism AICS score and collectivist word recall as well as collectivist self-rating and collectivist word recall, but the same results were not found with individualism. It is important to study individualism and collectivism since these constructs have an impact on the way people view themselves, the world, and those around them. Looking at ways in which these constructs affect cognitive processes such as memory can help people to become more aware and more understanding of others, especially as intercultural interaction becomes more frequent.

**Information about the Author:**
Holly Griskell is a senior psychology and Spanish double major, who is presenting this project as part of her honors work in psychology this year. She is interested in culture and the role that it might play in cognition, particularly memory. After graduation, Holly plans to pursue graduate study in developmental psychology with an emphasis on bilingualism and language.

**Faculty Sponsor:** Jim Nelson

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**A Case Study of the VU Social Work Department Advising Transition**

Rebekah Miller, Madalyn Harvey, Dejana Nonkovic, Sara Von Borstel, Nicole Maenza

**Departmental Affiliation:** Social Work

This research project focuses on one aspect of the implicit curriculum within the Social Work Department at Valparaiso University, that of advisement. Specifically, this research was conducted in order to understand the experiences of students during the transition from faculty members as advisors to a single professional academic advisor. Grady (2011) created a survey for the purpose of studying the implicit curriculum in a masters program. Based on that work, we have constructed a survey specific to advising and mentorship that will be used in the present study. We hypothesize that the transition has had a negative impact on faculty-student relations in the Social Work Department and that relationships have not yet been cultivated between students and the professional academic advisor. Data will be collected through surveys and interviews with social work students. It is our intention to provide feedback about the process of advising to the VUDSW based on the findings of this research.

**Information about the Authors:**
Four of the five researchers are junior social work majors. One researcher is a social work minor, and all have been affected by this transition from faculty members as advisors to one professional academic advisor. This made the researchers curious about how the rest of the Social Work Department experienced this transition. They want to find out if this transition was a positive or negative change for the department,
regarding the relationships between students and faculty. Then they plan to give feedback to the department about the experiences and attitudes of students about this transition.

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**Professional Development Experienced Through an Undergraduate Social Work Curriculum**

Jennifer Reed, Sara Lukach  
**Departmental Affiliation:** Social Work

Individuals enter the VU Social Work Department at different points in their collegiate careers. We are interested in studying how this affects their ability to implement the core competencies into their social work identity. In order to examine this, we will be researching how individuals feel at different levels of their undergraduate career in relation to how they feel about their professional identity.

**Information about the Authors:**  
The authors are junior social work majors who are passionate about the development of professional identity of social work majors. They are curious to observe how individuals feel that they have changed not only through the curriculum but through their internship experiences as well as they move through the social work program.

**Faculty Sponsor:** Jane Barden  
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**Experience of Diversity within the Social Work Department**

Melanie Schmidt, Lindsay Roettger, Brendan Flaherty, Arianna Cussick  
**Departmental Affiliation:** Social Work

The purpose of this research is to improve understanding of the Implicit Curriculum in the Valparaiso University Department of Social Work. Implicit Curriculum, as defined by the Council on Social Work Education, is "the educational environment in which the explicit curriculum is presented" (CSWE, 2008). Specifically, this project will examine how students from racial, ethnic, religious, and gender majority and minority groups experience the discrepancy between the lack of diversity in the Department of Social Work versus the diversity focus presented in the explicit curriculum. This research will take place in the VU Department of Social Work. We will recruit participants from social work classes by asking them to complete a demographic questionnaire. We will then be interviewing participants based on their answers to the questionnaire.

**Information about the Authors:**  
All the authors are junior social work majors who attend Valparaiso University, Lindsay Roettger, Melanie Schmidt, Brendan Flaherty, and Arianna Cussick are interested in researching diversity issues. They all found it puzzling that in the classroom setting and field setting, they are suppose to practice diversity, but there is no diversity in the classroom.

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Quantifying Nitrate Leaching From Autumn Olive into Groundwater

Kathryn Jackson, Steven Warner, Dana Hinaman, Zuhdi Aljobeh

Departmental Affiliation: Civil Engineering

Elaeagnus umbellata (Autumn Olive) was introduced to the United States in 1830 as a means of fast growing wildlife habitats and for erosion control. The Asian native plant is now an invasive species that disturbs the plants that are native to the United States. The autumn olive has nitrogen-fixing roots which allow the plant to grow in a variety of soil types, making it all the more invasive. When there is a heavy rainfall, highly mobile nitrate residual from the plant roots may be washed through the soil and enter the groundwater. Nitrate is the form of nitrogen that primarily affects groundwater and if untreated is toxic to children under a year old and small animals. A farm containing a large population of autumn olive plants was used as a research site for nitrate testing. In the fall of 2014, 16 lysimeters were installed to collect groundwater; eight placed near an autumn olive plant as samples, and eight placed away from the plants in a neutral area as controls. Groundwater was collected from each of the 16 lysimeters weekly until the first snowfall. The water was tested for nitrite, nitrate, and total nitrogen within 24 hours of being retrieved. Potassium and hardness testing was also conducted. Current results show that nitrate levels are higher near the autumn olive plants compared to the controlled locations. The results of the research have not yet been completed due the continuing collection from the lysimeters into the spring.

Information about the Authors:
Kathryn Jackson, Steven Warner, and Dana Hinaman are civil engineering students at Valparaiso University. Kathryn and Steven will be graduating in May 2015, Dana in May 2016. Kathryn plans on entering the engineering field for a few years until she returns to school to pursue a graduate degree in civil engineering and educate engineering students at a university level. Steven plans on entering the engineering field as a design engineer, later pursuing a masters degree in civil engineering. Dana also plans on working as an engineer in the field until she returns to school to pursue an MBA degree. Dr. Zuhdi Aljobeh, P.E. is an associate professor of civil engineering at Valparaiso University. His teaching, research, and practice are in the areas of environmental engineering and stormwater management.

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Microscopic Simulation and Safety Analysis of Roundabouts

Joshua Wolfgram, Ryan Saline, Jesus Osorio, Nezamuddin

Departmental Affiliation: Civil Engineering

Although circular junctions are usually associated with the British, their presence in the United States dates back to at least 1905. Those early twentieth century circular junctions, called traffic circles, were designed for high-speed entries into the circular area and gave priority to the entering vehicles over the circulating vehicles. The resulting high crash frequency and choked traffic circles associated with these intersections stopped the spread of circular junctions in the United States. In the 1960s, the United Kingdom introduced the mandatory yield-at-entry rule at circular junctions, which led to the birth of the modern roundabout. Safety is the hallmark of modern roundabouts, as they reduce both the frequency and severity of crashes. The first modern roundabout in the United States was built in Nevada in 1990 and their number is steadily rising since then: 38 in 1997, more than 2,000 in 2010, and over 3,500 at present. Initial resistance by the public usually changes to a favorable response upon the completion of roundabouts. As a result, hundreds of roundabouts are expected to be built each year in the United States. This study presents a microscopic simulation modeling and safety analysis of modern roundabouts. Various microscopic simulation modeling tools were explored for traffic analysis of roundabout operation. For safety analysis, researchers looked at simulation-based surrogate safety analysis model (SSAM) as well as guidelines in the Highway Safety Manual. The proposed roundabout at Laporte-Silhavy and 5-points roundabout in Valparaiso will be studied as field cases and modeled using microscopic traffic simulation.

Information about the Authors:
No information provided.

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Valparaiso University College of Engineering
SatNOGS Open-Sourced Satellite Ground Station: UHF and VHF Antenna Theory and Construction

Thomas Biedron, Jonathan Clabuesch

Departmental Affiliation: Electrical and Computer Engineering

This project cooperates with the international open-sourced SatNOGS project in order to create and operate a satellite communications ground station at Valparaiso University, located in Valparaiso, Indiana. SatNOGS is an open source ground station, optimized for modularity, and is built from readily available and affordable tools and resources. The long term goal of SatNOGS is to establish a world-wide network of operator-less ground stations. As part of implementing the SatNOGS project at Valparaiso, Thomas Biedron and Jonathan Clabuesch are designing and building 70-centimeter and 2-meter antennas for the project. The goal of our poster presentation is to inform attendees about satellite signal theory and its application in antenna design and construction. As this is an open-source project, our final design and step-by-step implementations will also be posted to the SatNOGS website to be used by those who follow us in similar pursuits.

Information about the Authors:
Thomas Biedron and Jonathan Clabuesch are electrical engineering students attending the College of Engineering at Valparaiso University. They both have a passion for practical application of their academic studies. This resulted in their partnership to design and build these antennas as part of a true international project, which they are both receiving credit through an independent study course guided by Professor Dan White.

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A Signal Distribution Network for Sequential Quantum-dot Cellular Automata Systems

Hayden Hast, Douglas Tougaw, Sami Khorbotly

Departmental Affiliation: Electrical and Computer Engineering

The authors describe a signal distribution network for sequential systems constructed using the Quantum-dot Cellular Automata (QCA) computing paradigm. This network promises to enable the construction of arbitrarily complex QCA sequential systems in which all wire crossings are performed using nearest neighbor interactions, which will improve the thermal behavior of QCA systems as well as their resistance to stray charge and fabrication imperfections. The new sequential signal distribution network is demonstrated by the complete design and simulation of a two-bit counter, a three-bit counter, and a pattern detection circuit.
Activity Bots. Using these small robots, as well as additional hardware and sensors, we aim to investigate the practical application of this algorithm, as well as investigate the feasibility of use in larger scale scenarios, such as transportation, delivery, and in mapping paths in disrupted terrains for natural disaster relief first responders. By limiting ourselves to a small-scale example, we hope to identify the bare-bone necessities for such an implementation of the ACO Algorithm, which have not previously been evident in computational simulations. Through our research we hope to engineer a basic model of practical implementation for the use of those wishing to make use of these concepts in the future.

Information about the Authors:
Aaron Roggow is a sophomore computer engineering student from Edwardsville, Illinois. He is interested in mechatronics and visualization systems. Danielle Desmond is a sophomore computer engineering student from Glenview, Illinois. She is interested in software development and engineering management. Chase Greenhagen is a sophomore computer engineering student from Waverly, Minnesota. He is interested in mechatronics and artificial intelligence. Tim Krentz is a junior electrical engineering student from Wheaton, Illinois. He is interested in controls and embedded systems.

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Valpo-Sat: The Rotator Software and Hardware for the SatNOGS Open-Sourced Satellite Ground Station

Kaitlin Werth, Elise DeVol, Zach Scheve

Departmental Affiliation: Electrical and Computer Engineering

This project attempts to utilize the open-sourced SatNOGS project in order to create and operate a satellite communications ground station at Valparaiso University, IN. SatNOGS is an open source ground station, optimized for modularity, and is built from readily available and affordable tools and resources. The long term goal of SatNOGS is to establish a world-wide network of operator-less ground stations. As part of implementing the SatNOGS project at Valparaiso, Zach Scheve is ordering a thermoplastic box as well as trying to find a suitable source that other teams could use. The thermoplastic box is used to house the stepper motor as well as the driver for the motor. Kaitlin Werth and Elise DeVol are also working on the hardware for the rotator and the
software for it. The rotator is constructed from a stepper motor which is controlled by a motor driver and the Arduino. Continuous updating is necessary to stay up to date with the ever-evolving SatNOGS design.

Information about the Authors:
Kaitlin Werth is a senior electrical engineer from Niagara Falls, NY. Elise DeVol is a junior electrical engineer from Norridge, IL. Zach Scheve is a junior electrical engineer from Palatine, IL.

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Solar Thermal Reactor Model
Zachary Matejczyk, Ryan Hall

Departmental Affiliation: Mechanical Engineering

Solar reactors are devices that collect concentrated solar energy from systems such as the solar furnace in the James S. Markiewicz Solar Energy Research Facility for the purpose of supplying high-temperature process heat to endothermic chemical processes. In order to efficiently utilize the concentrated sunlight, solar receivers must be designed to have a high effective solar absorbance, to evenly distribute the solar energy to the chemical reactions within the receiver, and to minimize heat losses. Radiation heat transfer plays a central role in each of these design challenges. An accurate model of the radiation heat transfer is thus desired.

In this study, we develop a model of the radiation heat transfer in a solar reactor designed to reduce cobalt oxide (Co₃O₄) and ultimately, in a separate chemical step, hydrogen from water. Our model, which is based on the Monte Carlo Ray Tracing (MCRT) technique, predicts the distribution of thermal energy by radiation from the VU solar furnace over the internal surfaces of the solar reactor and also the distribution of thermal energy emitted from the hot reactor surfaces within the reactor. By including the VU solar furnace in the radiation model, the model resolves the unique and complex directional and spatial distribution of the concentrated solar energy streaming in to the solar reactor. The radiation heat transfer model is coupled to a transient model of the solar reactor developed in a prior study that predicts the reactor temperature, the rate of the reduction of the cobalt oxide, and the reactor solar thermal efficiency during start-up and steady operation. The transient reactor model coupled with the MCRT radiation heat transfer model suggests that the reactor will achieve efficiencies on the order of 30%. The location of peak flux within and maximum temperature within the reactor is also shown.

Information about the Authors:
No information provided.

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Producing Magnesium Using Solar Thermal Energy
Jacob Yager, Todd Vervynckt

Departmental Affiliation: Mechanical Engineering

The solar energy research team at VU is developing a novel process for producing Magnesium (Mg) that is less energy intensive, less polluting, and cost competitive with commercially deployed processes. To reduce the energy intensity and CO₂ emissions associated with Mg production, the VU process leverages the high-temperatures attainable with concentrated solar energy from the solar furnace in the James S. Markiewicz Solar Energy Research Facility in order to substitute solar thermal energy for electric energy.

A major challenge of the research effort is to develop an interface that allows the integration of the solar thermal energy into the electrolytic cell where the Mg is produced. The heat transfer from the outside of the cell into its hot interior containing a molten salt electrolyte near 1000°C must be fast enough to prevent overheating of cell components. In this study, our aim was to measure the rate of heat transfer into the cell which occurs via natural convection. Experiments are necessary because of the unique geometry of the internal elements of the electrolytic cells that precludes the application of existing empirical correlations for natural convection heat transfer.

A direct measurement of the heat transfer in the molten salt electrolyte during MgO electrolysis, while preferred, presents substantial experimental challenges due to the corrosiveness of the molten salts, the solid-to-liquid phase change upon heating, operating temperatures near 1200 K, and convoluting effects from electric currents. In an effort to increase the accuracy of the heat transfer measurement in the face of these challenges, we developed a low-temperature experimental model based on non-corrosive fluids. Lower temperatures allowed the
application of readily available copper-constantan thermocouples and electric surface-mounted heaters capable of supplying heat fluxes at accurate levels. Our model allowed for the measurement of Nusselt numbers—which provide an indication of the rate of heat transfer—over a range of Rayleigh numbers from $10^7$ to $7 \times 10^8$ and Prandtl numbers from 2 to 6200 that encompass the expected operating range of the high-temperature motel salt filled electrolytic cell. The heat transfer results are collapsed into a single correlation equation that predicts the Nusselt number in the electrolytic within 16%. Application of the model suggests that for the heat fluxes required in the electrolytic cell, the heat transfer will lead to a 40°C temperature difference between the outside and inside of the cell, well below levels for which overheating becomes a concern.

Information about the Authors:
Todd Vervynckt is a senior mechanical engineering major that has been doing research for three semesters with the James. S. Markiewicz Solar Energy Research team and one semester of solar reactor design. His research included building a 10 kilowatt solar concentrator that allows the solar facility to run experiments. In addition, he drew up the initial designs for electrolytic cell prototype. Jacob Yager is a sophomore mechanical engineering major that has been doing research with the James. S. Markiewicz Solar Energy Research team for one semester. His research has included designing a temperature cooling lid for the electrolytic cell.

Faculty Sponsor: Luke Venstrom

Student Contact: jacob.yager@valpo.edu
Opinions about Smoking Policies, Exposure to Secondhand Smoke, and Smoking Behaviors of Freshman College Students

Megan Eggert, Mana Alahmari, Kaitlyn Betz, Emily Steinbacher, Haley DeYoung

The purpose of this project was to assess freshman college students’ opinions of smoking policies, secondhand smoke exposure, and smoking behaviors within a smoke-free campus. The Transtheoretical Model (Prochaska & DiClemente, 1983) provided the framework for this project. An on-line cross-sectional survey was emailed to all freshman students at a private, Midwestern university from 2011 through 2014. The survey contained 56 questions. A total of 1,294 freshmen responded yielding a 42.9% response rate. The majority of the subjects were female (59%) and white (85%). Twenty-eight percent were unaware the campus is smoke-free. While 75% of the respondents agreed or strongly agreed that the campus should be smoke-free, 68% reported seeing students smoking on campus. Twenty-two percent of the freshman students were exposed to secondhand, and 46% indicated they have friends who smoke. Ninety-one percent indicated they would rather date a non-smoker. Fourteen percent (n = 139) indicated they smoked during the previous 30 days, but only 48 (26%) of these smokers would consider themselves a “smoker”. Smoking was reported as a social behavior with 94% indicating they smoked with others. Based on the TTM stages of change, intentions to abstain from smoking were assessed. Twenty-two smokers (14%) decided to stop smoking within the next month and had a quit date. Forty-one (27%) did not think smoking was a problem and did not plan to quit. Findings indicated that the rate of smoking behaviors of freshman students was similar to national college data. These data are being used to form a foundation for an evidence-based project on smoking abstinence.

Information about the Authors:
The research team consists of three seniors and two junior nursing students and two faculty mentors. Students have responsibility for developing the online survey, monitoring the survey distribution and collection, and analyzing the data. The workload is distributed evenly amongst the students with the seniors taking a leadership role. The poster background, design, and layout were prepared by the student team with direction from the faculty mentors.

Faculty Sponsors: Theresa Kessler, Elise Alverson

Student Contact: megan.eggert@valpo.edu

Beyond the Volcanoes: A Community Partnership for Health in Rural Nicaragua

Emily Knippenberg, Jamielynn Tinkey, Vanesa Abad, Megan Heinz, Katelyn Mesalam

Background: Health inequities related to gender, ethnicity, socioeconomic status, and geography exist in rural Nicaragua due to a variety of causative factors. One such contributor to these inequalities is that of the increased exposure to indoor air pollution for women and children, and the subsequent respiratory infections that they may develop as a result of cooking over an open fire in poorly ventilated homes and kitchens. The purpose of the ongoing research project of Beyond the Volcanoes is to combat this particular additive to the global burden of disease and improve health equity in rural Nicaragua through social transformation using community-based participatory action research.

Methods: Prochaska’s Transtheoretical Model provides the theoretical foundation for the use of community-based participatory research methodology. This methodology involves six phases: partnership, assessment, planning, implementation, evaluation, and dissemination.

Results: The research team has now implemented 150 stoves, and although data is continuing to be analyzed, women in the community are anecdotally expressing improvements in the health outcomes related to eye irritation, cough, chest illness, shortness of breath, and headache. Since 2007, 15 students have participated on the research team, with four students returning post-graduation, for a total of 43 collective trips to one community in Nicaragua.

Conclusions: The results show that installing improved cookstoves with chimneys has decreased many symptoms previously experienced by residents of homes that cooked over open fires in the past.

Information about the Authors:
No information provided.

Faculty Sponsor: Amy Cory

Student Contact: emily.knippenberg@valpo.edu
Substance Use Behaviors Among College Students

Taylor Thompson, Jessica Mueller

The Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism (2002) has identified that drinking on college campuses is a unique culture and changing this culture is a top priority. Within the drinking culture, binge drinking has emerged as a growing problem that has dangerous consequences. Binge drinking has been correlated with high-risk behaviors, such as unsafe sex, sexual assault, injuries, and even death (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2013). The NIAAA (2013) defines binge drinking as 4 drinks for women and 5 drinks for men within a few hours. The main objective of this study was to assess substance abuse behaviors among undergraduate students at Valparaiso University and identify aspects that are associated with drinking on the college campus. Data were collected using a modified version of the Core Alcohol and Drug Survey: Long Form (Core Institute of Student Health Programs, 1994), which asks detailed questions about substance use behaviors. Following IRB approval, all undergraduate students (N = 3,052) during the 2014-2015 academic year were invited to participate in an online survey using SurveyMonkey®. A total of 1,164 students responded and 1,095 completed the survey, yielding a 35.9% response rate. Results showed that 62.6% of respondents drank alcohol. There were differences in drinking behaviors based on Greek life affiliation, gender, and athletic participation. There was a statistically significant difference ($X^2 = 66.001, p < .001$) based on Greek life affiliation; 83.9% of fraternity and sorority members drink alcohol compared to 57.3% not involved in Greek life. Of all students who drank alcohol, 71.7% engaged in binge drinking in the past 30 days. While there was no statistically significant difference in the rate of drinking alcohol based on gender (64% of males, 65.3% of females reported alcohol use), there was a statistically significant difference in binge drinking among males and females. Among drinkers, 76.5% of males engaged in binge drinking compared to 58.4% of females ($X^2 = 50.800, p = .001$). However there were no significant differences for binge drinking and Greek life affiliation or being an athlete. Of those in Greek life, 75.3% engaged in binge drinking compare to 60.3% not Greek affiliated ($X^2 = 30.526, p = .106$). Of those who reported being an athlete, 71.6% engaged in binge drinking while 64.4% of non-athletes engaged in binge drinking ($X^2 = 20.281, p = .625$). The top 3 reasons for drinking alcohol were: 86.5% “to have fun,” 75.2% “to feel good and relaxed,” 46.8% “makes it easier to socialize.” The majority of students on this campus drink alcohol. Moreover, binge drinking is a significant problem among those who use alcohol, particularly males and those affiliated with Greek life. Information from the survey will be used to develop evidence-based interventions to support a change in the drinking culture on this campus.

Information about the Authors:
Taylor Thompson and Jessica Mueller are undergraduate students currently in their junior year at Valparaiso University. The research team consists of two junior nursing students and two faculty mentors. Students had the responsibility of developing the online survey, as well as collecting and interpreting the data in order to target problems within the undergraduate student body.

Faculty Sponsors: Christine Kurtz, Terry Kessler

Student Contact: taylor.thompson@valpo.edu
## Creative Work and Research Committee
### Student Undergraduate Research Grant Recipients

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Undergraduate research grants are sponsored by the Valparaiso University Guild. The motivation for these awards is to enhance and facilitate more undergraduate research at Valparaiso University. Annually, $10,000 is available in support of undergraduate research: $5,000 for faculty development and support; $5,000 for student expenses.

Student funds support up to about ten awards with a soft cap of $500 each. If awarded, students generally use these funds for equipment purchases, supplies, photocopying, or other research needs or travel, meals, or lodging to present their findings at conferences.
ADDITIONAL CAMPUS EXHIBITS OR EVENTS
FOR SATURDAY, MAY 2, 2015

SALT Color 4 a Cause 5K Run
Registration from 8:30 a.m. – 9:30 a.m.
Race begins at 10 a.m.
Christopher Center Community Room

College of Engineering Design Expo
10 a.m. – 1 p.m.
Gellersen Engineering-Mathematics Center

Department of Art Student Art Exhibition
April 15 – May 10, 2015
Brauer Museum of Art
Wehling and McGill Galleries

Mathematics

Athletics

Baseball Game
Valpo vs. Milwaukee
12 p.m., Emory G. Bauer Field

Softball Game
Valpo vs. Youngstown State
11 a.m. and 1 p.m.
VU Softball Field

Department of Music
The 17th Annual Sousa Tribute Concert
Chapel of the Resurrection, 1 p.m.
Featuring the Valparaiso University Chamber Concert Band,
Luce Concert Band, and Community/University Concert Band
Jeffrey Scott Doebler, conductor
Tickets: $15 adults/$10 senior citizens and non-Valpo students
Free admission for Valpo students, faculty, and staff

Department of Theatre
Student Showcase Production
Studio Theatre
Valparaiso University Center for the Arts, 8 p.m.

Fiesta after Dark
8 p.m., Woiwod Dining Plaza (weather permitting), Harre Union
Sponsored by Multicultural Programs and
University Programming Council

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