Undergraduate Research and Artistry Day

Tuesday, April 24, 2012
Holmes Student Center
Duke Ellington Ballroom
Welcome to the 3rd annual Undergraduate Research and Artistry Day! From research that searches for the cure to cancer to artistry projects that document the plight of the homeless in Chicago, NIU students have the ability to engage in hands-on meaningful activities that bring to life the world around them.

We believe NIU’s undergraduate research programs like Huskie Research Rookies, USOAR, URA, URAP, EURA, UARAP, the Undergraduate Travel Fund, and Undergraduate Research & Artistry Day will challenge students to define their passions, academic and professional goals, and ultimately your contributions to society.

Moreover, participating in the breadth of undergraduate research opportunities at NIU can have a profound impact on a student’s academic journey. It is our hope that students will explore these exciting programs and begin to realize their full potential while they move toward their degree at Northern Illinois University.

Our goal is through this event is to provide students with a venue to showcase their academic work. We know you will be as impressed with the caliber of NIU’s undergraduate students as we are!

Julia Spears, Ph.D.  Rachel Tripodi
Director   Assistant Director
Greetings,

Thank you for joining us at Undergraduate Research and Artistry Day, a celebration of the hard work and dedication put forth by some of our most outstanding students.

The individuals participating in this event comprise the next generation of scientists, engineers, artists, inventors and discoverers. Working under the mentorship of some of our top faculty and researchers, they are participating in the highest forms of learning – not just memorizing or synthesizing information from lectures and textbooks, but contributing new ideas and new works of art to the existing body of knowledge and culture.

The value of such learning experiences cannot be overstated. That is why the Vision 2020 Initiative we launched last year includes a goal of ensuring that, by 2020, every student enrolled at NIU will partake in at least one form of experiential learning. That includes Research Rookies, Study Abroad, URAP, etc. – before they graduate.

Events such as Undergraduate Research and Artistry Day bring into focus the value of these activities. So please explore, ask questions and, most importantly, join us in working to make such opportunities part of the experience of every NIU student.

John G. Peters
President, Northern Illinois University
Greetings,

At Northern Illinois University, we place a premium on providing students with opportunities for learning that extend far beyond the classroom. Nothing better illustrates the success of those efforts than the dramatic growth of Undergraduate Research and Artistry Day.

Launched just two years ago, with 108 participants, this year’s edition features more than 200 students, drawn from all six of the undergraduate colleges on campus. Every piece of work on display represents not only knowledge acquired by our students, but also new knowledge and new artistry created. Their work not only enriches their time on campus, but also prepares them for greater success in the years ahead.

Please join us in celebrating the success of the top projects at today’s award ceremony at 2:30 p.m. Awards will be presented for the first-, second- and third-place projects, as well as for honorable mention. Additionally, a “People’s Choice” Award will be given to the audience’s favorite project. One research adviser also will be honored with the Faculty Mentor of the Year Award.

We are extremely proud of our students’ accomplishments and invite you to get to know them at this event. Thank you for your support of undergraduate research at NIU.

Raymond W. Alden III
Executive Vice President and Provost, Northern Illinois University
**Schedule of Events**

Viewing of Projects 9:00 AM-3:00 PM
(Presenters will rotate throughout the event)

Judging Session 1 9:00 AM-10:15 AM

Judging Session 2 10:15 AM-11:30 AM

Judging Session 3 11:30 AM-12:45 PM

Judging Session 4 12:45 PM-2:00 PM

Open Session 2:00 PM-2:30 PM
(Evaluation sheets will be reviewed and winners selected)

Awards Ceremony 2:30 PM-3:00 PM
(All participants are encouraged to attend)

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Research Categories
The following two research categories will be judged

STEM: Science, Technology, Engineering, Math
SSHA: Social Science, Health, Humanities, Arts

Awards
The following awards will be given to the winning project in each category

• First - $200
• Second - $150
• Third - $100
• Honorable Mention - $50
• People’s Choice - $000

The audience will have the opportunity to select their favorite poster in each category
Judges

Adler, Marc - STEM
Department of Chemistry & Biochemistry

Almagambetova, Nailya - SSHA
School of Nursing & Health Studies

Barbe, Katharina - SSHA
Department of Foreign Languages & Literatures

Barber, Larissa - SSHA
Department of Psychology

Bishop, Terry - SSHA
Department of Management

Bostwick, Wendy - SSHA
School of Nursing & Health Studies

Brennan, Christina - SSHA
School of Nursing & Health Studies

Brim, Brian - SSHA
Office of the Vice Provost

Britt, Anne - SSHA
Department of Psychology

Buford, Andrea - SSHA
School of Nursing & Health Studies

Burlingame, Melissa - SSHA
Department of Geology & Environmental Geosciences

Carnahan, Jon - STEM
Department of Chemistry & Biochemistry

Castle, Nancy - SSHA
NGOLD

Chakraborty, Dhiman - STEM
Department of Physics

Damodaran, Purushothaman - STEM
Department of Industrial & Systems Engineering

Duffy, Michael - SSHA
Libraries

Durik, Amanda - SSHA
Department of Psychology

DeCicco, Stephanie - SSHA
Department of Leadership, Educational Psychology & Foundations

Demir, Veysel - STEM
Department of Electrical

Haji-Sheikh, Michael - STEM
Department of Electrical Engineering

Hampel, Arnold - STEM*
Department of Biological Sciences

Hanna, Jason - SSHA
Department of Philosophy

Hapner, Joshua - STEM
Department of Biological Sciences

Hoffman, Beatrix - SSHA
Department of History

Hofstetter, Heike - STEM
Department of Chemistry & Biochemistry

Horn, James - STEM
Department of Chemistry & Biochemistry

Gasser, Kenneth - STEM
Department of Biological Sciences

Levin, Amy - SSHA
Department of English

Macdonald, Doris - SSHA
Department of English

Macfarlane, Pamela - STEM
Department of Kinesiology & Physical Education

Magliano, Joe - SSHA
Department of Psychology

Maher, Colette - SSHA
Academic Advising Center

Majumdar, Pradip - STEM
Department of Mechanical Engineering

Malecki, Christine - SSHA
Department of Psychology

Martin, Stephen - STEM
Department of Physics

Millis, Keith - SSHA
Department of Psychology

*Retiree and/or Alumni
**Judges**

**Mirman, Cliff** - STEM  
Department of Technology

**Moremen, Robin** - STEM  
Department of Sociology

**Murphy, David** - STEM  
Department of Geography

**Muthuswamy, Shanthi** - STEM  
Department of Technology

**Myers, Lindsey** - SSHA  
Housing & Dining

**Napientek, Randi** - SSHA  
Office of Student Academic Success

**Olson, Peter** - SSHA  
School of Art

**Parker, Christopher** - SSHA  
Department of Psychology

**Pitney, William** - STEM  
Department of Kinesiology & Physical Education

**Pohlman, Nicholas** - STEM  
Department of Mechanical Engineering

**Reynolds, Jeff** - STEM  
Office of the Provost

**Rigg, Lesley** - STEM  
Department of Geography

**Rodgers, Diane** - SSHA  
Department of Sociology

**Salvani, Emily** - SSHA  
NIU Foundation

**Schatteman, Alicia** - SSHA  
Department of Public Administration

**Schlabach, Gretchen** - SSHA  
Department of Kinesiology & Physical Education

**Schroeder, David** - STEM  
Department of Technology

**Schwartz, Howard** - SSHA  
School of Allied Health & Communicative Disorders

**Shokrani, Masih** - STEM  
School of Allied Health & Communicative Disorders

**Smith, M Cecil** - SSHA  
Department of Leadership, Educational Psychology & Foundations

**Spears, Christian** - SSHA  
Intercollegiate Athletics

**Streb, Matt** - SSHA  
Department of Political Science

**Towell, Elizabeth** - SSHA  
Department of Operations Management & Information Systems

**Vemu, Sheela** - STEM  
Department of Biological Sciences

**Wallace, Douglas** - SSHA  
Department of Psychology

**Wallace, Patricia** - SSHA  
Department of Psychology

**Wescott, Mandy** - SSHA  
Office of Student Academic Success

**Wolter, James** - SSHA*  
Department of Leadership, Educational Psychology & Foundations

**Wolter, Moke Chee** - SSHA*  
School of Art

**Yore, Adam** - SSHA  
Department of Finance

**Yusko, Rita** - STEM  
Division of Research & Graduate Studies

**Zhou, Jie** - STEM  
Department of Computer Science

**Zinger, Don** - STEM  
Department of Electrical Engineering
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College of Business
College of Education
College of Engineering & Technology
College of Engineering & Human Sciences

Stage

Refreshments
Abstracts - Posters

Please note: Contents of the abstracts were printed as submitted by the project participants and are represented in the college of the students major.
To motivate employees in efficient ways, there are two types of incentives employers can use in addition to salaries and wages: monetary incentives and non-monetary incentives. The vast majority of incentive research focuses on the effect of monetary incentives on employee performance (Bonner et al. 2000). In 1999 U.S. companies spent over $20 billion on tangible non-monetary incentives to employees, which is approximately five to ten percent of the total spending on employee incentives (Jeffrey, 2003). Economic changes since that time have forced companies to focus more on reducing expenses, and as a result more emphasis is being placed on non-monetary incentives and how they affect employees’ performance (Borzaga and Tortia, 2006). In an effort to better understand the effect of non-monetary incentives this research project was conducted by Dr. Ann Dzuranin. This research project will focus on understanding how non-monetary incentives affect a firm’s employees’ behavior and performance. Non-monetary incentives have many forms, such as “Employee of the month,” and “Rookie of the year,” and other simple recognitions to employees. The data to be analyzed was collected by Dr. Ann Dzuranin in 2005 for her Ph. D research. The collected data will be analyzed to determine the effectiveness of a incentive plan implemented in a large southeastern cellular phone company call center. The incentive plan alternated between monetary and non-monetary incentives. The design of the incentive systems allows us to compare the effectiveness of non-monetary incentives to monetary incentives. Bonner, S. E., R. Hastie, G. B. Sprinkle, and S. M. Young. 2000. A review of the effects of financial incentives on performance in laboratory tasks. Journal of Management Accounting Research, 12: 19-64. Borzaga, C., & Tortia, E. (2006). Woeker motivations, job satisfaction, and loyalty in public and nonprofit social services. Nonprofit and Voluntary Sector Quarterly, 10, 228. Jeffrey, Scott. (2003). The benefits of tangible non-monetary incentives. University of Chicago, Graduate School of Business. 1.
Non-profit boards of directors have a fiduciary responsibility to oversee the actions and operations of non-profit enterprises. Prior literature suggests that governance characteristics influence firm performance in the for-profit setting; however, little research has addressed how these characteristics influence performance in the non-profit sector. Using available metrics from studies of for-profit firms and data collected from government sources, our study seeks to understand the correlation between measures of effective for-profit governance and non-profit performance for two different matched samples: local charities in DeKalb and Sycamore and charities in Chicago. We also examine the similarities and differences in performance between small charities and large charities. Our results indicate that small, local charities perform as well as larger, metropolitan charities in many respects; however, smaller charities often lack the governance and employee protection characteristics of larger charities. We also find little difference between performance and the presence or absence of governance mechanisms. We hope our study will inform the ongoing debate about how to improve the functioning and delivery of non-profit services in the local and regional community, and how governance and board of director characteristics can influence the delivery of social services to Illinois residents.
JASMINE LAND & CHLOE CONNOR

MILLENNIAL CUSTOMER ATTRACTION AND RETENTION IN THE GROCERY INDUSTRY

Authors: Jasmine Land, Kelly Penn, Brett Swanson, Katrina Ofenlock, Austin Schuetz & Chloe Connor
Faculty Mentor: Mark Rosenbaum
Department: Marketing
Research Category: Social Science, Humanities and Arts
Judging Time: 12:45-2:00PM

Jewel-Osco currently operates 183 stores in Illinois, Indiana and Iowa. The firm has been operating in the Chicagoland area for over 100 years and it has a very devoted and loyal customer base. The firm’s loyal customers have been shopping with Jewel-Osco for many years, and many enjoy shopping in a traditional grocery store format. However, Jewel-Osco understands that its customers’ shopping patterns are starting to change, especially as so-called “Millennials” become a sizable consumer market. In order for Jewel-Osco to ensure its longevity and relevance in an ever changing grocery market, the firm needs to determine how to adapt its products and services to meet the needs of both its current customers and its newly emerging customers; most notably, the Millennials. By working with Northern Illinois University’s Experiential Learning Center, Jewel-Osco was provided with eight strategic recommendations for attracting Millennial grocery customers. These strategies emerged from both secondary and primary data results. The Itasca-based Jewel-Osco organizations is already witnessing results from the recommendations, as three of the eight recommendations have been implemented and the other five recommendations are forthcoming in development.
In order to gain a better understanding of how texts are adapted from one genre to another, I analyzed the 18th century philosopher Voltaire’s novella, Candide, and a 2005 adaptation of Leonard Bernstein’s operetta, Candide. My goal was to explore the strategies Bernstein used to adapt a work written centuries ago so that it could speak to a modern audience while keeping the original spirit of the work. I began by comparing the similarities and differences between the novella and the operetta. Then, I developed my own hypothesis about why the changes were made. Lastly, I read some critical studies and articles on both works. I found that an artist adapting a work does not always have full control over the adaptation. In Bernstein’s case, some changes are made to fit the stage, streamline the plot to keep the audience interested, and respect the new genre characteristics. The last consideration plays perhaps the largest role. Leonard Bernstein’s Candide had to fit the criteria of the “American comic operetta” genre. The 2005 version of Candide reflects the original 1956 version, the multiple failed versions, and the visions of various producers over time, until it became the success we know it to be today. My findings provide an audience with insight as to the extensive process of putting together an adaptation.
Dedric Richardson

Managerial Indiscretions

Authors: Dedric Richardson
Faculty Mentor: Adam Yore
Department: Finance
Research Category: Social Science, Humanities and Arts
Judging Time: 12:45-2:00PM

This research determines if there are any agency costs to managerial indiscretions in post-bailout nation. It will determine whether the things that top managers such as CEO’s, CFO’s, etc., of publicly traded companies do in their personal life affect returns to shareholders in a post-bailout nation and if their personal lives interfere with their responsibilities at the job.

Benjamin Clark

Sport Satisfaction Survey

Authors: Benjamin Clark
Faculty Mentor: Tim Aurand & Robert Peterson
Department: Marketing
Research Category: Social Science, Humanities and Arts
Judging Time: 9:00-10:15AM

The purpose of my research project was to assess the overall satisfaction of current NIU students at home football games. I have been working closely with the NIU Athletics Department in order to meet the goals they need to reach for Vision 2020, NIU’s plan for the improvement of the overall University. For my project, I worked closely with my mentor, Dr. Aurand, from the Marketing Department in the College of Business. He and I designed and created a survey to assess the satisfaction from everything about the students’ experiences before, during, and after the game. We worked closely with Associate Athletic Director, Shelley Binegar, to ensure we were working toward what needed to be accomplished for Vision 2020. Once the survey was distributed, we input the results in a data-analyzing program and we were able to assess what NIU students enjoyed most about home football games, and what they felt needed improvement.
Kathleen Abell

Information Systems Requirements Determination: The Case of What Students Want with MyNIU

Authors: Kathleen Abell
Faculty Mentor: Charles Downing & Brian Brim
Department: Operations Management and Information Systems and Provost’s Office
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30AM-12:45PM

There are many different types of students at NIU. Every type has a different need when it comes to their MyNIU homepage. These days, students expect to be able to customize almost everything the way they find the most fitting to their needs. This includes their MyNIU homepage; their central location of everything NIU. I will be surveying a large sample of NIU students to get their opinion on the new MyNIU student system. The data collected from these surveys will go straight to the designers of the new MyNIU system and will be considered in the layout of the MyNIU homepage. Students know what they want to see and have access to when they login to their MyNIU. I will be giving the students of NIU a voice in what is seen and accessed in their MyNIU.
Physical educators and coaches at all grade levels are faced with students and athletes of various abilities when it comes to games and sports. Throughout this project, I analyzed an expert tennis player and three average tennis players with different skill levels, performing the tennis serve, forehand, and backhand. Using a computer program called Dartfish, I was able to breakdown each subject’s skill and isolate the critical instances and phases. I compared the average players to the expert to show where improvements should be made with explanations as to why. I then provided activities that focus on and correct the common mistakes that were found in my research. Teachers and coaches can use the information provided to correct these tendencies when they find them occurring within their class or team.
The purpose of this case study was to examine Latino parents’ perceptions of their educational roles with a child with a disability. It focused on Latino parents’ level of involvement and what factors directed them to communicate less or more with teachers to enhance their child’s success. A Latino family who has a child with a disability was interviewed about their definition of collaborating and how they approach school professionals, as well as questions related to contextual factors. The family was also observed in a community-based educational activity. Interviews were transcribed and coded to identify themes. Observations were immediately recorded in field notes and later compared with interview data for triangulation purposes. Results of the study indicate that for at least one Latino family, it appeared to the parent that others’ low expectations kept the child from realizing his full potential. The parent had a high level of participation in the child’s education, but did not always feel supported by family members, community leaders, or teachers. These findings indicate that Latino parents of children with special needs must be willing and able take the role of child advocate in order to overcome barriers associated with low expectations, and that schools need to value Latino parents’ voices and foster close communication between parents and teachers about appropriate goals for the child.
The purpose of this study was to examine the effects of a sport massage on blood lactate levels (BLL) after vigorous anaerobic activity. Using a crossover design, 11 healthy subjects (5 female, 6 male), mean age: 22.6±2.4, mean height: 175.25cm±7.58, mean mass: 76.0 kg±17.12 participated in the study. The independent variable was a 30 minute sport massage to the lower extremity performed by a licensed massage therapist, and the dependent variable was the subjects’ BLL. For the intervention session, participants engaged in a baseline blood lactate test followed by a 3 minute warm up on a stationary bike. This preceded the performance of a 30 second Wingate test to increase lactate levels. Participants then received a 30 minute massage after which a post-interventions BLL test was conducted. The control session involved the same steps as the intervention with the exception of the massage; they lay supine for a 30 minute duration. A paired samples t-test was used to compare the control group and intervention groups’ BLL. The mean BLL for the control group following a 30 minute rest was 3.46±.99 and the massage group had a mean level of 3.25±.93. There was no significant difference between the BLL between the control group and massage group at 30 minutes post Wingate test, (t10=.628, P=.54). There was no difference in the subjects’ BLL following massage compared to the control, indicating that a 30 minute sport massage does not aid in that facet of recovery.
Physicists at Fermilab have constructed a laser system that utilizes a pulsed laser source travelling through an optical amplification circuit in order to achieve very high power levels. During this process, a titanium sapphire rod absorbs approximately 9.5 watts of heat. The purpose of this project is to design a cooling system that will remove the heat from this titanium sapphire rod. This cooling system must uniformly remove heat in order to avoid heat concentrations which will cause thermal lensing. Thermal lensing causes the passing laser to lose focus resulting in the loss of overall power and amplification. The cooling system design includes a copper jacket shrink fitted to the titanium sapphire rod to increase the amount of surface area that can be cooled and separate the cooling fluid from the rod. This jacket is inserted into a cylindrical fixture that has three channels that will move the water axially over the copper jacket. Preliminary simulations have shown that the liquid flow within the cooling fixture is linear, which promotes uniform cooling. A vacuum chamber is also being designed to prevent condensation from building up and gathering on the end of the titanium rod. The condensation will interfere with the laser path and cause distortion and lost power. All components of this system will ensure that Fermilab’s laser system will function properly.
The Department of Technology recognizes the following students for their research

Chris Bradt, Shiraz Zaidi & Scott Morris  
*Dr. Lichuan Liu*

Justin Lavrencik, Abdulla Alfehaid & Jason Pittenger  
*Dr. Donald Zinger*

Kevin Cielenski & Jason Marosi  
*Dr. Andrew Otieno*

Jae Kim, Allen Rhodes & Steven Curtis  
*Dr. Said Oucheriah*

Daniel Kovarik, La Vongprasearth & Steven Dingess  
*Dr. Abul Azad*

Jason Marosi, Jon McGinley & Kevin Cielenski  
*Dr. Cliff Mirman*

Nathan James, Mark Gabatino & Mike Pintozzi  
*Dr. Liping Guo*

Salvatore Palazzolo & Greg Shields  
*Dr. Andrew Otieno*

Jonathan Phelps, Kevin DeMar & Bryan Birman  
*Dr. Theodore Hogan*

Brian Procek, Matthew Zastrow, Christopher Goodwin & Adam Tyminski  
*Dr. Andrew Otieno*

Joshua Nixon  
*Dr. David Murphy*

For more information:  
Department of Technology  
Northern Illinois University  
Still Gym 203  
www.niu.edu/tech  
815-753-1349
Energy is used to heat and cool our homes in modern heating and cooling systems. Instead of getting our power from a windmill or solar farm and transmitting it down a power line to heat and cool our homes. We have wind and solar energy right outside our windows that can be used to make our rooms of our homes more comfortable, drawing less power from the power company in the process. In addition to the monetary savings, it is also nice to get fresh air. Unlike an air exchanger system that looks like a window air conditioning unit, you can see through a window and feel more in touch with the world around. Opening a window when the weather is nice has been around since windows you could open. People are busy and may not want to spend their time opening and closing windows. Also we cannot live all of our lives in front of the window. Additionally, in our homes we probably have more than one window as well. Adjusting a house full of windows would be quite a laborious task. An automatic system to control when your window opens and closes could accomplish this for the user. This automatic system can be set to the settings that make one comfortable. It has sensors to detect rain, interior temperature, outside temperature, intruders, wind, window open, and window closed. With this added peace of mind, users of the Smart Window would free up time to enjoy other aspects of life.
The project is to design a DC-DC boost converter that will be able to adjust in real time to varying input voltages and varying loads, while tracking a desired reference voltage. The external input voltage to the system is 6 volts and the output voltage will be adjustable from 7 volts to 12 volts. The load ranges from 40 Ohms to 160 Ohms. The system consists of a DC-DC boost converter circuit and a robust sliding mode controller. This controller will be designed and simulated using Matlab/Simulink and will be implemented using the dSpace controller board. The controller output generated from the dSpace controller board is fed to the boost converter to regulate the output voltage against large and sudden variations in the input voltage and the load. The boost converter is extensively used in LEDs, solar panels, hybrid cars, and laptop batteries where there is a need to step up the input voltage.
As part of our senior design project for the College of Electrical and Computer Engineering, we improved upon the design of the music instrument named the Theremin. The Theremin is an electrical capacitive sensing instrument invented by Leon Theremin. The major modification designed by our group is a LCD which displays the musical note associated with the frequency created by the Theremin. It also displays whether the frequency is flat or sharp compared to the nearest musical note in the standard twelve tone equal temperament scale. A PIC18 microcontroller is programmed to drive the 8x2 segment LCD.
Aerospace Design Team’s purpose is to design and build a remotely controlled aircraft to be entered into the Society of Aerospace Engineering (SAE) Aero West Design competition held at Los Angeles, CA on March 16-18. The goal of the competition is enter an aircraft that can lift as much payload as possible, while adhering to certain restrictions. We are limited to a .61 OS FX motor that generates around 15lbs of thrust, and total length+width+height dimension of 225 inches for the aircraft. Those restrictions are similar to full-scale aircraft where a complex balance must be made between the design features and performance capabilities. As a team, we research and test different airfoils to examine the quantity of lift generated at low speeds of only 20-30 mph. An innovative feature this year is the use of inducted fans and nozzle design for greater thrust performance. The inducted fan allows for the propeller to push a much larger quantity of air, as well as reduce the drag at the propeller tips, which in turn increases our propeller’s rotation speed. The inducted fan also utilizes the flow benefit of a nozzle, which increases the exhaust air speed, giving the plane a greater forward momentum. The entire plane is designed in the 3D modeling software SolidWorks, allowing us to perform drag, lift, and flow analyses before the plane is physically assembled. The team is a great way for students from all engineering and technology fields to get first-hand experience in the aerospace design and fabrication industry.
Antibodies help the immune system battle foreign bacteria and viruses that have entered our bodies. In addition, antibodies can be used as a form of treatment or diagnosis of disease. The Horn Lab is interested in understanding a unique type of Camelid antibodies called VHH. These VHH antibodies do not possess a light chain; consequently their antigen binding site is only a single domain from the heavy chain. Such antibodies, which have several improved biophysical properties over conventional antibodies, have been used successfully in treating inflammatory bowel disease and colon cancer. The long-term goal of this research project is to better understand antibody interactions and antibody stability using a model antibody-antigen complex. Specifically, we will aim to enhance the thermostability of a previously engineered pH-dependent antibody. This will be achieved using various methods including (i) Site-directed mutagenesis where we will introduce two cysteine residues into our DNA using Kunkel mutagenesis. The cysteine pair are in close proximity in the folded VHH structure and should enable the formations of a disulfide bond that will help stabilize the antibody. (ii) Recombinant expression and purification of the engineered antibody and (iii) characterization of the engineered antibody’s binding and stability. Since many engineered antibodies fail to meet their expectations due to protein instability, understanding methods to stabilize antibody structure is imperative for the development of new biotherapeutics and diagnostics. This work will help provide a better understanding of how to stabilize VHH antibodies for diagnostics and therapies.
The project is to design and develop a mobile robot as a capstan project for our BS program with the Technology Department of NIU. The mobile robot will be called as NIU-INTELi-BOT. The basic premise of the NIU-INTELi-BOT will be to design and develop a mobile robot that will be controlled wirelessly from a computer. The project team has decided on several high level requirements that will allow the mobile robot to have the following specifications and capabilities: • Design a frame to mount everything to that is structurally sound • Create a vehicle that can travel without any sort of tether over smooth terrain at a rate of at least 6 inches per second • Be able to communicate with a computer wirelessly over the 2.4 GHz waveband with a radius of at least 50ft • Transmit video from the vehicle to the computer of at least 800 X 600 resolution • Transmit commands from the computer to the vehicle • Able to navigate in different possible modes such as: o Navigates while taking commands from the computer o Navigates autonomously using sensors and GPS • Accompanying documentation of all parts of the design along with reasoning for those choices • Accompanying schematics and other diagrams for designed parts • Accompanying documentation of the project as a whole.
PRELIMINARY COST-BENEFIT ANALYSIS OF A NORTHERN ILLINOIS UNIVERSITY BIODIESEL PROGRAM

Authors: Joshua Nixon
Faculty Mentor: David Murphy
Department: Geography
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

My research project concentrates on the cooking oil that is disposed of in the dining halls of Northern Illinois University and its biodiesel fuel potential. This potential may be great enough to offset some of Northern’s dependence on diesel fuel in the vehicles that are used on campus. If this is true, then Northern would have a more environmentally clean transportation system and the use of nonrenewable resources will be decreased. Using a renewable resource like cooking oil will be much more sustainable for the future when diesel fuel becomes less available. Having an alternative fuel option like biodiesel for running Northern’s vehicles can insure that the diesel using machines will be able to function without relying only on petroleum based fuels. From this project I hope to learn more about diesel vehicles and how their fuel consumption impacts our environment. In addition, I want to learn more about how vehicles’ demand for oil affects the world and its landscape. Also, I also want to learn about different ways to replace oil with safer and renewable resources. Along with this knowledge, I want to find the practicality of implementing a successful program to function alongside current systems of transportation in order to reduce oil dependency.
Most golf ball collecting mechanisms attach to an employee driven gas-powered golf cart. Because of the working environment, special protective caging needs to be placed around the golf carts to protect the driver from flying golf balls. These additional components are highly expensive. Another flaw to the existing ball collector mechanisms is that the discs used to pick up the balls from the ground wear out periodically and need to be replaced. The Automated Golf Ball Collector will utilize two independently driven electric motors and a machine vision system to navigate the driving range while mechanically picking up golf balls and storing them in an on-board basket. A golf ball-collecting drum that grips the balls when moving over them will pick up the golf balls. The drum will be belt driven and positioned slightly above ground level to eliminate common wear that normal collecting drums would otherwise be susceptible to. Once the balls are picked from the ground they will be redirected from the drum into a basket by a series of ball-directors that weave between the two. The Automated Golf Ball Collector will serve as a prototype to eventually derive a cost efficient and safer alternative to traditional methods of ball collecting.
The objective of this project is to improve an existing experiment for a mechanical engineering course called Experimental Methods (MEE 390). The purpose of the experiment as it pertains to the course is to familiarize students with digital data acquisition and confirm the students’ knowledge of engineering concepts. Such concepts would include calculus applications, the conservation of energy principle, and Newton’s Second Law. The existing experimental apparatus allows two-dimensional analysis of linear and non-linear paths, and uses magnetic sensors in the data acquisition process. A flexible tube serves as the track and a ball bearing is treated as a particle which travels along the path. The procedure to properly adjust the track is somewhat tedious, and so the redesign of the roller coaster apparatus calls for a three-dimensional track layout and a new type of sensor, namely an optical LED sensor. The new and improved format incorporates a roller coaster system and an optical table to permit a wide range of three-dimensional paths to be constructed. The redesigned apparatus has convenient mounting hardware for the new optical sensors and can accommodate the previously used magnetic sensors. Instead of a tube for the traveling ball bearing, the system utilizes two equally spaced plastic rails to embrace the ball bearing as it traverses. Finally, data acquisition is used to compare the data sets of the magnetic and optical sensors which can then be correlated with the theoretical kinematic values.
The project seeks to complete a utility vehicle for use by the Northern Illinois University department of technology and ROTC. Due to future uses, this vehicle will have the outward appearance of a classic Willys MB jeep. Implementation of this project is completed by designing the vehicle from concept. Once designed, the project will also construct the vehicle from the designs. The result of this project will be an amalgamation of the accrued learning of project members and then demonstrated until the final product of a utility vehicle is produced. Furthermore, this project will produce a vehicle that will meet the state and federal standards for a low speed vehicle so that it may be safely and legally operated on streets.
The idea of The American Sign Language (ASL) Translating Glove was chosen for senior design project because approximately 22 million people in the United States are deaf. This glove is meant to be a teaching aid and study tool for any person that wants to learn ASL. The main design of the glove consists of flexible resistors attached the back of each finger on the right hand. The signal, corresponding to finger position, is sent to a microprocessor. The microprocessor then takes the input data, configures it, and then sends the corresponding ASCII symbol to a display. Some advantages of the ASL Translating Glove are that it allows a person who is hearing impaired to communicate with someone who does not know ASL. It also can be used as a teaching tool, allowing for the individual to make correct ASL hand gestures. The ASL Translator Glove is an innovative tool that allows for better communication and assists the process of learning.
This closed-loop system is designed to accurately heat and dispense pre-polymers on demand, out of a 55 gallon drum. The flow is powered by a high viscosity drum-pump, which recirculates the material back into the drum. The operator triggers a three-way valve to dispense the material into measured portions. A heat exchanger brings the material to the proper mixing temperature with progressive circulations. The system is controlled by a PLC (Programmable Logic Controller), and a PID (Proportional Integral Derivative Controller) to receive and compute voltage outputs from a volumetric flow meter. These components help to maintain a constant flow of material. Other sensory transducer components monitor pressure, temperature, and vacuum. All readings are displayed on a color touch screen, which controls the entire system. A back pressure regulator helps maintain constant flow in correlation with the PID and PLC control devices. A four-way valve allows for solvent purges and flushes to effectively clean and maintain the system.
SPX Hydraulics Technologies is a global company with a manufacturing facility in Rockford that specializes in the production of Hydraulic Assemblies. Our team was challenged to analyze a series of hydraulic assembly work cells and identify room for improvements. These cells, in their current state, are struggling to meet the customer demand and are failing to make on time deliveries. SPX is also concerned about a poor material flow throughout the work cells, and asked our team to consider the feasibility of combining work-cells. With the use of Simulation Software, the process was accurately modeled, which lead to a verification of current process capabilities. This model was then modified based off of calculations from tools such as Mixed Model Line Balancing, Process Mapping, Spaghetti Diagrams, Precedence Diagrams, Facilities Planning, and Relationship Charting to determine the optimal layout for the work cells. Upon completion, the project will allow our team to implement improvements that aim to increase the number of on time deliveries and better the flow of the department.
In manufacturing, it is important to continuously reduce processing times and costs while increasing product quality to remain competitive. A rise in customer demand has motivated Caterpillar Inc. to review the capacity of the Large Wheel Loader Engine Assembly work area, and improve if possible. Our approach identifies opportunities for improvement through Time Study data collection and the application of Lean Manufacturing tools (Process Mapping, 7 Deadly Wastes, etc.). Alternative layouts and process changes are modeled, validated and presented through the use of computer simulation with an emphasis on reducing processing times and travel distances.
Our project will provide the homeowner with flexibility in their heating demands. By providing exact control over the heating in each room, energy losses are minimized by reducing unnecessary heating in infrequently used rooms. We will use house power lines as a communication medium to reduce installation costs/complexity. By using master-slave controllers, each room will have temperature setting independent of the master thermostat’s setting allowing comfort level adjustment without leaving the room. Variable dampers will control heat flow with greater precision than previous technology resulting in greater efficiency and energy savings. The ultimate goal is to develop a modular system using master-slave controllers, variable dampers, and power line communications. These features will be used to develop an extremely efficient heating system, offer energy savings on heating by at least 30%, and provide more comfort than a standard HVAC system. Most of the development time will be spent on writing code for microcontrollers and building thermostats. We roughly estimate this process will take 60 days. Smaller portions of time will be spent simulating power line communications, constructing a model house and heating system, testing the final design, and documenting the results. We estimate this project will cost $255.99 and be completed April 16, 2012.
Our project deals with the Caterpillar facility in Aurora. More specifically we will be focusing on the equipment known as compactors. Compactors are vehicles that are used in landfills and for dirt tilling. Caterpillar would like to increase productivity from 1.5 engines per 8 hour shift to 2.2 engines per shift starting next year. Accomplishing this objective will result in an increase of production by 32%. This objective has three sub-objectives to address the smaller problems in the area. We will also have the objectives of addressing part shortages, modifying the floor plan to a more workable space, and streamlining production. Our group will be able to accomplish this by decreasing Takt time, creating a relationship chart so we can apply facilities planning, collecting time studies with an emphasis on micro-motion to find extra time in the process, and implementing 5S. Takt time will precisely match production with demand. Creating a relationship chart will show the relationship of each pair of activities which will help in creating a new facility layout in AutoCAD. Collecting time study will point out idle time throughout the process such as excess motion that could be eliminated. Implementing 5S is a continuous improvement that will help keep a workplace organized by keeping what is needed, and having a home for everything. The results from the improvement(s) are compared with the current productivity rate followed a Caterpillar.
This project looks at the contactor bridge of a Hartland Controls 3-pole contactor and how to model the various parameters affecting the life. It builds on a previous project that modeled the dynamics of the contactor closing. The group is modeling the temperature of the contactor bridge, contact holding force, constriction resistance, power factor, erosion due to arcing, and the various materials that can be used in the construction of the contactor bridge. These will then be used to run a design of experiments analysis to look for correlation between variables and to attempt to reduce temperature rise in the contactor bridge.
### Michael Colwell, Jason Fritsch, Michael Bellendir

**The Effects of Vaporized Gasoline on a Low Horsepower Motor**

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<tr>
<th>Authors:</th>
<th>Michael Colwell, Jason Fritsch, &amp; Michael Bellendir</th>
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<tr>
<td>Faculty Mentor:</td>
<td>Dr. Behrooz Fallahi</td>
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<td>Department:</td>
<td>Mechanical Engineering</td>
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With the high cost of gasoline and the effect of the pollutants produced by modern vehicles on the environment; society is looking for a more efficient and environmentally friendly alternative. Our senior design project will test a patent pending apparatus that claims to both reduce harmful emissions and increase fuel efficiency. The device will heat up gasoline to a vapor, which will then be injected into a 9 horsepower motor. The effects of vapor on the motor will be measured. Such parameters being tested are efficiency of the motor with a set applied load, fuel efficiency, and the resultant emissions. Our sponsors for this project are the apparatus designer Delbert Weller, and his associate Martin Eden.
Each year, the Society of Automotive Engineers hosts seven international competitions for colleges to design and build a Formula style racecar. A key aspect of the racecar is the braking system. There is a wide variety of braking systems available for racing applications, but none specific for Formula SAE. The braking system consists of the brake pedal, which translates the force through a bias bar and into the master cylinders. These cylinders use hydraulic pressure through lines to the brake calipers. The calipers have pistons which press onto the brake pads, compressing the pads onto the rotors. These rotors translate the clamping force through to the hats which connect to the tire and make the vehicle stop. Little investigation has been done into using floating rotors, and making all parts of the braking system interchangeable. Research into material choice for rotors and hats, as well as design and size of the rotor hat combination is a key component of interchangeable parts. Choosing the master cylinders and the bias bar must be investigated and designing a pedal to meet the driver’s demands and pedal ratio needs to be taken into consideration. The entire system must be able to withstand significant weight transfer during braking and protect the driver and the vehicle from crashing. Researching, designing, and building the rotors and hats of a Formula SAE braking system is the project that I chose.
HYBRID AND ELECTRIC VEHICLE BATTERY DRIVE SYSTEM EVALUATION

Authors: Austin Hale
Faculty Mentor: Pradip Majumdar
Department: Mechanical Engineering
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

The first phase of this research project, conducted during the 2011-2012 academic year, encompassed mainly familiarization research into hybrid and electric motor vehicle battery and drive systems. This included battery types, charge and discharge rates, and some performance properties, including how different changes and environments affect performance and stability. Most of the research done this year was done using articles and journals, in order to become more familiar with the systems and how they work. In addition, laboratory testing has been done on charge and discharge rates under different environmental conditions, in order to evaluate the performance of similar battery systems to those used commonly in hybrid and electric vehicle drive systems under normal operating temperatures and more extreme temperatures.
Technology has advanced to the point where we can create robotic hands that have the full range of movement that a human hand has, without being excessively heavier than a human’s hand. This means that we can now make a replacement limb from a robotic hand that would have full mobility. The only difficulty is in the interface between the person and the robotic hand. Our solution to this problem will be to create a BCI (Brain Computer Interface) using an EEG (Electroencephalogram) as a translator for the signals from the brain to the hand. We propose to do this using a noninvasive technique with an EEG cap and electrodes to take the signals from the brain and output them to a micro-controller. At this time our team is isolating the signals that are sent for opening and closing a hand as well as rotating it clockwise and counterclockwise. Currently we have found that only a single electrode is necessary for a single hand. With only one electrode to look at, the amount of data processing required is greatly reduced. This will be a cost efficient and relatively simple solution to the problem of amputees interfacing with a robotic limb.
The suspension system in the SAE Mini Baja car is an essential system for the car's overall performance. Being able to cushion the car during a race is crucial for both driver performance and car performance. Traditionally, the SAE team has used A-arms for both the front and rear suspension. Although A-arms performed well in competition, there are better ways to assemble the suspension system. The new system will focus on using trailing arms for the rear suspension while keeping A-arms for the front suspension. The main difference between trailing arms and A-arms is the outputs of both systems. Trailing arms move in such a way that the tire always has line contact with the ground that is parallel with the drive shaft, while the A-arms line of contact is perpendicular to the drive shaft. The tire will wear more evenly by having the line of contact parallel to the drive shaft. As well, by using trailing arms, the manufacturability is simpler than manufacturing A-arms. A-arms required one to match and weld members that are cut at non-conventional angles, while the trailing arms require less cutting and matching of angled cuts. Additionally, the trailing arm system involves fewer members, and therefore weighs less than the A-arm system. Overall having the rear suspension designed as a trailing arm system provides more desired behaviors of the suspension system.
Within a health care organization physicians have several duties and responsibilities to attend to. And with the large amount of “Baby Boomers” reaching retirement, hospitals and healthcare systems are encouraged to increase the number of patients they see to accommodate the growing number of patients. Morrison Community Hospital wants to improve their physicians’ productivity within its outpatient clinic in order to reduce patients’ wait times. Using Arena Simulation software, the process of an appointment at a clinic will be mapped and inefficiencies identified. Data collected by the clinic will be used as the basis for patient arrival times and process times of an appointment. Finally, using the simulation, different forms of scheduling will be analyzed to find a better fit that helps utilize the physicians more and reduce patients’ wait time. With these tools at hand, this project looks to improve the physicians’ time management, achieving a better scheduling system for its patients, and overall increase the physicians’ productivity at the clinic.
JOSHUA OTT

DESIGN AND IMPLEMENTATION OF AN IMPROVED COOKING STOVE FOR A RURAL HIGH SCHOOL IN TANZANIA

Authors: Joshua Ott
Faculty Mentor: Andrew Otieno
Department: Technology
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

This project involves designing and constructing an improved wood cooking stove for a rural secondary school in Tanzania. NIU Engineers Without Borders (EWB) chapter has been involved with the Nyegina secondary school for the last two years. The Lion Stove is an institutional brick cooking stove. It was designed to be more energy efficient than traditional three stone fires and more modern metal stoves. The Lion Stove was originally designed by an NGO working in Swaziland, providing cooking stoves to neighborhood care points that fed locals who could not afford food. The need for fuel efficiency is obvious in places like northwestern Tanzania, the project location, due to the high cost of fire wood. The project was implemented at the Nyegina secondary school in Nyegina, Tanzania in January 2012. The school is home to 600 students who are fed three meals per day. The amount of wood that is needed to cook these meals has a significant impact on the schools operating budget. The need for a more efficient cooking system was seen and the Lion Stove was shown to be the best alternative. In fall 2011, I led a team of NIU EWB students to re-design the based on the specifications for Tanzania. After alterations to the design to accommodate the brick size found in Tanzania, a final set of drawings was made. In January I lead a project team to the site and we completed the first of three Lion Stoves that will be built at the school.
Each year the Society of Automotive Engineers host several collegiate competitions to design and build a Formula racecar. Engineering designs are presented and proved to judges from the motorsports industry; who then criticize our designs. One of the most important aspects of a racecar is the suspension system. The suspension is the only thing that keeps the tires on the road, and a properly designed suspension system will increase the car’s performance. The suspension system consists of many different components. The wheels connect to a spindle, which is what physically spins. The Spindle is attached to the upright, which attaches to the control arms and steering link. The control arms are what attach the wheels to the chassis of the car. They also determine how well the car can corner, and how stable it is over bumps. The aspect of the suspension that most people are familiar with are the shocks and springs. The springs hold the car up, while the shocks prevent the springs from bouncing the car up and down. Suspension designs also differ between racecars and street cars. I have designed the suspension system for Northern Illinois Universities Formula car. Through extensive computer modeling and analysis, I have developed a suspension system that will provide the handling and stability the car will need to win at competition. The design process started in May of 2011 and continued to October. After the design process, I began building the suspension system. We compete in May, and hope to perform well.
Solid waste management (e.g. landfill) is important to the growth and sustainability of underdeveloped countries. Waste pickers at a landfill, called scavengers, make a meager living by sifting wastes; however, they are exposed to potential environmental hazards. This study was conducted in the capitol of Guatemala City, Guatemala, in July 2011, in order to evaluate living and working environments for those who work or live in a community in close proximity to the city landfill. Face-to-face interviews were conducted with fifty-four individuals in the surrounding community to gather information on health risks including water quality, sanitation, hygiene, and immunizations. A XRF analyzer was used to assess ground contaminations in multiple locations, inside and outside of the community. High concentrations of lead (84 mg/kg) and other hazardous heavy metals (e.g. arsenic, chromium, copper, and zinc) were detected. This study documents the health profile of the individuals working and living in this area and shows the extent to which they are exposed to environmental health risks attributed to the Guatemala City landfill.
This study evaluated an inclusive Theatre Communications Class implemented at a suburban high school. It is a class designed to target social and communication skills in students with ASD using role playing theatre activities with students without ASD that are prepared and performed for the class. Caregivers of 2 students with ASD were asked to complete the Autism Social Skills Profile prior to enrollment. Two students without ASD were also asked to complete the Multidimensional Attitudes Scale to assess their attitudes towards individuals with autism prior to enrollment. In December of 2011, after a semester in the program, a posttest was conducted. Caregivers of students with ASD and the students without ASD were asked to complete the same measures again. Analyses were completed to determine if the social skills of students with ASD changed and if high school students attitudes towards individuals with autism changed after participating in the program. Data from the posttest of the Autism Social Skills Profile showed a positive change in the social skills of both students with ASD when compared with the data from the pretest. Data from the posttest of the Multidimensional Attitudes Scale illustrated that both students without ASD reacted differently to the Theatre Communications Class, such that each participant demonstrated an increase in at least one rating level.
The goal of the federal vocational rehabilitation (VR) program is to help people with disabilities become employed. People with hearing loss represent one disability consumer group who utilize the VR program and its services to assist them in finding employment. Individuals with hearing impairments are categorized across degree of hearing loss and primary type of communication. For example, individuals may be classified as deaf or hard of hearing and communicate in either visual or auditory modes. People who communicate visually tend to use one of several signed languages; whereas, those who use auditory communication rely on speech and their residual hearing. The VR program administers twenty-two service options to help people with disabilities find work. However, not every service is effective in assisting consumers achieve their vocational goals. The VR dataset that was analyzed was provided by the U.S. Department of Education’s Rehabilitation Services Administration. The database is a publically available dataset of all case closures for the VR program for any given fiscal year. The sample used in this study came from the fiscal year 2010 data set. Therefore, the consumer cases that were analyzed will have had their VR cases closed between October 1, 2009 and September 30, 2010. Logistic regression analysis was used to determine effective services for consumers with a hearing impairment based on communication type. Results indicate that services that predict competitive employment do differ for consumers depending on primary mode of communication, either visual or auditory.
Swallowing ability is vital to an individual’s health, protecting the airway from foreign material and facilitating nutrition. With swallowing impairment these vital functions degrade. There are various medical conditions that can cause such impairment as well as increase the risk of aspiration leading some individuals to develop pneumonia. In fact, up to 1/3 of all cases (Langmore 1998) develop pneumonia. Aspiration pneumonia is caused by a bacterial growth in lung tissue due to this intrusion of foreign material. The source of these bacteria comes from the oropharynx and is delivered to lungs from the aspiration of saliva (Marik 2003). Consequently, oral hygiene plays an important role in preventing aspiration pneumonia. Unfortunately, the practice of oral hygiene is not standard in hospital and nursing care facilities and is subject to poor compliance due to discomfort in some procedures.

The objective of this investigation is to find the most comfortable, effective method for oral hygiene. Results from this study will help develop a standard of care that is as free from discomfort but effective at reducing bacteria in the oral cavity. To accomplish this we assessed perceived comfort in healthy adults using four different oral hygiene methods. Participants rated their level of comfort on a Likert-type rating scale as they provided oral hygiene to themselves and as they underwent a typical oral hygiene protocol from the researcher. Results will undergo analysis using a 4 (oral hygiene tool) x2 (method) ANOVA.
43  **Diana Lopez**

**Does type of play effect mothers provision of internal state vocabulary?**

Authors: Diana Lopez  
Faculty Mentor: Janet Olson  
Department: Allied Health & Communicative Disorders  
Research Category: Social Science, Humanities and Arts  
Judging Time: 12:45-2:00PM

To examine the play contexts where mothers use internal state words, four, 13-month-old infants (2 boys and 2 girls) and their mothers were observed for 10 minutes as they interacted with a standard toy set. The internal state words mothers used as they interacted were identified and classified as perception, disposition, volition or cognition labels. The play that co-occurred with mothers’ use of these internal state words was coded as object or non-object play. Results showed that mothers used internal state words with greater frequency during object than non-object play. Mothers were most likely to label infant’s perceptions in both object and non-object play. Cognition labels occurred more often in non-object than object play.
Background: Aphasia is damage to the left hemisphere of the brain due to stroke or brain injury. Speech therapists theorize that frequent and intense treatment will lead to the recovery of language. The problem, however, is that many insurance companies will not cover frequent and intense therapy, especially in the chronic phase post-onset. A possible solution is the utilization of computer programs designed for people with aphasia, however, the efficacy of these programs have yet to be researched fully; such as the computer program called Parrot Software. Methods: A single-subject, multiple-baseline-across-subjects design will be used. Each subject will be given 3 to 4 programs from Parrot Software that is chosen for the individual’s needs. The patients will receive a baseline test and several probes, which are designed to test the type of language exercises that Parrot Software designed. At the end of treatment the patient will receive the post-treatment probe. Results: Data collection is in progress. If the post-treatment probes show improvement in language skills of the subject, one can conclude that Parrot Software is a reliable source for patients to receive the recommended amount of therapy. Implications: If the results show evidence that computer programs, designed for at home therapy, have the capability of improving language skills in people with aphasia this could allow patients to receive the frequent and intense therapy needed for recovery; therefore solving the issue of patients not receiving intense and frequent therapy because of insurance companies only covering a limited amount of treatment.
There are many reasons why people alter their breathing patterns. Reasons could include diseases, infections, or exercise. However, the most notable is when they use their voice for speaking. The nature of this experiment is focused on the emotional aspect of breathing responses, and the sensitivity of emotion on how we breathe and how these affect voicing. In this project, we are measuring the impact of breathing and voicing to different emotional responses. The aim of this study is that different emotional responses will lead to differences in breathing patterns for voicing. We anticipate that if we are able to provide a different emotional response to a participant, their emotional response will affect their breathing and ultimately their voicing. We will measure the changes in breathing during voicing using a measure called phonation threshold pressure. Using this data and information, we will be able to have a better understanding of how vocal behavior is affected by emotional processing. Our goal is to provide details of how emotional processing influences voicing with the hopes of informing speech language pathologists in clinical practice of the nature of these relationships.
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Voice disorders affect between 3-9% of the population at any given time and can have detrimental effects on communication, employment and quality-of-life (Roy, Merrill, Gray, & Smith, 2005). Because of this, understanding the importance of individual factors on the development and treatment of voice disorders can lead to improvements in individual lives. One such factor is temperament or emotional processing. However, methods that are sensitive to both emotional processing and to vocal fold behavior need to be validated in order to investigate the relation between these two attributes. Electroglottography, a well-researched voice measure, in response to a startle probe administered during emotional conditions, may prove useful in directly measuring vocal behavior in people with voice disorders. The proposed research will validate electroglottography during the startle probe as a reliable measure of vocal behavior in emotional conditions. In doing so, this research will not only facilitate understanding of the research processes from start to finish, with special emphasis on the proper procedures and techniques required to work with human participants, but it will also help contribute a greater understanding of how vocal behavior is affected by emotional processing in a transdisciplinary way. The ultimate goal of the research is to provide a glimpse into how research can contribute to a body of understanding and assist speech language pathologists in clinical decisions.
In order to examine how infants use baby signs to comment and request, fourteen babies (7 boys and 7 girls) and their mothers were observed at 13 and 17 months. Mothers were randomly assigned to one of two groups and asked to teach their babies five signs at 13 months. Group one was asked to teach their baby the signs ball, dance, duck, go, and more. Group two was asked to teach the signs throw, bear, open, car, and more. Mothers were given a Parent Report Sign Form to record what signs the babies used at home, how often they used them (i.e., often, sometimes, rarely, never) and to record what type of communicative intent the signs expressed (i.e., request, comment, other). Mothers returned the completed Parent Report Sign Form when their baby was 17 months old. Thirteen infants produced two or more of the signs at home. Results showed that infants used baby signs more often to request than comment. Boys and girls used baby signs with the same frequency and did not differ in their use of baby signs to comment and request or to represent nouns and verbs.
ADAPTATION OF JOINT ATTENTION TREATMENT FOR YOUNG CHILDREN WITH AUTISM

Authors: Katie Janssen
Faculty Mentor: Danai Fannin
Department: Allied Health & Communicative Disorders
Research Category: Social Science, Humanities and Arts
Judging Time: 12:45-2:00PM

An experimental treatment focusing on the development of joint attention routines in the context of parent-child play and daily activities has shown evidence of improving language skills in children with autism (Kasari, Freeman, & Paparella, 2006; Kasari et al., 2008). Thus, providing a similar joint attention treatment would be helpful for Speech-Language Pathologists (SLPs) when providing treatment in schools and clinics without the parent. The parent-child treatment was adapted for SLPs and administered to a 4-year-old girl with autism at the NIU Speech-Language-Hearing Clinic. Preliminary data on the adaptation of the treatment will be discussed.
Existing research studies suggest that adolescents with limb differences and deficiencies are at a greater risk for depression, anxiety and loss of self-esteem (Varni, Rubenfeld, Talbot, & Setoguchi, 1989). There is limited information available that examines the relation between severity of limb difference, as opposed to the presence or absence of a limb difference, and adolescents’ psychological and social adjustment. This investigation examined the relation between severity of adolescents’ limb differences and adolescents’ externalizing behavior, internalizing behavior, experiences of peer teasing, loneliness, and friendship quality. It was hypothesized that more severe limb differences would be high levels of externalizing behavior, internalizing behavior, teasing by peers, and loneliness. It was also hypothesized that more severe limb differences would be higher levels of negative friendship quality and lower levels of positive friendship quality. It was also hypothesized that the severity of limb difference would be related to loneliness with teasing as a mediator. Questionnaires were completed by 39 parent-child dyads in which the adolescent, ages 11-17, was receiving treatment for a limb difference at a local hospital. There was a significant correlation between the severity of limb difference and the adolescents’ internalizing and externalizing disorders, such that more severe limb differences were related to poorer adjustment. There was no significant relationship between the severity of limb difference and friendship quality. There was a significant relationship between severity of limb difference and the experiences with teasing and feelings of loneliness. The relationship between severity of limb difference and loneliness was mediated by teasing.
RESEARCHING THE FACTORS INVOLVED WITH THE PARTICIPATION OF HISPANICS IN A COMPUTER TRAINING PROGRAM

Authors: Elaine Rodriguez
Faculty Mentor: Jim Ciesla
Department: Nursing and Health Studies
Research Category: Social Science, Humanities and Arts
Judging Time: 12:45-2:00PM

The purpose of the research project is to identify factors leading to participation and nonparticipation in a computer training program among low income Hispanic seniors. The program’s purpose is to encourage computer and Internet use among seniors. The target population of the program is people who live in a sample of 23 public housing facilities and subsidized housing buildings located in northern Illinois which were the sites of an Internet training program. The training program lasted twelve weeks. The rate of participation and completion of Hispanic seniors was disappointingly low. Participation of Hispanic seniors in the program may have been affected by many factors. This research will identify the main factors leading to the lack of participation and completion of the Hispanic seniors. With my Spanish speaking ability I will conduct telephone interviews. I have created a questionnaire to use when I conduct the interviews. The results of this research will make it possible to improve or design computer and Internet programs for Hispanic seniors.
There are various hematological disorders associated with the structure and function of the hemoglobin molecule in the human red blood cell. These disorders range from the very common, such as thalassemia and sickle cell anemia, to the very rare. Hemoglobin Athens-Georgia is a very rare condition associated with a mutation of the normal hemoglobin molecule. A genetic mutation causes a substitution at the C helix of the beta-chain in the molecule which leads to the disorder. The substitution involves the amino acid arginine being replaced with the amino acid lysine. This mutation results in a slightly increased affinity for oxygen and interference with HbA1C test that is used for the diagnosis of diabetes mellitus. This study aims at the elucidation of pathology associated with Hemoglobin Athens-Georgia and related hemoglobinopathies.
The big question is, “How can child sexual abuse be prevented?” This abuse, by both relatives (intrafamilial) and nonrelatives (extrafamilial), occurs widely. The goal of this study was to identify successful interventions by analyzing current treatment and education for adolescent boys who are sexually abusing children and to learn what gaps exist to limit abuse and ultimately prevent adolescent boys from becoming child sexual abusers. The method was a focused literature review and 6 interviews with practitioners to learn how therapists, educators, and public health professionals address the problem of sexual abuse with adolescent boys who are perpetrators. Results: Current knowledge and research focuses largely on victims rather than perpetrators, on females rather than males, and on adults rather than adolescents. A gap exists regarding the complex topic of child sexual abuse perpetrated by adolescent boys. Interviewees answered the following questions:

- When becoming sexually mature himself, what influences an adolescent boy to abuse others sexually?
- What are some successful interventions for adolescent boys who are sexually abusing children?
- What is being done now to treat or educate adolescent boys who are child sexual abusers?
- What needs to be changed to limit or prevent sexual abuse by adolescent boys.

Responses were mixed and all of the professionals expressed frustration about how to address this issue. Increasing protective factors seems most effective in the long term. This finding supports Finkelhor’s model in which supervision and protection are the most critical barriers that keep child sexual abuse from happening.
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Cancer cells must respond to challenges within tumor microenvironments, including hypoxia and nutrient deprivation. In addition to glucose, the amino acid glutamine is consumed avidly by cancer cells to fuel growth, and is imported into human liver cancer cells by a transporter named ASCT2. In this study, the effects of specific amino acid deprivation on ASCT2 activity and expression were examined. Among amino acids tested, deprivation of the sulfur-containing amino acid cysteine evoked a selective increase in ASCT2 activity relative to other amino acid transporters. To test the mechanism of increased ASCT2 activity, four human liver cancer cell lines were used to test whether or not cysteine deprivation increases ASCT2 expression at the mRNA and protein levels through quantitative real-time PCR (qPCR) and western blotting, respectively. As cysteine and glutamine are used to manufacture glutathione, the major cellular antioxidant essential for cell survival, we tested whether cysteine deprivation also increased expression of an amino acid transporter termed xct, the major cystine transporter in cells. We further tested the hypothesis that cysteine starvation-induced glutathione deficit was sufficient to evoke increased ASCT2 activity by treating cancer cells with buthionine sulfoximine (BSO), a biochemical inhibitor of glutathione synthesis. The results obtained demonstrate the complex responses of different cancer cells to nutrient deprivation challenges, and represent the first report of selective linking of a major glutamine transporter to glutathione metabolism. Such information will be valuable in designing selective therapies for liver cancer.
Many plants defend themselves through induced chemical resistance in response to herbivores, but this ability can vary with environmental factors. Associations between plants and arbuscular mycorrhizal fungi (AMF) are ubiquitous in terrestrial ecosystems, and this symbiosis affects plant-herbivore interactions. However, the impact of AMF on induced plant defenses is largely unknown. We examined the effects of AMF on the induced defenses of Solanum ptycanthum (Solanaceae), a common agricultural weed in Illinois. We grew S. ptycanthum with and without Glomus intraradices, a globally common AMF species and induced chemical defenses using jasmonic acid. We measured induced chemical defenses (activity of enzymes that interfere with herbivore digestion), herbivore preference, and herbivore growth. We also determined direct effects of AMF on plant growth and nutritional status (nitrogen content) and plant reproduction by measuring flower production, flower size, and seed production.
The veA gene is a light-dependent global regulator of morphological development and secondary metabolism in Aspergillus nidulans. In these studies a novel A. nidulans C2H2 zinc finger domain type transcription factor, designated as RM7, has been identified and characterized. Previous studies in our laboratory have shown that RM7 is VeA dependent. Over-expression of the rm7 gene in a veA+ wild type genetic background resulted in reduced amounts of sterigmatocystin (mycotoxin) production. Further gene expression analysis revealed that the expression levels of the genes stcU and aflR, necessary for sterigmatocystin production, were reduced in the over-expression strain with respect to the levels seen in the wild type. These findings indicate that RM7 is a negative regulator of sterigmatocystin biosynthesis. Additional experiments in this study have shown that rm7 gene has the opposite role in controlling the production of another secondary metabolite, penicillin, and is necessary for the synthesis of this antibiotic.
JUSTIN DURANCIK

STUDY OF ClpB IN THE WELL-CHARACTERIZED MODEL FILAMENTOUS FUNGUS ASPERGILLUS NIDULANS

Authors: Justin Durancik
Faculty Mentor: Ana Calvo
Department: Biological Sciences
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30AM-12:45PM

This project includes the investigation of fungal global genetic regulators that potentially control morphogenesis and the biosynthesis of secondary metabolites, including carcinogenic mycotoxins or antibiotics such as penicillin. Specifically, in this study, I am investigating the role of the ClpB protein complex in the well-known model filamentous fungus Aspergillus nidulans. The Clp proteins are proteases similar to heat shock proteins. The expression of the genes encoding Clp proteins is dependent on VeA, a global regulator controlling development and synthesis of secondary metabolites in different fungal species. These proteins have been studied in many bacteria and the yeast Saccharomyces cerevisiae. However, they have not yet been studied in any filamentous fungi. This study contributes to determine the function of A. nidulans ClpB by characterizing a ClpB gene deletion mutant and assessing whether this gene has a role in fungal development as well as in mycotoxin or antibiotic biosynthesis. The results of this study could derive in applications to decrease the detrimental effects of fungi while enhancing those that are beneficial.
**ALLISON MAKULEC**

**GROWTH OF NATIVE ILLINOIS MICROALGAE AND DEGRADATION OF ALGAL CELLULOSE**

Authors: Allison Makulec  
Faculty Mentor: W. Scott Grayburn  
Department: Biological Sciences  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 9:00-10:15AM

Microalgae are currently considered to be the best source of oil for biodiesel because they can be found naturally around the globe in many climates. Microalgae grown in effluent water are a great resource of cellulose because they grow quickly and do not compete for use of land that is normally reserved for food. Cellulose is the most abundant naturally occurring polymer on earth. Some microorganisms are able to breakdown cellulose into its constituent glucose molecules. Glucose can then be converted to ethanol by industrial fermentation. The goal of this study is to test various bacteria for their ability to utilize synthetic and algal cellulose as carbon sources. The bacteria chosen are two different strains of Bacillus megaterium, Streptomyces coelicolor, a strain of Exiguobacterium, and Escherichia coli. All the strains of bacteria being used have genomes that are completely sequenced except the Exiguobacterium which has close relatives with complete DNA sequences available. Streptomyces coelicolor and Exiguobacterium were previously identified as having cellulytic activity. Concurrently, different microalgae that grow well in local effluent water are being cultured in defined media. When azenic (pure) cultures are obtained, this will facilitate identification using morphological and DNA sequencing approaches.
Gametophytic Self-Incompatibility (GSI) is a phenomenon that allows plants to discriminate against self-pollination. In our lab, we are seeking to determine how petunias are able to recognize and discriminate self-pollen from non-self pollen. In an attempt to do this, we are pursuing both genetic and molecular approaches. The genetic portion of this project is focused on quantitative variation in the levels of self-incompatibility, a phenomenon known as pseudo-self-compatibility (PSC). We have characterized different strains of Petunia hybrida PSC levels, and are genotyping the different PSC lines. Ultimately we hope to make comparisons between the varying degrees of self-incompatibility and protein expression. A more molecular oriented approach is focused on characterizing the SCF-SLF protein complex. This E3 ubiquitin ligase complex is specific to GSI, and is thought to act to target non-self S-RNases for sequestration or degradation inside pollen tubes. Some of the proteins that make up this complex have already been successfully cloned. A current goal is to clone a remaining protein of this complex, SSK1. Cloning the SSK1 protein involves PCR amplification, digestion with restriction enzymes, ligation, and transformation. Once all of the SCF-SLF complex proteins are cloned, we will use the different cloned proteins for protein interaction assays using yeast two-hybrid and Bimolecular Fluorescence Complementation assays.
CCL5 is a cytokine that has been shown to play an important role in trafficking of immune cells to sites of injury. CCL5 is also a cytokine that is a growth factor for specific cells such as a stromal cell or a tumor cell. There are three receptors associated with CCL5 including CCR1, CCR3 and CCR5. The receptor that we will be working more closely with is the receptor CCR3. We will be focusing on CCL5 effects on GLI1 and GLI3 activity and expression in HS-5 stromal cells. Goals of this project include investigating the effects of CCL5/CCR3 signaling on GLI1 and GLI3 expression by reverse transcription polymerase chain reaction (RT-PCR). In addition, we will use a luciferase assay to determine GLI activity in response to CCL5 treatment and CCR3 expression. Previous studies have shown that CCL5 promotes GLI2 expression, but we don’t know the effect that it will have on the other members of the GLI protein family, GLI1 and GLI3. This project is significant because it helps to identify possible new roles that CCL5 can have on GLI1 and GLI3.
In this faculty-sponsored study, I plan to enhance my biological knowledge by examining the forelimb anatomy of the domestic cat, Felis catus. Domestic cats are often the anatomical models for anatomy and physiology courses, but the details of their forelimb muscles, especially the paws, remain understudied. Therefore, the first goal of my research is dissecting the forearms, wrists, and paws of several cat specimens. During this study, I will compile muscle maps, detailing individual placements and bony attachments. I also plan to identify variants in the muscle structure that differ from the commonly used Felis catus diagrams. If these irregular structures are found, I will then examine domestic cat behavior to determine how these muscles function and if the irregularities have functional significance. My work will complement my advisor’s research, which is determining hunting and other behaviors in saber-tooth ambush predators. Integrating our comparisons will lead to a more accurate and complete depiction of the anatomy of these fields. This will further my career path toward understanding the part anatomy plays in animal behavior.
**ALEXANDRA TERRY**

**INTRODUCTION OF A DISULFIDE BOND IN A HIGHLY PH DEPENDENT ANTI-RNASE A VHH ANTIBODY**

Authors: Alexandra Terry, Megan Murtaugh & Christopher Smith
Faculty Mentor: James Horn
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

Antibodies are macromolecules which play an important role in the immune response. Their ability to bind target molecules with high affinity and specificity has expanded their use in a wide range of applications, including diagnostics, drug delivery systems, therapeutics, and chromatography. Previous work in the Horn Lab generated a highly pH sensitive single domain VHH camelid antibody. An unintended consequence of this engineering was a decrease in the VHH antibody’s thermostability. Here we investigate whether an engineered disulfide bond can enhance VHH stability without loss of the pH sensitive binding. Using Kunkel mutagenesis, two cysteine residues were incorporated into the anti-RNase A VHH at positions 49 and 70 to create a disulfide bond. Circular Dichroism (CD) and Isothermal Titration Calorimetry (ITC) are used to determine whether the engineered disulfide bond increases stability without altering the pH dependent binding affinity of the VHH variant.
Neisseria gonorrhoeae is the pathogen responsible for the sexually transmitted infection gonorrhea. Since gonorrhea has been publicly made aware of, many antibiotics such as penicillin and ceftriaxone have been used to fight the bacterium. However, due to antibiotic resistance these drugs are becoming less useful in fighting the infection. Antibiotic resistance comes from the antigenic variation of the pilus structure in Neisseria gonorrhoeae. Periodically, the bacterium will change the structure of the pilus by changing the gene responsible for making it, the pilE. One would assume that by stopping transcription on the pilE gene, you would stop antigenic variation all together. However, this proved to be not true, and this was due to another set of genes called the pilS, or pilSilent. Recently Professor Hill found that these genes were being transcribed, and thus are not “silent” per say. In Hill’s lab, I work with the genomic sequence of the FA1090 strain of Neisseria gonorrhoeae to find if there are any promotor sites on the pilS loci that are causing this transcription. The pilS gene has a set of conserved regions, and so far we have found that transcription seems to be occurring close to or in the actual conserved regions in each of the pilS genes, leading us to believe they share common promoter sites. By locating exactly where these sites are in each of the pilS genes, we can then find a way to stop the the promoter from binding to the DNA, and prevent transcription from starting.
This research is aimed at exploring means for a more selective and efficient delivery system for boron neutron capture therapy (BNCT). Currently there are a handful of various methods for researchers to introduce the boron compound into malignant cells. However, each of these methods has their own pitfalls. If this technology is to become commercially available it first needs to have a consistent and reliable method of cellular introduction. It is the hopes of this project to discover a new aspect of delivery that could spark the boron neutron capture therapy community into realizing this drug can in fact be delivered in a dependable manner. The main aspect of this project will be to convert a compound commonly used in PET-scans, the amino acid L-Glutamine, to introduce boron into malignant cells. This compound will continue to behave as it normally would in PET-scans, allowing it to easily be absorbed by the cells; however certain parts of the compound will be replaced by boric acid allowing it to function as an agent of boron neutron capture therapy. Once the PET-scan compound has been converted to carry boron into cells, specific cells that contain a high amount of this compound can be killed without affecting any surrounding cells. Think of it as chemotherapy without the harmful radiation side effects. It is the anticipation of this project to finalize a method of reliable delivery for BNCT.
Low cost synthesis of p-Carborane  Ronald N. Peter, Ivan Snajdr, Amartya Chakrabarti, Narayan S. Hosmane* Department of Chemistry and Biochemistry, Northern Illinois University  para-Carborane is a very unique compound that displays excellent thermal stability and high thermal conductivity. It can as well be a boron source for potential Boron Neutron Capture Therapy (BNCT) applications. The major problem in its practical usage is the availability of the material due to its high cost. Our goal is to synthesize p-carborane by using simple and affordable chemistry and inexpensive starting materials. The synthetic scheme is consisted of five steps starting from boron trifluoride diethyl etherate and sodium borohydride. The products were thoroughly characterized by FT-IR spectroscopy, NMR spectroscopy and Elemental analysis.
Lead discovery by fragment screening for infectious disease drug targets was used to detect highly efficient ligands that could be used as drug candidates. The MEP pathway is used and essential to P. falciparum and P. vivax, in which the synthesis of new antimalarial and antibacterial assays is currently needed. The microbial MEP pathway (methyl-erythritol pathway) was used for the biosynthesis of isoprenoid precursors. MEP pathway contains several enzymes, B. pseudomallei (BpIspF) was the enzyme chosen as the drug target as its active site overlays with residues for multiple infectious diseases. Fragment crystallization was used to identify possible efficient ligands that could be used as drug candidates. Fragment screen was used to identify small chemical fragments, which may bind only weakly to the biological target, but then used by growing them or combining them to produce a lead with a higher affinity. The ISPF enzyme contained several fragment hits, in which the zinc and cytosine sub pockets were the components used to focus the synthesis of the ISPF inhibitor off of. The design strategy focused on linking both the cytosine and zinc binding fragments in order to create unique ISPF inhibitors. SPR (surface plasmon resonance) analysis was used to further analyze ligands that could bind to target enzyme. The ligand FOL995 was a weak ligand that was determined by the SPR assay, where binding to the zinc was incorporated through the imidazole ring and the phenol component bonded to both the Asp65 and Phe63 residues. This compound could be built off of incorporating it into the space cytosine occupies.
Protein-protein interactions form an important core of biological regulation and function. One example includes apoptosis, a highly regulated pathway for programmed cell death. Apoptosis is controlled by inhibitory anti-apoptotic proteins, such as Bcl-xL, and pro-apoptotic proteins, such as BAD. As Bcl-xL is an anti-apoptotic protein, overexpression or malfunction can lead to too little cell death and hence cancerous growth, rendering it an excellent potential target for small molecule and peptide inhibitors. Understanding the nature of these protein interactions through the study of protein energetics and structure can facilitate the design of small molecules capable of inhibiting these interactions and impeding their harmful down-stream effects. The structural details of the Bcl-xL/BAD complex reveal a single helix is involved in BAD’s interaction with Bcl-xL. Unfortunately, modifications of the BAD helix intended to probe the basis of molecular recognition may not be straight-forward due to the possibility that modifications can also destabilize the helix. To address whether we could stabilize the helix through the addition of an exogenous ligand, we engineered a metal-ion binding site into the BAD peptide at a location that should not interfere with Bcl-xL recognition. The metal-binding variant of the BAD peptide was expressed as a ubiquitin peptide fusion protein and purified using FPLC and HPLC. Circular dichroism spectroscopy will be used to determine whether the presence of nickel will stabilize the BAD peptide and facilitate further investigation of the Bcl-xL-BAD interaction.
My research was conducted using the hydroxyalkylation reaction. I worked under the supervision of Dr. Douglas A. Klumpp conducting research in organic chemical synthesis. In this project, I worked with graduate student, Matt Zielinski. The hydroxyalkylation reaction is a widely used mechanism used to produce a variety of products ranging from colorings and dyes to various polymers. This reaction is sometimes called a “condensation reaction” since the formation of the product results in the loss of water as the nucleophiles readily react with an electrophilic ketone. The reaction is catalyzed by a superacid known as “triflic acid”. The superacid “triflic acid” is over one thousand times stronger than concentrated sulfuric acid. The systems for this project were selected by Dr. Klumpp of the Department of chemistry and biochemistry. Each chemical reaction was carried out using exactly 1.0 equivalents of the diketone with exactly 2.0 equivalents of the crown ether in chloroform. About 8 equivalents of triflic acid were used in each reaction. This research was submitted and accepted by Tetrahedron Letters and is presently in print.
Because of its size and location in the cell, understanding DNA has presented its share of problems. In 1983, Kary Mullis developed a fairly simple and effective way of cloning and amplifying specific regions of a genome through a polymerase chain reaction (PCR). Our lab has been using this technique to isolate and sequence regions of chloroplast genomes from different grasses; assembling those regions into complete circular plastome maps. Constant progress and improvement in science has produced new and more effective techniques. The next generation sequencing that Illumina offers has the capability of generating sequence data for entire chloroplast, mitochondrial and nuclear genomes in a fraction of the time. Genomes are sonicated into small fragments. A specific size is then selected for, extracted from the gel and attached to a lawn to be bridge amplified and sequenced. Reversible terminator chemistry is using to generate highly accurate base readings. Utilizing this more rapid accumulation of genome data will accelerate our understanding of gene structure and function, while comparison with genomes from other species offers crucial insights into mutations and other important evolutionary changes, advancing the field of comparative genomics.
Synthesis of hexagonal Boron Nitride (h-BN) nanomaterials is currently a major research topic due to the unique properties of h-BN, such as both thermal and electrical conductance. In this research, h-BN nanosheets were formed by vapor deposition technique using boric acid and urea as starting materials. The products were characterized via Fourier Transform Infrared (FT-IR) Spectroscopy, Raman Spectroscopy, Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), X-Ray Powder Diffraction (XRD) and Energy Dispersive X-ray Spectroscopy (EDS).
Antibodies are proteins secreted by immune cells in response to bacteria, virus or other foreign molecules. The unique ability of antibodies to bind tightly to target molecules is of great importance in applications such as therapies, diagnostics and biotechnology. As such, there is great interest in engineering antibodies with new or enhanced properties. Unfortunately, such modifications frequently have adverse effects on antibody structure and stability. One example includes our recently engineered anti-methotrexate antibody, which was designed to display pH-dependent binding. The structural modifications that were necessary to introduce the pH sensitivity ultimately decreased antibody stability. Here, we address whether increased stability can be reintroduced without loss of pH-dependent binding. Using site-directed mutagenesis we have inserted two cysteine residues into the protein to create a new disulfide bond. Disulfide bonds usually increase the stability of the folded form of a protein as they provide a covalent “cross-link” between two residues distant in sequence. Techniques including fluorescence spectroscopy and circular dichroism have been used to determine the melting temperature of the engineered antibody and isothermal titration calorimetry (ITC) to determine the binding energy. The results suggest that the engineered antibody binds with the same relative affinity as the original antibody, yet the melting temperature has increased significantly.
Leah Ko

Physiology of Bleaching in Two Model Octocorals.

Authors: Leah Ko, Laura Busija, Justin Evans, Michael Lewis, Patrick Morrison & Sarah Netherton
Faculty Mentor: Neil Blackstone
Department: Biological Sciences
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30AM-12:45PM

Cnidarians are a major component of coral reefs, some of the most diverse ecosystems on Earth. Coral bleaching threatens these reefs and hence is a major environmental concern. Bleaching occurs when the host coral undergoes a stress response, and its photosynthetic symbionts leave the tissue where they usually reside. In vivo laboratory studies of model cnidarians using video and fluorescent microscopy and polarographic measures of oxygen uptake or formation can illuminate this stress response. Colonies of two octocoral species, Sarcothelia sp. and Phenganax parrini were grown on microscope cover glass for these experiments. While these species are both members of the Holaxonia-Alcyoniina clade of the Alcyonacea (which includes most symbiont-containing octocorals), they are otherwise not closely related. Perturbations using light, temperature, or confinement in small volumes of seawater result in a stereotypical stress response: the polyps of the colony bleach and symbiont-containing cells accumulate in the stolons. Regardless of the proximate trigger of this response (e.g., temperature or confinement in a small volume of seawater), a major perturbation of photosynthesis was found, with oxygen formation of a colony diminished by roughly half. Respiration of the colony was less clearly impacted. Likely related to the effect on photosynthesis, perturbation of reactive oxygen (ROS) and reactive nitrogen species (RNS) was also observed using fluorescent probes. ROS in the coral tissue peak immediately after the initiation of perturbation and decline to much lower levels after 24 hours. A corresponding effect on native fluorescence of NAD(P)H, however, was not observed. Throughout the stress response, RNS appear at only low background levels in the coral tissue, but symbiont-containing cells in the lumen of the stolons may exhibit very high levels of RNS. While much of the details of the physiology of octocoral bleaching remain to be elucidated, the finding that vast numbers of functional symbionts remain in a colony during bleaching is a potential game-changer in terms of understanding recovery from perturbation. This work will ultimately be used to guide the development of therapeutics for the bleaching process.
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“Undergraduate research provides students with learning opportunities that are not possible in traditional classroom settings. Research students take an active role in the research project, explore questions that have never been answered, and gain experience with cutting-edge techniques.”

-James R. Horn, 2011 NIU Faculty Mentor of the Year

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Molecules that can reversibly adopt discreet conformational states in a controlled manner are called molecular switches. These compounds can be used in a wide range of applications, including chemical sensing, environmentally responsive materials, and the study of biological systems. In this project, we aim to establish the chalcone/flavanone scaffold as a covalent molecular switch by demonstrating the ability to control this equilibrium via substituents on the benzene ring. Here we present the synthesis, characterization, and evaluation of several such molecules.
Antibodies play an essential role in the immune response due to their high affinity and specificity for their target molecule. In addition, they play an important role in many life science applications, including diagnostics and therapeutics. To better understand the nature of how antibodies can recognize a small molecule target (i.e., haptens), we are actively investigating structure/function relationships for a unique class of camelid antibodies, called VHH. Prior work in the Horn lab revealed a previously unknown mechanism of hapten recognition where an anti-caffeine VHH formed homodimers that were necessary for caffeine recognition. Here we further our study by investigating whether it is possible to control caffeine affinity through small changes in pH. To initiate such pH dependency we introduced single histidine residues at different locations within the VHH-VHH interface. This included genetically engineering the VHH DNA to incorporate histidine groups at positions 49, 61, and 108. All histidine substitution positions were strategically located in the VHH dimer interface. The resulting protein was expressed in E. coli, purified, and analyzed by isothermal titration calorimetry (ITC). While some histidine insertion positions produced a pH dependent antibody, others resulted in complete loss of caffeine binding. The results demonstrate that histidine incorporation onto the dimer interface can introduce pH dependent caffeine binding through a coupled dimerization equilibrium.
Stereoselective interactions between proteins and low-molecular weight ligands, such as drugs, are still not well understood even though they have been described first more than a century ago. Extensive work has been carried out to understand the stereoselectivity displayed by a number of anti-alpha-amino acid antibodies (D.I. Ranieri, NIU, 2009). We are now interested in the molecular basis of two stereoselective antibodies raised against alpha-hydroxy acids, namely 8E10 and 10B2. DNA was isolated from hybridoma cell lines and antibody heavy and light chain DNA was amplified using polymerase chain reaction. DNA was then cloned into plasmids and sequenced.
AMBER CARRICK

Authors: Amber Carrick
Faculty Mentor: Timothy Hagen
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM
HIGH HEAT DISSIPATION AND ELECTRICAL-INSULATING NANO-COATING FOR ALUMINUM PRINTED CIRCUIT BOARD DEVICES.

Authors: Joseph Fleck & Tun-Jen Hsiao
Faculty Mentor: Chhiu-Tsu Lin
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30AM-12:45PM

The build-up of heat in light emitting diodes leads to shorter lifetime of the unit, low efficiency, and wavelength shift. Metal Core Printed Circuit Boards are currently the best way to enhance thermal dissipation to combat these effects. These MCPCBs are constituted of a metal core layer, dielectric layer, and copper circuit layer. To further develop heat dissipation, we have created several nano-coating formulations for application to Aluminum panels: two aqueous emulsions containing graphene nanoparticles (MCPCB-black) and two aqueous emulsions containing hexagonal boron nitride (MCPCB-white). Each black or white formulation has a water-based and solvent-based version. The Aluminum panels were prepared for these emulsions using a three step cleaning process, and the emulsions were applied by spray-coating. After application, the combined product was thermally cured at 130 degrees Celsius for 10 minutes and a copper circuit layer was applied using physical vapor deposition. We have found that MCPCB-black and MCPCB-white formulations were able to increase cooling by 23 and 15 degrees Celsius respectively, while also functioning as a dielectric layer with a breakdown voltage greater than 4 kilovolts. Cleaned aluminum panels lacking a coating were used as a control. We conclude that nano-coatings have excellent thermal dissipation and dielectric properties, allowing increased efficiency for LED and metal heatsink applications by effectively allowing the copper circuit layer to be applied directly to the coated heatsink base.
BIOPHYSICAL INVESTIGATIONS INTO THE ROLE OF AN INTRAMOLECULAR HYDROGEN BOND BETWEEN TWO INTERFACE CDR LOOPS IN AN ANTI-METHOTREXATE ANTIBODY

Authors: James Lee, Christopher Smith & James Horn
Faculty Mentor: James Horn
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

Antibodies are large Y-shaped proteins produced by B-cells that are used by the immune system to help eliminate foreign objects such as viruses, bacteria and proteins introduced into the body. The effectiveness of antibodies arise from their high degree of specificity and affinity for their target antigen. In this study, an anti-methotrexate VHH antibody is examined to determine the role an intramolecular hydrogen bond has on methotrexate recognition. Site-directed mutagenesis was used to replace interface residue tyrosine-79 with phenylalanine, thus removing the hydroxyl group involved in the intramolecular hydrogen bond. The effect of this mutation on binding affinity and stability was evaluated through isothermal titration calorimetry (ITC), differential scanning fluorimetry (DSF), as well as circular dichroism (CD). Overall, removal of the hydrogen bonding hydroxyl group results in a decrease in both binding affinity and thermostability, indicating interface intramolecular hydrogen bonds can play significant roles in recognition of small molecule ligands by VHH antibodies.
The pKa of benzoic acid can be predictably modulated by additional substituents on the benzene ring. Electronic effects of substituents at the meta and para positions have been thoroughly documented. The focus of this research is to investigate the stereoelectronic implications of a Lewis acid/base interaction between the carbonyl oxygen of the acid and ortho-silyloxy groups. The compounds were made using standard organic synthetic techniques and analyzed using 1H, 13C, and 29Si NMR, and pKa evaluation. The aim of this project is to investigate the role of silicon substituents on its Lewis acidity for future application in the development of silicon-based Lewis acid catalysts.
PETAR MATIC

Authors: Petar Matic
Faculty Mentor: Timothy Hagen
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM
Advancement in cancer therapy relies mostly on the development of drug delivery systems. The major challenge in the drug delivery system is the increment in the efficiency of the agent by delivering maximum amount of doses to the cancer cells. The use of boron doped silica nanoparticles with Boron Neutron Capture Therapy (BNCT) is a relatively new endeavor. The silica nanoparticles are going to be attached to sugar moieties in order to transport the nanoparticles to the cancer cell. This project will also be investigating the viability of thiosugars and Stevia as tumor specific drug carrier.
Robert Meyers

_Apoptosis Gene Expression in Glioblastoma Multiforme Tumor Cells Treated with Cisplatin and Gamma Irradiation_

Authors: Robert Meyers, Miranda Foster & Immanuel Jackson
Faculty Mentor: Linda Yasui & Scott Grayburn
Department: Biological Sciences
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

Glioblastoma multiforme (GBM) is the most prevalent and aggressive malignant primary brain tumor in humans. Once diagnosed, patient survival times range from three months if left untreated to a 12 percent survival rate at two years with palliative treatment. Death is usually a result of cerebral edema and increased intracranial pressure associated with a necrotic mass. Treatment of GBM is very difficult due to the vulnerability of healthy brain tissue to conventional treatments and the restricted ability of the brain to repair itself, as well as the difficulties associated with administering chemotherapeutic agents across the blood brain barrier. Treatment of GBM with gamma irradiation and chemotherapy concurrently has been shown to significantly improve patient survival rates when compared to tumor resection alone (Patwardhan et. al., 2004). The expression of apoptosis genes in response to treatment with cisplatin and/or gamma irradiation was investigated by quantitative real time polymerase chain reaction (qPCR). Treated GBM tumor cell lines, U87 and U251, were collected for qPRC three or seven days post-treatment. qPCR results may provide insights into the mode of cell death as a result of the various treatments. Ideally, up regulation of genes associated with pro-apoptotic pathways and down regulation of genes associated with anti-apoptotic pathways would increase levels of programmed cell death by apoptosis, as opposed to necrosis, and may result in increased patient survival rates.
Conservation biologists often lack basic life history information for species that exhibit reclusive behavior, even when the species is common and widespread. To address this need capture-mark-recapture study of the Brown Snake (Storeria dekayi) and the Common Gartersnake (Thamnophis sirtalis) was conducted at Potawatomi Woods Forest Preserve in DeKalb County and Nachusa Grasslands in Lee and Ogle County. Potawatomi consists primarily of wet sedge meadow habitat and Nachusa is mesic prairie. Fieldwork involved checking cover boards (recycled conveyor belt) weekly. Snakes were measured to obtain mass and snout-to-vent length (SVL) and each individual was uniquely marked by clipping ventral scales. In 2011, 155 Brown Snakes and 177 Gartersnakes were captured at Potawatomi and 75 Brown Snakes and 64 Gartersnakes were captured at Nachusa. Neonates (snakes born during the 2011 season) of both species were larger at Nachusa than Potawatomi. By October 1st, Brown Snake neonates at Nachusa were 11% longer and 20% heavier than neonates at Potawatomi. Similarly, Gartersnake neonates at Nachusa were 24% longer and 57% heavier than neonates at Potawatomi. Possible mechanisms for these differences may be earlier birth, larger size at birth, or faster growth at Nachusa. Possibly, temperature differences between Potawatomi (cooler) and Nachusa (warmer) are responsible. Soil temperature data will be collected at both sites in 2012 to test this hypothesis. The effect of soil temperature may help estimate impacts of global climate change on these species.
Aspergillus nidulans is a filamentous fungus that is often used as a model organism in genetics and molecular biology studies. The species has a well-characterized life-cycle and its genome has been sequenced. Aspergillus species are commonly found in the environment and some can cause health problems in humans. Some Aspergillus species produce aflatoxin, a toxic compound that causes acute necrosis, cirrhosis, and carcinoma of the liver in some animal species and can potentially cause similar symptoms in humans. A. nidulans produces the carcinogenic mycotoxin sterigmatocystin (ST), a precursor in the aflatoxin biosynthetic pathway. The focus of this project is to characterize the possible involvement of two A. nidulans stress-response protein kinases in the regulation of mycotoxin production. The two protein kinases under study are HogA and SskB. They are part of a phosphorelay system that senses osmotic and oxidative stress and triggers an adaptive response to these stimuli. Our results suggest that the HogA pathway negatively regulates ST biosynthesis. This is the first study of the connection between elements of the HogA response pathway and regulation of ST production.
Spatial disorientation or wandering is commonly observed during the progression of dementia of Alzheimer’s type (DAT) and stems from an inability to use spatial cues to navigate throughout an environment. The septohippocampal system has been implicated in the neuropathology associated with the progression of DAT. The cholinergic and GABAergic projections are two excitatory components in the septohippocampal system. The cholinergic component has been the main focus of most studies; however, the pharmaceutical therapies developed from this component have not been very successful. As of yet, the role of the GABAergic component in spatial orientation remains to be determined. The current study examined rat performance in the food-hoarding paradigm and water maze tasks following an infusion of GAT1-Saporin (immunotoxin that targets GABAergic cells) into the medial septum. The food-hoarding paradigm allows the independent manipulation of environmental (visual, olfactory, and auditory) and self-movement cues (vestibular, sensory flow, proprioception), whereas water maze tasks are commonly used to evaluate mnemonic function. Rats that received the infusion of GAT1-Saporin were impaired in returning to the refuge when restricted to using self-movement cues. In contrast, performance was spared when rats were provided access to environmental cues. These findings suggest that the septohippocampal GABAergic system may contribute to self-movement cue processing. This further demonstrates a role for GABAergic component of the septohippocampal system in spatial orientation and could lead to the development of novel DAT-therapies that act on this system.
AUG start codon is a common initiator of translation of proteins form mRNA template in all living organisms and viruses. Brome mosaic virus (BMV) is model type viral system used in current research to understand the mechanisms behind translation of viral movement proteins. Brome Mosaic Virus (BMV) is unique in forming two distinct RNA templates for translation of the p3a movement protein. Prior research attempting to deduce the reason for synthesizing two separate templates yielded the discovery that both strands still operate as translational templates when the start codon is mutated. Current work focuses on how BMV is able to carry out translation of p3a without a typically AUG start codon. Through in vitro translation, multiple point mutations were tested in an effort to understand how the virus is able to utilize non-canonical start codons. Moreover, the suspected translation enhancement region (Y-loop) at 5’ end of the movement protein open reading frame elements were sequentially removed in order to map the possible enhancement sequence necessary for efficient translation. Further studies are focused on inserting the suspected Y-loop 5' to the coat protein open reading frame, in an attempt to ascertain if the secondary structure promotes ribosomal binding, thus facilitating translation.
Over the past few years, cancer researchers have targeted amino acid transporters as prime candidates for chemotherapy delivery, tumor imaging and diagnostic/prognostic and therapeutic markers. One particular amino acid transporter that has been studied by many labs is LAT1. LAT1, or L-type amino acid transporter 1, is a part of System L, the major nutrient transport system responsible for the transport of large neutral amino acids including several essential amino acids. LAT1 represents an extremely important step in understanding and eventually exploiting cancer physiology and nutrition. To date, LAT1 has been shown to be significantly upregulated in various cancers including breast, prostate, lung, glioma, and human hepatocellular carcinoma (HCC). This observation is particularly significant because LAT1 is not highly expressed in normal cells, and has been linked to other metabolic changes including enhanced glucose utilization (the Warburg Effect). Therefore, the unique augmented expression of this transporter in cancerous cells offers researchers a chance to probe the reliance of tumors on its function and potential as a therapeutic target. Recent reports and data from Dr. Bode’s lab have implicated LAT1 in being associated with the aggressive glucose-intensive metabolism (Warburg Effect) in cancer cells. The studies proposed here will help to test such hypotheses regarding this relationship between LAT1, the Warburg Effect, and eventually contribute to better targeted therapies for HCC patients.
Parasitoid wasps are natural enemies of filth flies, and therefore an alternative to insecticides. Filth flies tend to be common where livestock are raised. Our experiments looked at the effects of livestock bedding (cedar shavings, pine shavings, corncob pellets, and wood pellets) on wasps, on their adult longevity, grooming behavior, and offspring development within the fly pupae. Parasitoid species used were Spalangia endius and Urolepis rufipes, and the host species was house flies. Longevity was measured by placing a wasp in a petri dish with one type of bedding and recording daily whether it was alive or dead. Preference for resting on the bedding versus the petri dish was also observed. Longevity was decreased in cedar shavings compared to pine. No significant differences were found between wood and corncob pellets. Grooming behavior was observed by putting a wasp in a petri dish filled with bedding on a vortex machine for one minute. The bedding was then removed from the dish, and the behavior of the wasp was observed for ten minutes. Is time spent grooming or time spent in locomotion affected by bedding type? The effects of bedding on wasp development within fly pupae were observed by giving female parasitoids 15 fly pupae to parasitize for 24 hours. After 24 hours the pupae were removed and put into a jar with either cedar shavings, pine shavings, or no shavings. Is number of flies and wasps emerging affected by bedding or bedding type?
Multiple paternity is a phenomenon that is both a phylogenetically widespread and ecologically frequent occurrence in numerous species of snakes, lizards, and turtles. This study was conducted with Eastern Massasauga (Sistrurus catenatus catenatus) dams and their offspring from study sites in western Pennsylvania and central Illinois to determine whether there is evidence for multiple paternity in this species. The DNA of each of the dams and their corresponding litters was amplified at 2-7 variable microsatellite loci. Those litters which have more than 2 paternal alleles for a given microsatellite locus provide evidence for multiple paternity. For example, in one litter from central Illinois 3 paternal alleles were present at two distinct loci. Additionally, another litter showed 3 paternal alleles at one locus. Having more than 2 paternal alleles provides evidence for more than one sire and thus, for multiple paternity. Multiple paternity studies may be used to provide answers to questions concerning sexual selection, mating systems, and sperm competition, to name a few, with the overall goal being to understand the evolutionary advantage multiple paternity confers to both male and female snakes.
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Oxygen concentration can play a role in various ocular disorders including cataract and macular degeneration. The measurement of oxygen concentration at a specific location in the eye can indicate progression of certain ocular diseases as well as susceptibility to secondary ocular disorders. We are developing a new method to measure oxygen noninvasively in the eye. This consists of injecting a phosphorescent probe, palladium porphyrin, into the eye. The probe compound has a room temperature phosphorescence and the phosphorescence lifetime varies linearly with oxygen concentration. An FM-2 Fluorotron (TM) Master, is then used to measure the resulting phosphorescence signal throughout the eye. The ability to noninvasively measure the oxygen tension in the different compartments of the eye can be a valuable tool in clinical ophthalmic practices as well as opening new avenues in research.
We are interested in quantitatively measuring the development of autophagosomes in irradiated human brain cancer, glioblastoma multiforme U87 and U251, cells following different types of irradiation. Our experiments involved measuring the intensity of “brightness” emitted by cells after fluorescent staining, which is directly related to the number and size of autophagosomes in the cell. We grew U87 and U251 GBM cells in tissue culture and irradiated the cells using gamma irradiation or fast neutron irradiation. Cells were then stained with acridine orange fluorescent dye, and the “brightness” emitted by individual cells was measured 3 days and 7 days after irradiation. Those cells subjected to gamma irradiation displayed a higher intensity “brightness” after AO staining compared to unirradiated samples. A clear increase in cell “brightness” from the 3 day to the 7 day time period was also observed. Data for cells undergoing fast neutron irradiation is also noted. With this method, we are able to determine which irradiation therapies will cause the greatest extent of autophagy in each cell line. Ultimately, we are working on developing irradiation therapies that will prove more effective against cancerous human GBM.
The model filamentous fungus Aspergillus nidulans develops asexually forming specialized conidium-producing structures called conidiophores, as well as sexually, forming spherical fruiting bodies called cleistothecia. It is known that the transcription factor FlbB is necessary for normal conidiogenesis in A. nidulans, however all the studies until now have been carried out in fungal strains with genetic background including a mutation in a gene call veA (veA1 mutant allele) that leads to the formation of a truncated protein with partial loss of function, such as lack of light-response. In this work we are focusing in characterizing FlbB function in a true wild-type background (veA+). Aspergillus nidulans develops asexually or sexual dependent on light in veA+ background: in the light the fungus mainly conidiates, while in the dark it develops sexually forming cleistothecia. When we studied the phenotype of the flbB mutant in strains with a veA+ genetic background and compare it with that of a veA+ control strain with a flbB wild-type allele we found that while sexual development is mostly suppressed in the light in the wild type, under these same conditions the flbB mutant produces abundant cleistothecia, that also maturates faster than those in the control strain. These findings suggest that FlbB is not only necessary for conidiogenesis but it is also a repressor of sexual development. The next step in this project is to elucidate whether FlbB controls the transcription of genes encoding other transcription factors necessary for sexual development in this model fungus.
The purpose of this research is to better understand promotion to leadership positions in American state legislatures. Promotion to leadership is seen as important because of the significant role leaders’ play in agenda-setting and the ultimate passage of new legislation. Specifically, the research will look for possible age and gender discrimination in the promotion to leadership positions. More specifically, the research will test the rate in which women and young legislators are promoted while controlling for length of service. In addition, the research seeks to test whether there are regional or partisan differences in the promotion patterns of women and young legislators. State legislative leadership positions include the speaker of the House or Assembly, speaker pro tempore, majority and minority whips, majority and minority leaders (also “floor leaders”) of the House and Senate, president of the Senate, and president pro tempore of the Senate.
Is it possible to tell what type of people would be more uncivil as members of Congress? Do certain traits or characteristics, whether gained through nature or nurture, make some Members of Congress more predisposed to act uncivilly in the halls of Congress? Obviously, these are two extremely broad questions, with many different possible answers; limitless traits and characteristics can be studied to find which members of Congress are more predisposed to be uncivil on Capitol Hill. As such, this research will specifically focus on members who serve as congressional leaders, members who formerly served in state legislatures, member’s who are female, members who are ideologues, and whether a correlation exists between each of these separate groups and congressional incivility. For example, are female Members of Congress more or less likely to be uncivil?
Law Clerks have been an active part of the United States Supreme Court since the early 1880’s. Since their beginning, they have become an integral part of the Court and its operation. Becoming a clerk for the Supreme Court is thought of as a revered position reserved for only the most elite young attorneys. Throughout the past thirty years, however, the path to the Court, as well as the prospects afterwards, has changed dramatically. I have chosen to collect data on the law clerks from 1980, 1985, 1990, 1995, 2000, 2005, and 2010. Then I will compare different aspects of the clerks lives: age at time of clerkship, amount of work experience prior to clerking, law school from which they graduated, ideology of the Justice for whom they served, and first job attained after graduation. I want to know if the same type of clerk that was selected twenty years ago is still being selected today, or if there has been a gradual shift in the qualities the Justices look for. I hypothesize that clerks today will be older and with more work experience than those of twenty years ago. I also believe that we will see a strong correlation between the ideology of the clerks Justice, and the type of job they begin after their clerkship.
The Robotics Revolution is a recent phenomenon under the category of a Revolution of Military Affairs (RMAs). This use of robots in warfare is new and unconventional way that is changing the way the United States military is engaging threats across the globe. This revolution is still in its infancy and academia has made little attempt to understand it. Using survey-based research, Undergraduate student Jacob O. Kenney and Political Science Professor Rebecca J. Hannagan polled several Northern Illinois University students, asking empathy-scale based questions and giving students a random condition between lethal and non-lethal robots to observe and respond to. This poster is an analysis of the information given by the students.
For only the second time in recent history, the Swedish people elected an extreme-right populist party, the Sweden Democrats (SD), to the Riksdag (parliament). In 2010, not only did the Sweden Democrats exceed the required percentage of votes to receive seats in the Riksdag, but they obtained an even higher number of votes than the farthest-left party. This is a significant shift in the Swedish political landscape, which has traditionally been dominated by the center-left Social Democrats, and has also been rather supportive of extreme-left representation in the Riksdag. By developing a theoretical and empirical understanding of contemporary Swedish politics, and the history and trends of extreme-right populism in Western Europe, I evaluated the social, cultural, and institutional components that led to the recent electoral success of SD. Additionally, I analyzed the factors that drive both the salience and significance of the immigration debate that has been so central to their platform. After completing a review of current literature on extreme-right populism in Western Europe and interviewing members of SD, other political parties, and scholars, I conclude that the electoral future looks bright for SD if the mainstream right-wing party, Modaraterna, adopts some of their demands for tighter restriction of immigration and asylum practices, thereby increasing the electoral salience of this issue. SD has forced immigration into the spotlight, and it behooves the agenda-setting mission of Modaraterna to capitalize on this by taking ownership of the immigration issue for themselves. This, in turn, will bring greater legitimacy to SD, breaking the single-issue stereotype that has plagued them from the start.
WOMEN’S INVOLVEMENT IN POLITICAL UPEHAVAL AND SUCCESSFUL WOMEN’S MOVEMENTS?
COMPARATIVE ANALYSIS OF INDONESIA AND THE UNITED STATES

Authors: Jenifer Puetz
Faculty Mentor: Kikue Hamayotsu
Department: Political Science
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM

By comparing political upheaval in the United States in the 1960s and in Indonesia in 1997, I will be focusing on how the involvement of women in the upheaval dictates how women’s movements emerge from the upheaval. While much research exists on women’s movements, an understudied element of women’s movements has been women’s participation in political upheaval. I will be focusing on two main questions: the strong involvement of women in upheaval as a catalyst for successful women’s movements; the existence, predating upheaval or the result of upheaval, of a democratic regime or hybrid regime with democratic elements. While women’s movements may emerge from other circumstances, I believe that the success rate when movements follow political upheaval, is higher than other conditions. If the strong involvement of women in political upheavals does lead to successful women’s movements then this knowledge can be utilized in future political upheavals to aid in successful women’s movements.
KAZIMIER CHEVAS

JON STEWART: MEDIA CRITIC

Authors: Kazimier Chevas
Faculty Mentor: Artemus Ward
Department: Political Science
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM

Is Jon Stewart a comedian, entertainer, political pundit, or newscaster? My research hypothesis is that while he may wear each of these hats at various times, his most important role is media criticism. In short, I suggest that he is the Marshall McLuhan for the Millennial Generation. My project analyzes The Daily Show with Jon Stewart to determine how much time the show spends on critiques of the mass media, in relation to other topics, and examines the nature of those critiques. By quantitatively and qualitatively comparing episodes of Stewart’s programs in the 2007/2008 and 2011/2012 presidential election seasons I will also be able to see whether Stewart’s media criticism has evolved over time.
Despite the abundance of research on the Age of Exploration, the origins of one of the main motivations for European exploration has not been extensively covered. I analyzed the use of spices in a medieval Catalanian cookbook to ascertain how and in what quantities spices were used. I also looked at secondary research, most notably that of Paul Freedman, to further develop the topic. I found that in Catalonia and the surrounding area in the fourteenth to sixteenth centuries, spices were an integral part of elite cuisine. They were so important, in fact, that their influence moved to other aspects of southern European society. The high demand for spices resulted in increased attempts to dominate the spice market by the exploration of more direct trade routes. The great discoveries of fifteenth- to seventeenth-century Europe were driven by the search for spices, as rich traders and monarchs commissioned maps and funded the expeditions of famous explorers such as Christopher Columbus and Amerigo Vespucci.
ADAM BROWN

LIBERALIZATION AND ITS ELECTORAL CONSEQUENCES IN POST-SOVIET RUSSIA: THE SHIFTING OF POLITICAL CULTURE

Authors: Adam Brown
Faculty Mentor: Michael Clark
Department: Political Science
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM

In this project I will analyze the development of democracy in Russia since the ascension of Vladimir Putin as president. Using political culture theory as a framework, I will argue that both Russian political culture and the demands of the electorate have shifted in favor of greater democracy. I will argue that this is in spite of Putin’s institutional changes towards increased autocracy or ‘managed democracy’. My project will conclude with the most recent parliamentary elections of December, 2011 and the protests against the regime which have proliferated throughout the country. I will also briefly address the coming presidential election and the future of Putin and his party, United Russia.
One method to evaluate the productivity of an oil field is to calculate the ratio of the energy produced versus the energy consumed. This ratio is called the Energy Return on Investment (EROI). California’s oil field data collection system provides a unique opportunity because the production and injection data used in the EROI model have been collected for over a century. Yearly EROI calculations were performed on all reported oil fields in California from 1977 to 2009. Preliminary findings indicate that as the energy required for extraction increases, the net energy return declines. The most significant factors contributing to this decline are the increased need for energy-intensive enhanced thermal recovery methods (i.e. steam injection) as primary and secondary recovery methods become less effective, and the increased production of water from the wells increases the energy used for water treatment.
Representatives of the Weather Services Division of Chesapeake Energy Corporation sought information about how the frequency of occurrence of certain extreme temperature and precipitation events has changed temporally and varies geographically in the United States east of the Rocky Mountains. This information is considered important to the division’s interests in the agricultural and energy industries. For a set of 50 first-order stations (hereafter, FOS(s)) for the 1931-2010 period, the seasonal number of days in June through August on which the daily maximum temperature equaled or exceeded 95 degrees Fahrenheit (for those stations north of Interstate Highway 40), the daily maximum temperature equaled or exceeded 100 degrees Fahrenheit (south of I-40), and the daily minimum temperature equaled or exceeded 75 degrees Fahrenheit was examined. Also, for the same set of stations during the same time period, the seasonal number of days in December through February on which the daily minimum temperature was 0 degrees Fahrenheit or lower (north of I-40) and the daily minimum temperature was 25 degrees Fahrenheit or lower (south of I-40) was examined. Moreover, for 48 FOSs for the 1941-2010 period, the seasonal number of instances in which 48-hour liquid-equivalent precipitation equaled or exceeded 3.00” in March through August was assessed. For the temperature thresholds, there existed temporal and spatial trends that permitted the identification of regions with like temporal trends in the occurrence of the threshold on the basis of a decadal analysis. For the precipitation threshold, no notable temporal or spatial trends were identified.
As the third largest city and a major economic center in the United States, Chicago faces great challenges in relieving its traffic pressure. In a recent urban mobility study, Texas Transportation Institute reported that Chicago was ranked as the worst city in traffic in the country. An investigation of the commute and travel patterns in Chicago would provide important policy implications for transportation planning and traffic management. Under this context, this study aims to examine and visualize the commute and travel patterns of Chicago using GIS techniques. Based on the 2010 Chicago Metropolitan Planning Agency’s Travel Tracker Survey data, this study analyzed the commute patterns related to the use of public transit, including both the CTA bus and train systems and the Metro train system. Based on the survey of trip-chain movements, this study further interpolated and visualized the activity density surface. Finally, the space-time trip patterns were revealed in a 3D environment. The analysis of the CTA system shows that the Loop area was the major depot of trip origins and destinations, seconded by the north side of Chicago. Regardless of origin and destination, Union Station and Ogilvie Station – the two stations close to the Loop, carried the most amount of commuters. The trip-chain analysis provides a clear picture of the spatio-temporal travel patterns associated with different trip purposes.
Historians who have researched why men enlisted in the U. S. Army during the Civil War have bypassed the northern Illinois region in favor of the eastern states. By examining primary sources exclusively from this region, the research will address the motivations behind men’s decisions and place them in the context of the overall analysis of men from the Union side. The study was conducted by examining primary source collections at ten archival repositories, and analyzing over twenty additional primary sources along with seventeen secondary sources. The results validate general themes of motivation across the northern states for volunteering during the first two years of the war including: preservation of the union, patriotism, liberty for the slaves, and the ability to prove one’s self a man. The research is also supplemented by more personal motivators. Money, prestige, personal affections, and social advancement are also discovered in the sources. The Civil War era in Illinois has been dominated by Lincoln, Grant, and the city of Chicago, now the face of the common man has a chance to emerge.
“TO GET A HAPPY HOME”: CHALLENGES TO THE MARRIAGES OF PEOPLE WITH DISABILITIES IN THE UNITED STATES, 1920-1925

From 1900 to 1925, people with disabilities deployed multiple strategies in court in order to counter legal challenges to the validity of their marriages. Eugenicists campaigned to block the contraction of marriages by people with disabilities, especially those who were labeled “feeble-minded” or “insane.” They asserted that such marriages were a major moral and reproductive threat to the nation. This rhetoric, along with new laws in some states that restricted access to marriage on eugenic grounds, encouraged legal challenges to the marriages of people with disabilities. But older traditions of common law jurisprudence allowed people with disabilities whose marriages were challenged an opportunity to argue before the court that they possessed the capacity to decide and consent and their marriages should therefore be upheld. My research focuses on uncovering the logic of marriage restrictions, investigating how people whose marriages were challenged defended their validity, and examining the outcomes of these court cases.
**RACHAEL KAHLEY**

*CHAUCER'S CLOTHING IN THE CANTERBURY TALES*

Authors: Rachael Kahley  
Faculty Mentor: Valerie Garver  
Department: History  
Research Category: Social Science, Humanities and Arts  
Judging Time: 12:45-2:00PM

My research paper examined how Geoffrey Chaucer used clothing in *The Canterbury Tales* to show how people defied the rules and legislation imposed by the governing elite. Chaucer held multiple positions within England's medieval society, and he developed the work’s different characters with knowledge about the meanings that were connected to various types of clothing. I examined the images from the Ellesmere facsimile and the descriptions of the clothing from the stories and compared them to the secular and religious laws to show how the laws were defied by the clergy, nobility, and peasants. My research concluded that the secular laws, known as the Apparel Acts, and the religious laws created by the Lateran Councils ultimately failed due to the overall disregard of the laws by the people.
In the spring of 1849, in the small pioneer town of Sycamore, Illinois, a farmer by the name of George M. Kinyon faced two devastating tragedies. The first occurred on March 26th of that year when his young bride Marilla (Churchill) Kinyon, age sixteen, was taken from him by cholera only after a few months of marriage. The second tragedy occurred a few weeks later when Kinyon and his father-in-law David Churchill realized that Marilla’s body was stolen from her grave by a few body snatchers from a neighboring county. The body snatchers, or ‘The Resurrectionists’ as the notable Dekalb County Historian Henry L. Boies likes to refer to them, were actually medical students under the direction of Doctor George W. Richards of the first medical school in Illinois, the Franklin Medical School in St. Charles. The theft of Marilla’s body consequently led to a mob of 40-300 men from neighboring counties walking to Doctor Richards’ house where a gun fight then ensued. My research involves pin-pointing every single detail of the incident that are either left out or disagreed upon in the many accounts of the event by examining primary documents from the NIU Regional Archive, the St. Charles Heritage center, local libraries, and cemetery records. In addition, I compare the accounts, whether they are first hand or secondary, and try to distinguish biases against medical students of the location and period, and compare them to other incidents in the U.S.A.
Modern computers are constantly increasing in complexity while decreasing in size. Therefore, future devices must utilize novel materials capable of high density data storage techniques. Much of this progress is centered on spin electronics which involves storing information in the quantum mechanical spin of electrons. Metal oxide thin-films display both high magnetic switching fields and low resistivity desirable in spintronic devices. They are able to not only conduct electric charge, but also transport electrons with a specific spin. However, the properties of these materials are different for thin-films than bulk quantities. At small scales, the interface between the substrate and the material has a large effect on the material’s properties. This relationship between properties and material interface is not fully understood at this time. Transmission electron microscopy (TEM) and electron energy loss spectroscopy (EELS) allow for both high resolution images at the atomic scales and mapping of magnetic domains. We examine nanoscale oxide thin-films (SrRuO3 & LaMnO3) using TEM and EELS to develop precise characterization techniques to better understand the relationship between structural and magnetic properties.
The NIU-Collaborative on Early Adolescence (CEA) recognizes these students for their research with CEA members and affiliates:

Emily Anderson  
Departmental Honors Thesis  
Department of Psychology  
Dr. David P. Valentiner

Aaron Kelter  
Departmental Honors Thesis  
Department of Psychology  
Dr. Amanda Durik

Kayley Bloss & Lucero Martinez  
University Honors Capstone Project  
Department of Psychology  
Dr. Amy Luckner

Robert Nielsen  
Independent Study Project  
Department of Psychology  
Dr. Amanda Durik

Julia Dombrow  
University Honors Capstone Project  
Department of Psychology  
Dr. Amy Luckner

Kristen Rabe  
Independent Study Project  
Department of Psychology  
Dr. Laura Pittman

Courtney Halas  
Research Rookie  
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This research project looks at the fluctuations in the density profile of model cell membranes made of phospholipids. More specifically, we are measuring the effect of calcium ions on the density profile of these membranes. This density profile is then used to determine how thermal fluctuations modify the membrane shape. This is being done by measuring the diffraction of x-rays from our sample. Our samples are composed of double bi-layers of the phospholipid dipalmitoylphosphatidylcholine (DPPC) on a silicon substrate, suspended in water. The samples are deposited onto a silicon substrate using a Langmuir-Blodgett trough and then transferred to a water filled cell to be measured. In order to verify proper preparation of the samples a measurement of the diffraction of x-rays was also taken for a blank silicon substrate and a single bi-layer. Then after measuring a control double bi-layer we are changing the concentration of calcium ions and measuring what affect it has on the double bi-layer. The affect of the calcium ions on the model cell membrane will improve the understanding of thermodynamic behaviors in cell membranes. A better understanding of the behavior of cell membranes will allow for many medical treatments to be advanced in the future. Specifically, it will help our understanding in how to make better drug transfers between cells, create or manipulate membrane fusion, and disrupt cell membranes.
ADVANCING THE HYDROGEN SENSOR FOR HYDROGEN FUEL CELLS

Authors: Garrett Wise
Faculty Mentor: Zhili Xiao & Yasuo Ito
Department: Physics
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

On the verge of oil crisis, alternative modes of energy are becoming necessary. One such form is the hydrogen fuel cell. In such a fuel system, hydrogen sensors are critical components due to possible hydrogen leaks, which would be incredibly dangerous. The present project is focused on improving our understanding of the hydrogen sensing mechanism by nanoscopic structural investigation of palladium-gold nanowire network deposited on a porous alumina substrate. I made electron microscopy samples of palladium-gold nanostructures, and analyzed them under the scanning electron microscope and transmission electron microscope at Argonne National Laboratory. I focused on visually analyzing structural integrity and elemental distribution of the samples. The first sample yielded interesting results in that an aluminum oxide layer was partially chemically removed from the sample, leaving the network of palladium/gold nanowires with it. The outcome of the project could lead to a new generation of hydrogen sensors that are more reliable, faster and more selective in sensing only hydrogen.
This project consists of cataloging the artifacts of the different room block samples excavated at San Marcos Pueblo outside Santa Fe, New Mexico. This research is important to filling the gap of knowledge regarding the population of San Marcos and is essentially to further research of this site. We have been analyzing data in the form of artifacts. These artifacts were then catalogued on spread sheets under one of four categories. The spread sheets are then going to be analyzed to find similarities and differences between room blocks. Although we have not yet analyzed the data, we hope it will shed light on what the population of San Marcos was actually like, or at least help us get closer to an answer to the question of population.
WHERE HAVE ALL OF THE WILD WOMEN GONE:
IDENTITY AND SURVIVAL IN THE OLD WEST

Authors: Andria Maxwell
Faculty Mentor: Winifred Creamer
Department: Anthropology
Research Category: Social Science, Humanities and Arts
Judging Time: 9:00-10:15AM

Frontier life during the nineteenth century kicked open the swinging doors of the Wild West. Combined with the westward expansion of the United States, women during this time period had more opportunities to acquire wealth, property, and a life of their own than ever before. This investigation attempts to piece together the paradoxical roles of identity and economic reward for women in the old west, by using a comparative, qualitative study of primary and secondary sources to review women’s biographies and autobiographies to understand their motives for occupying tenuous positions during westward expansion.
This project aimed to obtain a preliminary understanding of the perceptions of nature held by Northern Illinois residents. Because of society’s growing concern about the state of our environment, climate change, and an increasing tendency towards conservationism research in this quarter is relevant. Our study will not only provide a foundation for developing future environmental policies and action, but more importantly, can help to make those policies and actions successful. In our pilot study we aimed to test our methodology and research design, and to determine if a larger, more in-depth study is warranted. In this project we hypothesized that our subjects would have a Relative Frame of Reference, and therefore perceive and understand nature from an ego- or human-centric perspective. We interviewed subjects from Northern Illinois (n=15) using an indirect approach to access their perceptions, transcribed the interviews and analyzed them in three ways. We conducted a key word analysis (including an agent vs. patient analysis), a gist analysis and a metaphor analysis. Our findings supported our hypothesis and we find that a larger study is warranted by this pilot study. The poster presented represents the culmination of three years of undergraduate research, funded by the URAP from the College of Liberal Arts & Sciences, NIU.
For my URAP project I have been working with Dr. Creamer in the Anthropology department. We have been working with and identifying artifacts that have been unearthed at the site of San Marcus Pueblo. We went through boxes of artifacts recovered from the site and organized them by their excavation location in different room blocks. We then went through each room block separately making spreadsheets on all of from each level. There is a lot of pottery, ground stone, including some stone tools, bones and materials such as plaster, turquoise, and adobe from the structures. As we were analyzing each artifact we wrote down where the object was located, what the decoration on the pottery was if there was any, and possibly what era it was made in. With the ground stone that was found we recorded the dimensions and probable function. For bone we recorded the size, number of fragments and the possibility of it also being a tool such as an awl. Upon completion of the spreadsheet for each room block we wrote a summary using our data and the field notes made when the site was being excavated. We put those into our summaries as well to get a better conclusion of where the artifacts were found and how they might have been used in that room or area.
The focus of this research was to determine individuals’ perceptions of individuals who are using other-deprecating and self-deprecating humor styles. We were interested in whether individuals attribute self- or other-directed humor to a specific gender. Also, we were interested in whether gender affects the individual’s association of the humor style used. Data is currently being collected from students and working adults acquainted with students through electronic surveys. Participants are asked to rate a series of humorous work related emails on characteristics such as how funny they are, how offensive, and their reaction to the humor. These emails were first pre-tested to ensure that the emails can be properly categorized into their intended humor style categories. Participants were also asked what they believed the gender of the individual composing these emails to be. It was hypothesized that males and females will attribute to other-directed humor to males, and self-directed humor to females. Data collection will be complete by the end of March and results will be reported at the time of the Research Fair.
The purpose of this study was to investigate global and targeted social support as a moderator in the relation between victimization and internalizing symptoms. Targeted social support can be defined as social support that is targeted at a specific issue (i.e., coping with victimization), and global social support can be described as general social support that is broad and not targeted at any particular issue. A total of 863 seventh and eighth graders completed the Child and Adolescent Social Support Scale (CASSS; Malecki et al., 2000), A Victim Questionnaire (Demaray & Malecki, 2003), the Child and Adolescent Social Support Scale – Victim (CASSS-V; Malecki, Demaray & Rueger, 2010), and the Behavior Assessment System for Children, Self-Report of Personality Second Edition (BASC-2 SRP-A; Reynolds & Kamphaus, 2004). Results provided psychometric support for the CASSS-Victim measure. There was a moderate and significant relation between global and targeted social support. Lastly, Total Support for Victimization moderated the relation between victimization and anxiety.
The Agreement of Victimization Reports Across Parent, Teacher, and Student Perceptions

Authors: Scott Zwolski & Kristen Rabe
Faculty Mentor: Christine Malecki & Michelle Demaray
Department: Psychology
Research Category: Social Science, Humanities and Arts
Judging Time: 10:15-11:30AM

Problem or Major Purpose: Bullying has become a significant concern in many schools, with as many as 30-35% of students reporting being involved in bullying, as either the bully, the victim, or both (e.g., Nansel et al., 2001). While there have been some variations in the description of bullying and victimization, the widely agreed upon definition is a provocative aggression where the behavior is repetitive, intended to be harmful, and within a disproportionate power relationship (Olweus, 2011). In the limited research that has investigated the relations between bullying behavior and prevalence rates, it has been concluded that teachers report lower perceptions of bullying than students (e.g., Houndoumadi & Pateraki, 2001). This study will extend the literature by providing the agreement levels of parent, student, and teacher reports on victimization in schools.

Procedure: 3rd-8th graders (n = 137; 55% male; 86% Caucasian), along with their teachers and parents, reported their perceptions of student bullying and victimization using the Revised Olweus Bully/Victim Questionnaire (OB/VQ; Olweus, 1996). This commonly used bullying and victimization measure was given to students, and a modified version was given to parents and teachers. Conclusions and Implications: Results support past literature noting that students and teachers do not share the same agreement on reports of victimization. However, teachers were meaningfully related to girls’ self-ratings of victimization only in 3rd/4th grades. Regarding parents’ and boys’ reports of victimization, parents seem to have more of a grasp on boys’ social experiences than their teachers do.
How do we figure out what other people are thinking about us? Past research has suggested that we rely on our own self-perception or self-esteem to form metaperceptions—perceptions of what others are thinking about us (Kenny & DePaulo, 1996). However, recent research has shown that how we form metaperceptions depends on the extent to which we feel evaluative pressure in the social situation (Kaplan, Santuzzi, & Ruscher, 2009; Santuzzi, 2011). Perhaps we focus on different sources of information to form metaperceptions in evaluative as compared to non-evaluative situations. Thus, individuals might rely generally on self-perceptions to form metaperceptions in non-evaluative situations, but rely on stereotype expectations or other less uniquely personal structures to form metaperceptions in evaluative situations. The present study will examine the role of self perception in the formation of metaperceptions when anticipating face-to-face and computer-mediated environments. Each of the participants was randomly assigned to one of four conditions. One of the conditions involved anticipating a face-to-face interaction while the other 3 involved computer-mediated interactions. Based on previous research in the lab, we predicted that face-to-face situations with others will trigger a self-handicapping response in forming metaperceptions, such that metaperceptions will be more negative in those situations as compared to computer-mediated interactions. Furthermore, we expected that the usual relationship between self-perception and metaperception would be lower than in computer-mediated interactions. Computer-mediated interactions were expected to yield self-enhancement such that metaperceptions would be more positive than generally expected based on self-perceptions.
THE EFFECTS OF MANIPULATING PERSONAL RESPONSIBILITY ON ANALOG CHECKING BEHAVIOR: TESTING THE COGNITIVE MODEL OF OBSESSIVE-COMPULSIVE DISORDER SYMPTOMS

Authors: Stephanie Smith, Ryan Adolphson, Mary Docking, Kourtney Ikeler, Kayde Merrill, Katie Pawlicki & Charles Schafer

Faculty Mentor: Kevin Wu, PhD
Department: Psychology
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM

Obsessive-Compulsive Disorder (OCD) symptoms are repetitive acts performed to alleviate distress about a feared outcome. One OCD model posits that symptoms arise only when people feel personally responsible for the outcome. This experiment investigated if manipulating personal responsibility results in elevated checking behaviors (analog compulsions) for students completing a proofreading task. After completing baseline measures (including demographics, OC beliefs, symptoms, personality), participants were assigned to a high (HRG) or low (LRG) responsibility group. Pre-manipulation, groups were equivalent on all demographic variables and psychometric scales except perfectionism/certainty beliefs (HRG > LRG; p = .049; note, this variable was not significantly correlated with the task). The manipulation involved telling HRG that their performance was tied to the partner’s and both must complete the task 100% correctly to end the experiment; otherwise, both would be required to complete a second task. The LRG were told only to work carefully. After completing additional measures, both groups completed the task during a nearly open-ended period. The HRG scored higher than LRG on the two main dependent variables of time checking (p = .049) and number of checks (p = .077). Interestingly, (a) the groups did not differ on OC beliefs about responsibility and (b) the majority of HRG participants actually reported lower responsibility beliefs following the manipulation compared to baseline scores. This finding is counterintuitive and suggests OC responsibility is not driving the checking behavior. This presentation will explore whether variables other than elevated responsibility may predict the observed group differences.
This study examined the relationship between aggression and prosocial behaviors and how it is influenced by both types of popularity (sociometric and perceived). In this study, we defined sociometric popularity as how well-liked and accepted someone is. We also defined perceived popularity as showing social dominance in a peer group: “being well-liked and accepted by others,” (Meijs et al., 2010, p. 62). Perceived popularity is defined as “social dominance, influence, and prestige in the peer group,” (Meijs et al., 2010, p. 62. It was hypothesized that students who score high on peer perceived popularity will engage in relational aggression, while students who score high in sociometric popularity will engage in higher levels of prosocial behavior. Also, it was also hypothesized that males who have high perceived popularity, will show higher levels of relational aggression comparatively to those who score low on perceived popularity. Participants included 321 (189 female, 132 male) undergraduate psychology students, at a Midwestern University. The age range was between 18 and 39, with a mean age of 20.67 years. A self-report questionnaire was given to the students, used to measure relational aggression, physical aggression, verbal aggression, peer status, and prosocial behavior. The self-report questionnaire was given on a seven-point Likert scale. Results showed that there was a positive correlation between physical aggression and perceived popularity. Prosocial behavior is significantly related to sociometric popularity with no gender-related differences. No association was found between relational aggression and perceived popularity.
Stress, anxiety and depression are pervasive in modern society, and can negatively impact functioning (Cash & Whittingham, 2010). It is important to correctly identify which psychological conditions a person is experiencing, through the process of differential diagnosis, in order to choose the appropriate clinical intervention. Mindfulness-based interventions have been proposed to ameliorate the symptoms of stress, anxiety, and worry (Cash & Whittingham, 2010). Mindfulness is defined as being consciously aware of and accepting experiences in the present-moment without judgment (Baer, 2003). Mindfulness-based treatments focus on developing awareness and acceptance of thoughts, feelings, and physical experience through psycho-education, physical movement, and meditation (Cardaciotto et. al., 2008). This study examined whether depression, anxiety, and stress differentially predicted mindful-awareness and acceptance. Results indicated that there was a moderation effect of gender when examining whether anxiety, stress, and depression predicted levels of awareness and acceptance. For females, anxiety significantly predicted awareness ($\beta = .225, p = .024$). When accounting for anxiety, stress ($\beta = .193, p = .109$) and depression ($\beta = -.158, p = .153$) did not significantly predict awareness. Stress significantly predicted acceptance ($\beta = .236, p = .038$) in females. When accounting for stress, anxiety ($\beta = .128, p = .167$) and depression ($\beta = .111, p = .285$) did not significantly predict awareness. However, for males, there was no significant relationship between any of the predictor variables and acceptance or awareness. Understanding the differential effects of mindfulness-based intervention on psychological symptom clusters may help clinical decision-making and treatment effectiveness.
This study focuses on asexuality, a sexual minority that is often marginalized even within the LGBT (lesbian, gay, bisexual, and transgender) community. Asexuality, in terms of human sexuality, is popularly defined as a lack of sexual attraction. That is to say, a person who identifies as asexual does not experience sexual attraction to others. There are two hypotheses in this study. Firstly, asexuals, like any other sexual minority, have to go through a coming out process but this coming out process is limited to an asexual’s romantic partner. Secondly, because asexuals are physically capable of sexual behavior, they are likely to engage in it when in a relationship with a sexual person after a process of sexual negotiation. Data are collected via online survey—hosted by SurveyMonkey—that is comprised of fifteen questions: ten open-ended and five forced-choice questions. All the answers are coded numerically for analysis. The questions themselves will be about the participants’ coming out experiences, past romantic relationships as well as past sexual experiences. Participants are recruited from asexuality or sexual minority websites such as AVEN (Asexuality Visibility and Education Network), with the approval of the site administrators. Anonymity for the participants is ensured through use of a link to the survey on SurveyMonkey, rather than having the survey posted directly onsite.
Stressful social environments contribute to many aspects of emotion, including depression. The hormone oxytocin has been shown to play a role in modulating depression and related behavior, although its precise role is still unknown. Prairie voles exhibit similar social characteristics to humans, making them a useful animal model for studying the mechanisms underlying depression. Previous research has established that social isolation leads to an increase in depressive behaviors in prairie voles. This study tests the hypothesis that blocking the actions of oxytocin with an oxytocin receptor antagonist (OTA) will exacerbate depression in isolated animals and increase depression in paired animals. Female prairie voles were either isolated from or remained paired with a sibling for 4 weeks. The animals were then injected with either the OTA or saline. After receiving injections, animals were exposed to two behavioral tests measuring depression. Isolated animals displayed greater depressive behavior than the paired group in both tests. In one test, administration of the OTA had no effect in the isolated group, but slightly increased depressive behavior in the paired group. In the other test, administration of the OTA increased depressive behavior in the isolated group, but slightly decreased depressive behavior in the paired group. These findings suggest that blocking the oxytocin receptors in the brain may affect depressive states in isolated and paired animals differently. Future experiments using the prairie vole model will continue to help us understand the influence of the social environment and hormones such as oxytocin in depression and related affective disorders.
During the last few decades, there has been an increase in digital games and learning environments in education. Researchers have tested the effectiveness of digital games by comparing them to standard practices and other types of controls. The results are varied. Although many of the results show a positive effect of digital games, some show negative effects, and some show no effect. A number of issues could be the reason for the different outcomes, including differences in game content, game design, time on task, type of control condition, and experimental design. In this study, we attempted to address some of these limitations by using a pre-post randomized control design to test the effectiveness of Operation ARA, an educational game that teaches concepts central to scientific inquiry. NIU undergraduate psychology students enrolled in a research methods course were randomly assigned to either a ‘game’ or a ‘no game’ version of the program. In the game condition, students experienced the storyline embedded in the game, competed against a virtual student, and earned and lost points as they performed learning tasks. Students in the ‘no game’ condition were not exposed to the storyline, collaborated (rather than competed) with a virtual student, and were given no points. Besides these differences, all aspects of the two conditions were identical. The study occurred across three weeks. The results are currently being analyzed and will be shown in our poster.
Elliot (2006) identified approach goals as focused on an energization and direction towards positive stimuli and avoidance goals as focused on energization and direction away from negative stimuli. That said, any approach goal (e.g., reaching safety) can also be conceptualized as an avoidance goal (e.g., fleeing a monster). We examined whether participants’ adoption of an approach or avoidance goal depended on their distance from opposing stimuli. This is consistent with prior research on regulatory focus, showing that it may be useful to have a match between the context and an individual’s focus (Higgins, Friedman, Harlow, Idson, Ayduk, & Taylor, 2001). Specifically, when the context is negative (i.e., negative stimulus is close), avoidance goals may be more relevant (Worth, Sullivan, Hertel, Rothman, & Jeffery, 2005). The current study examined the types of goals participants chose to focus on based on their proximity to opposing stimuli. Participants were exposed to a cartoon vignette depicting a swarm of bees (negative stimuli) and a cozy cabin (positive stimuli). Between the two stimuli, there was a picture of a person running toward the cabin. Participants were exposed to one of three character position conditions (equidistant between bees and cabin, closer to the bees, and closer to the cabin). Participants were then asked to describe what the cartoon character was trying to do. Additional survey items honed in on the goal (approach/avoidance) being utilized by the character. It was hypothesized that when the character was in close proximity to the bees, participants would identify the character as having an avoidance goal. Similarly, when the character was in close proximity to the cabin, participants would identify the character as having an approach goal. Individual differences in regulatory focus were also examined.
Although numerous studies have investigated prevalence, antecedents, and consequences of relational aggression, less is known about how adolescents view and interpret these behaviors. To address this question, researchers have begun to examine the social and moral reasoning individuals engage in regarding different types of relational aggression (e.g., exclusion, gossiping). For instance, Goldstein and Tisak (2010) found that early adolescents gave five different types of reasons (moral, conventional, personal choice, relationship maintenance, retaliation) when evaluating the acceptability of written scenarios describing different types of relational aggression. Interestingly, different reasons were used for different types of relational aggression (e.g., adolescents were more likely to use moral justifications to explain their beliefs about gossip than about peer exclusion). The current study expands on this research by investigating a full range of relational behaviors, including playful as well as aggressive behaviors. Specifically, the following questions were addressed: (1) Are there differences in how wrong individuals view playful and aggressive relational behaviors based on category (exclusion, ignoring, teasing, and spreading rumors)? and (2) What justifications do individuals use when determining how wrong these interactions are? Each participant viewed one of sixteen video clips portraying interactions of children aged 10-16. Participants rated the interactions using a 6 point Likert-type scale of ‘how wrong’ the participants perceived each interaction (1= Not at all, 6= Very). Following each rating, participants were asked to briefly explain their reasoning about their ratings.
PARANOID SOCIAL COGNITION AND JOB INTERVIEW SUCCESS

Authors: Marta Kowal  
Faculty Mentor: Alecia Santuzzi  
Department: Psychology  
Research Category: Social Science, Humanities and Arts  
Judging Time: 11:30AM-12:45PM

This study investigates the relationship between paranoid social cognition and job interview success. It is hypothesized that individuals who have paranoid social cognition will be more sensitive from the cues of the interviewer and will show more unusual monitoring behavior. In addition, it is hypothesized that the increase in sensitivity will correlate with more unnatural behavior during the interviews. Lastly, this study hypothesizes that the unnatural behavior of individuals with paranoid cognition will contribute to having unsuccessful job interviews. The participants will be randomly split into three groups, being the positive feedback, indifferent feedback, and no feedback conditions. They will be given a pre-interview questionnaire, which includes measures for paranoia, self-consciousness, and self-esteem in non-clinical samples. After the interview, the participants will be given a post-interview questionnaire to assess their metaperceptions of the interview and to ask for their demographic information. The interviewer will also rate each participant’s non-verbal behavior and performance following the interview. Correlations will determine if dispositional level of social paranoia predicts job interview behavior and interview success. Furthermore, regression analyses will examine whether those participants with higher levels of dispositional social paranoia will show more sensitivity to the interviewer’s feedback.
Most academic tasks require students to use multiple sources of information. For example, to complete an essay assignment, a student may turn to the internet and find multiple sources of information that would be useful to complete their task. When faced with such a task, it is useful to have an idea of what information you will need, where you will be able to find this information, and how you are going to use it to complete your task. In short, you should develop a set of goals. However, it is unknown the extent to which students actually rely on goals when doing such a task. It is probable that some students just start to look for information and it may be that they develop a set of goals along the way. It is also possible that some students never establish an adequate goal representation. The purpose of this study is to examine the types of goals that people have when they are faced with a similar task. Specifically, this study investigates the types of goals that students create when asked to write an argumentative essay.
Using Kramer’s (1998) model of paranoid social cognition to interpret psychological experiences during evaluative situations, the purpose of this study was to examine how perceptions of distinctiveness and race impact paranoid cognitive processing in a job interview situation. According to the model, higher levels of perceived evaluative scrutiny, distinctiveness, and uncertainty in social situations predict increased self-conscious concern, negative perceptions of others, and negative expectations of how others perceive the self (metaperceptions). Undergraduate students participated in this study. Participants were randomly assigned to one of three conditions of perceived distinctiveness amongst job candidates before participating in a simulated job interview: low distinctiveness (demographic and educational similarity to 80% of candidates); moderate distinctiveness (similarity to 50% of candidates); or considerable distinctiveness (similarity to 20% of candidates). After finishing the simulated interview, participants completed measures of general affect, metaperceptions, perceptions of bias, and expectations of future interview experiences. We expected that higher perceived distinctiveness would lead to increased paranoid cognitive processing, particularly among non-White interviewees. The results of an analysis of variance revealed a significant interaction for group-based bias where non-white participants perceived more bias in the considerable distinctiveness condition (20% similarity). An additional analysis revealed a significant interaction for self-consciousness and condition. Non-white participants in the considerable distinctiveness condition reported lower self-consciousness than those in the low distinctiveness condition, whereas white participants in the considerable distinctiveness condition reported higher self-consciousness than those in the low distinctiveness condition. In the future, potential studies could examine methods to alleviate interviewee anxiety and biases.
This study examines the effects of task framing on interest in a serious game, a type of program meant primarily to teach a concept rather than to entertain the user. Participants were randomly assigned to one of three conditions: a game condition, a work (learning) condition, and a hybrid condition. In each condition, reviews of the program constructed by the experimenters were given to participants to affect their initial interpretation of the game. In the game condition, the program was described as being entertaining and enjoyable to use. In the work condition, the program was described as being effective at teaching the material and as being very informative. In the hybrid frame, the program was described as being both fun and informational. After watching a tutorial video, participants then played a level of the game. This study tests whether the initial framing of the program can affect users’ interest in the program, both through self-report measures and whether they choose to keep playing after their individual sessions are over.
Due to an increasing number of unemployed individuals seeking reemployment, a better understanding of daily job search dynamics is both widely relevant and imperative. Wanberg, Zhu, and Van Hooft (2010) proposed a framework, based on self-regulation and goal-pursuit literature, for studying the day-to-day job search experience. Wanberg et al.’s (2010) findings indicate that when individuals perceive increased job search progress, they report increased positive affect and reemployment efficacy, resulting in decreased time expended on the following day’s job search. Incorporating Wanberg et al.’s (2010) framework and findings, the proposed study predicts that affect, reemployment efficacy, financial hardship perceptions, perceived effort, and action-state orientation moderate the perceived progress-time expenditure relationship. Furthermore, this study proposes that action-state orientation and financial hardship moderate the relationship between perceived progress and affect. Participants receive daily emails containing web-links to surveys measuring these variables. Hypotheses will be tested using multilevel modeling analyses. Finally, conduction of a formal test of mediation will replicate and extend past findings. This study will contribute to the self-control and job search literature and provide additional knowledge about the dynamics of the daily job search experience.
THE EFFECTS OF TELECOMMUTING ON THE LINK BETWEEN WORKAHOLISM AND EMPLOYEE STRESS

Authors: Eileen Bourassa
Faculty Mentor: Larissa Barber
Department: Psychology
Research Category: Social Science, Humanities and Arts
Judging Time: 12:45-2:00PM

This study further explores how telecommuting may exacerbate the relationship between workaholism facets (drive, involvement, and enjoyment) and stress-related outcomes (psychological strain and physical symptoms) of telecommuting using trait activation theory. Specifically, it was hypothesized that the effects of workaholism on employee stress outcomes are likely to be stronger among workers who telecommute than those who work in a physical work setting (workaholic traits are likely to be “activated” more in telecommuting settings). Moderated regression analyses were conducted with 515 employees. Results supported past findings that drive predicted greater psychological and physical strain and enjoyment predicting less psychological and physiological strain (with involvement not being a significant predictor) among all employees. Moderator hypotheses were not supported for psychological strain, although the interaction for involvement and telecommuting was marginally significant in the expected direction. Moderator hypothesis for physical symptoms were only supported for work enjoyment. Overall, results indicated that telecommuting may enhance the beneficial effects of work enjoyment on less physical strain symptoms while not necessarily exacerbating the effects of high drive and involvement on other stress outcomes. Future directions and limitations are discussed.
LAUREN BODDY

THE CONTRIBUTION OF PERCEIVED PARENTAL CARE AND OVERPROTECTION DURING THE FIRST SIXTEEN YEARS OF LIFE TO PROBLEMATIC EATING BEHAVIOR IN COLLEGE STUDENTS

Authors: Lauren Boddy
Faculty Mentor: David Bridgett
Department: Psychology
Research Category: Social Science, Humanities and Arts
Judging Time: 9:00-10:15AM

This research project was conducted within Northern Illinois University’s Emotion Regulation and Temperament Laboratory, located within the Department of Psychology. The goals of this project included evaluating associations between college student symptoms of depression, anxiety, eating behavior patterns, and perceived parenting. Fifty-eight students participated in the study by completing four measures, among others, and regression analyses were used to examine the data. It was anticipated that, after controlling for depression, anxiety, and gender, participants who reported experiencing more parental care before the age of 16 years would have fewer problematic eating patterns in young adulthood. On the other hand, it was anticipated that those participants who reported more overprotective parenting behavior would engage in more problematic eating behavior. Regression analyses did not support the hypotheses. However, zero-order associations suggest potential gender differences. For women, more perceived parental care was positively associated with weight concern, \( r = .21 \), and restraint, \( r = .25 \). On the other hand, for men, more perceived parental care was inversely associated with weight concern, \( r = -.13 \), and restraint, \( r = -.30 \). For men, no association was found between parental overprotection and weight concern or restraint. For women, however, there was an inverse relationship between perceived parental overprotection and weight concern, \( r = -.24 \), and restraint, \( r = -.28 \). While these associations are not statistically significant, the strength of these effects indicate the importance of considering gender when examining associations between perceived parenting and aspects of disordered eating. Given these preliminary findings, future research should examine these effects with larger samples of men and women.
SOCIAL SUPPORT IS BENEFICIAL FOR COPING WITH STRESS: STUDIES USING AN ANIMAL MODEL

Authors: Rachel Murphy, Katherine Appleton, Alan Kim Johnson, Neal McNeal, Joshua Wardwell, Christina Bishop, Stephanie Steel, Melissa-Ann Scotti & Angela Grippo
Faculty Mentor: Angela Grippo
Department: Psychology
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM

Our social environment may affect our experience of everyday stress. Previous research suggests that individuals that have social support are better able to cope with stress than those who experience stress alone. The current project investigated the hypothesis that social support is beneficial for emotional and physiological health using a rodent species, the prairie vole. These animals are relevant to studies of stress and social bonding because prairie voles, like humans, form long-term social bonds and sometimes mate for life. In the present study, male and female prairie voles were paired for 5 days and allowed to form a social bond. Following this period, half of the animals were isolated from the partner while the other half remained paired. After 5 days of isolation or continued pairing, all animals were exposed to several mild stressors for 10 days (similar to mild daily hassles that humans typically experience). Animals were then exposed to two tests designed to measure depressive behavior in animals. At the conclusion of the study, plasma was collected to measure circulating stress hormones. Our preliminary results indicate that isolated animals displayed increased depressive behaviors and poor stress-coping behaviors versus paired animals; and that isolated females showed greater signs of depression than isolated males. These results indicate that having a companion can improve stress-coping ability and mood, while social isolation impairs coping and produces depression. The current research has implications for human mental health and can inform treatment strategies for people who are experiencing social stress or depression.
Previous research has shown sex differences in performance on the water maze task, a test of rodent spatial learning. However, many factors can influence performance including motivation. The present experiment tested whether there were differences between male and female rats on motivation in the water maze by manipulating water temperature. We hypothesized that rats would swim faster to a visible platform in cold water than warm water due to the increased motivation associated with the water temperature (i.e. the cold water would motivate escape behaviors more strongly). All rats were trained to find a visible platform in the pool over 4 trials on 2 consecutive test days. The rats swam in a counterbalanced fashion, warm (24º C) on one of the two test days and cold (18º C) water on the other day. On day one, neither temperature nor sex had an effect on swim speed, distance traveled or latency to the platform. Therefore, our hypothesis was not supported that water temperature would alter performance in the water maze. When the two days of testing were compared, all groups showed improvement from day one to day two and the sex x test day interaction approached significance (p=.06 for velocity; p=.138 for distance). The results suggest that water temperature may not be a critical component to performance in the water maze. Future research will investigate other mechanisms underlying the observed sex differences in spatial memory.
Past research has shown that humans turn their heads in anticipation of the direction they are going to travel. These anticipatory head movements may significantly contribute to human spatial orientation. Considering the similarities in human and rat neurobiology, it is possible that the same behavior would be present in rats. As of yet, no studies have investigated this phenomenon in rats. The present study examines rat anticipatory head turns during periods of exploration under dark conditions. Motion capture software was used to characterize head and body angular speeds during periods when the rats were on a straight trajectory, turned, and then continued on a new straight trajectory. The data collected was then processed to measure the moment-to-moment angular speed of the head and body during a turn. Peak head angular speeds were observed to precede peak body angular speeds. In addition, a significant positive correlation was observed between angular speed of the rat’s head and the magnitude of the turn. These observations are evidence that anticipatory head movements are conserved in rats and provide a novel level of description of rat movement organization. This new level of description may result in a more detailed understanding of the neural basis spatial orientation.
143 **Alysa Berenson, Jesse Flores, Heather Fronczak, Katrina Lidik, Dawn Yarbrough**

**Cybervictimization: Gender Differences and Relations to Negative Outcomes**

Authors: Alysa Berenson, Jesse Flores, Heather Fronczak, Katrina Lidik & Dawn Yarbrough

Faculty Mentor: Michelle Demaray & Christine Malecki

Department: Psychology

Research Category: Social Science, Humanities and Arts

Judging Time: 9:00-10:15AM

Cyberbullying and victimization is a growing problem for adolescents. Some studies report as many as 25 to 36% of youth experience cyberbullying (Beran & Li, 2005; Hinduja & Patchin, 2008). Researchers have found mixed results for gender differences in levels of cybervictimization with some researchers finding gender differences and others not finding these differences (Dempsey et al., 2009; Hinduja & Patchin, 2008; Li, 2006; Slone & Smith, 2008). In addition, a recent study found gender differences in the relation between victimization and negative outcomes (Brown, 2012). The current study investigated gender differences in cybervictimization in 285 freshmen from an Illinois high school (56% girls and 53% white). Students completed the Electronic Victimization Survey (EVS; Brown & Demaray, 2011) and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001). The study consisted of two main questions: 1) Are there gender differences in levels of cybervictimization?, and 2) Is cybervictimization differentially related to outcomes for adolescent males and females? Results of the current study found that approximately 20 percent of students reported experiencing some level of cybervictimization. Although no differences were found in overall levels of cybervictimization between boys and girls, more significant relations to negative outcomes were found for males than females. Cybervictimization was significantly related to the SDQ Emotional, Conduct, Peer Problems, and Total Scores for both boys and girls with stronger relations found for boys. Results of this study will be presented along with a discussion of implications for schools.
Although rarely considered, grandparents are often an important part of the family (King, Russell, & Elder, 1998). Grandparents sometimes serve in a protective role when children are faced with risk (Werner & Smith, 1982; 1992), buffering the expected negative influences of maternal depression (Silverstein & Ruiz, 2006) and growing up in a single-parent household (Ruiz & Silverstein, 2007). Parenting practices are known to be important to child development (e.g., Collins, et al., 2000), but how the quality of grandparent relationships may interact with parenting practices in predicting adolescents’ mental health has not been examined. In this study, 18 and 19-year-old college students reported on their mothers’ and fathers’ parenting, their relationships with the grandmother and grandfather they felt were most influential, and aspects of their own psychological adjustment. Three sets of hierarchical regressions were run to examine the influence of aspects of mother and father parenting and grandmother and grandfather relationship quality on each adolescent outcome (i.e., Mental Health, Cognitive Functioning, Self-Worth, and Scholastic Competence). While grandparents’ relationship quality was not significantly associated with adolescent outcomes, multiple significant interactions were found related to grandparent relationship quality and parenting. When either parent was reported to have aspects of negative parenting (i.e., low acceptance, high psychological control), having a more positive relationship with a grandparent was often linked to more positive mental health in the adolescent.
Stimulants are used to treat disorders such as attention deficit disorder during childhood. The goal of treatment is to increase attentional processing and memory function, helping a child perform better in school. Although many children have been prescribed stimulants over the past 40 years, little is known about the long-term effects of the drugs during development. Our laboratory has shown previously that the stimulant methamphetamine given to juvenile rats has long-term effects on memory function (McFadden and Matuzewich, 2007), but the long-term effects on attention processes are unknown. Therefore, the current research examines whether early exposure to stimulants alters attention driven food protection behavior in adulthood. Food protection requires a rat to engage in lateral movements to prevent theft of a food item from an approaching conspecific. Over fourteen days (PD 21-35), four juvenile female rats were treated daily with either methamphetamine or saline. The rats then were tested as adults (PD 90) on the food protection task to assess differences in attention processing. Preliminary results indicate that the average distance between the heads of the rats at the initiation of evasive behaviors was smaller for the methamphetamine group, suggesting that they are reacting later to an approaching conspecific than control rats. If this trend continues, it would provide evidence that juvenile exposure to stimulants can impair attentional processing in adulthood.
Sex differences have been found in both humans and rats on spatial tasks. The water maze has been shown to consistently favor performance of male rats over female rats. The mechanism mediating sexually dimorphic performance remains to be determined. Water maze performance depends on processing environmental and self-movement cues. Studies have not examined sex differences in self-movement cue processing. The current study investigates self-movement and environmental cue processing in male and female rats. Rats were first trained in a food hoarding task under dark conditions in which they searched for randomly located food pellets and carried them to a refuge for consumption. Next, rats were trained to locate a hidden escape platform in the water maze under light conditions. Motion capture software was used to characterize movements of male and female rats in both tasks. No sex differences were found in the homeward segment of the food hoarding task. Male and female rats showed similar performance in locating the hidden platform across nine days in the water maze. These results suggest that self-movement cues may not contribute to sex differences usually found in spatial tasks; however, these results were not consistent with previous findings that suggest male rats perform better than female rats in the water maze. These outcomes may be due to the sequence of testing such that running the water maze after the food hoarding paradigm may have influenced performance. Further research is needed to understand the mechanisms that mediate changes in sexually dimorphic performance on spatial tasks.
Positive psychology is the study of using an individual’s strengths and positive attributes to influence a better state of mind and increase well-being and happiness levels. Happiness is defined as a state of mind that is encompassed by the positive emotions an individual feels. This feeling of happiness can be as little as feeling at ease to as much as intense joy. A person’s state of happiness is found to increase a person’s health and well-being (Seligman, 2005). There is evidence that shows that task performance can be directly influenced by a person’s levels of happiness. Ramlall (2008) conducted a study in which results showed a relationship between happiness and an increase in task performance among people in the workplace. In this current study, happiness was induced for PSYC 102 students, ages 18-40, by exposing them to bubbles. Three groups (two groups exposed to bubbles, a blowing bubbles group and a surrounded by bubbles group, and one control group) was used in this study. Participants completed two short tasks (a memory and math based task) and a mood questionnaire, were given a break to be exposed to the bubbles or not, and then repeated similar tasks and the mood questionnaire. It is hypothesized that the induced levels of happiness via bubbles will increase the participant’s happiness levels and will therefore increase an individual’s task performance when it comes to math and memory related tasks.
The aim of this paper is to argue that any plausible principle of beneficence ought to require those of us living in relative affluence to take substantial steps towards lessening the serious suffering of others. I will begin by discussing two cases well known in the literature: Peter Singer’s Pond and Peter Unger’s Envelope. Having done this, I will then identify some initial obstacles to embracing a demanding principle of beneficence, as well as discuss some of the proposals prominent in the literature. I will argue that an acceptable principle of beneficence should meet certain conditions, and I will conclude by advancing my own view and defending it from possible objections.
Experts have estimated that about 600 to 900 thousand women and girls are trafficked every year around the world (U.S. Department of Justice, 2011). Despite the pervasiveness of this problem, there has been little research examining awareness of this issue in the United States (Root Causes of Human Trafficking, 2011). This project was designed to assess understanding of the dynamics of sex trafficking (e.g., its prevalence and impact on victims) and willingness to help combat this problem in a sample of undergraduate students. Participants completed a set of questionnaires and participated in a drawing exercise. The questionnaires assessed their knowledge of sex trafficking, their willingness to help combat this problem, and their just world beliefs. Participants were also given the chance to participate in a drawing for $200. To assess their willingness to support sex trafficking causes, each participant was asked to decide whether they wanted to donate one or more of their five lottery tickets to an agency dedicated to sex trafficking. Results from this study will address the following questions:

• How much do undergraduates know/understand about sex trafficking?
• What are some of the most commonly misunderstood aspects of sex trafficking?
• Is there a relationship between knowledge of sex trafficking and willingness to help combat the issue? This project is the first of its nature to assess what undergraduate students understand about sex trafficking, and whether varying levels of knowledge and awareness might influence participants’ willingness to help combat this issue.
This study aims to answer the question, “Do different individual tax rates across states affect CEO availability?” In other words do higher tax rates in one state reduce the supply of CEO’s willing to accept jobs compared to states with lower tax rates? Assuming top management skill plays a role in the success of a corporation, policies offering corporations better access to CEO talent are more likely to produce business success, and in turn a favorable economy. Since the corporate tax deductibility of executive compensation varies by its composition, this study also investigates whether state income tax structures, based on highest marginal personal income tax and capital gains taxes, lead to a shift in compensation from salary to riskier stock options by generating a linear regression model comparing the ratio of salary compensation to stock options awarded. Additionally, tax structures that shift salary compensation toward stock options shape the way corporate management conducts business. Stock options are a form of equity compensation that only rewards the executive if the company’s stock price goes up. It may be argued, on the basis of agency, that management who find their compensation built more on stock options are more apt to look out for the success of their company rather than themselves. Alternatively, pay in stock options may engender excessive risk-taking since they are not penalized for failure. An environment managed by CEO’s mindful of their stock options may entail more risk, which can destabilize the local economy.
**Guadalupe Trejo**

*Latin American Graphic Design*

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My name is Guadalupe Trejo, I am a sophomore majoring in Visual Communications. My mentor is Dr. Aleksandra Giza, an associate professor in the Visual Communication Program at the School of Art. Under her guidance, I conducted my research on Latin American Graphic Design. The main focus of the research was its history, education, and how design has evolved over the years in Latin America. With my mentors help, I have researched accomplished Latin graphic designers. Dr. Aleksandra Giza assisted me with getting in contact with accomplished graphic designers from Latin America. Not only that, I have also collected visual data representing work done by Latin American designers, and created a design piece of my own. My design piece focuses on The Dream Act using Latin American design elements.
Previous research has shown that creating brands that attract teens, tweens, and even younger children has become a major focus of marketers, and that the use of branding has had a serious impact on Western youth. Previous research has also shown that color has a significant influence on our decisions when buying products. While there has been a lot of research conducted that focuses on the relationship between marketing and adolescents, there seems to be a gap between the use of color psychology in marketing and its effects on adolescents. The goal of this project is to bridge the gap between marketing and color psychology and examine the effects the relationship has on adolescents. Marketing and color psychology literature have been analyzed to help make a connection. Marketers and educators have been interviewed to gain their perspective on this topic and to make further connections. Those who were interviewed include Tina Wells, Direct Marketing, TRU Marketing, and the marketing faculty of NIU. An anticipated outcome of this study is that marketing has a significant impact on adolescents through the use of color psychology. Another anticipated outcome is that there is a significant difference between a marketer’s view and an educator’s view on the subject.
PLEASE NOTE: CONTENTS OF THE ABSTRACTS WERE PRINTED AS SUBMITTED BY THE PROJECT PARTICIPANTS AND ARE REPRESENTED IN THE COLLEGE OF THE STUDENTS MAJOR.
Farmers Markets have been increasing in numbers throughout the U.S. Consumers have a strong desire to support local businesses and farmers, and to purchase organic or locally grown fresh food products. The social aspects of Farmers Markets have also been of scholarly concern. There seems to be a growing trend to patronize local farmers markets due to the various social aspects they offer. Of particular importance is the study of motivation of farmers markets customers. Secondary data supports these consumer trends in Europe. A comprehensive marketing research questionnaire was designed to gather feedback from customers at the Lafayette, IN Farmers Market. Over 300 questionnaires were collected over the course of several weekends. SPSS software was utilized to analyze the results, determining relationships, buyer behavior and motivation. Exploratory factor analysis, cluster analysis, independent t tests, and crosstabulations were completed utilizing SPSS software. In addition, primary observational research was utilized to gather information from four successful farmers markets in Rome, Italy and Paris, France. This quantitative study bears significance, because it is the first of its scope for Lafayette, IN. The result of this research provides useful marketing implications for the managers of Lafayette Farmers Market.
Feed’Em Soup ("FES") is a non-profit organization located in DeKalb, IL, whose mission is “To provide meals, offer encouragement and support and supply opportunities to those in need within our community.” Volunteer assistance, donations and grants are the primary means to sustain the current FES operation. A goal of FES this year is to obtain additional public and private grants. However, FES’s current inventory tracking practices do not provide sufficient information to pursue most grants. This senior capstone provides FES a web-based inventory system that tracks food donations and generates reports essential for grant applications. With the data provided by the web-based inventory system, FES will be able to obtain further grants which will allow them to strengthen their core mission and expand the outreach provided to the community.
“I have fallen and can’t get up!” is the image often used to portray older adults. There is a need to present a more positive view of aging, one that is frequently the result of leading a physically active life. Upper division Exercise Science students completed an assignment where they developed profiles of older adults who currently participate in formal exercise programs. After IRB approval the students, working individually or in pairs, interviewed a selected individual and developed a profile that is designed to be shared with the public. Faculty and student peers rated the profiles and provided feedback to the students. The final profiles form a positive view of aging with images and quotes that suggest that a physically active lifestyle is worth pursuing.
The focus of the product line at CST Storage in Dekalb, IL is: porcelain enameled tanks constructed from steel plates. These are enameled on the “glass line”, which consists of one major component “firing”, which bonds the porcelain glass to the steel. The furnace, which does the firing, limits the productivity of this process because it must be adjusted to accommodate for different thicknesses of the plates and their desired colors. While the furnace is heating or cooling or the line, that holds the plates is changing speeds the furnace must be empty, the time that the furnace is empty is called set up time. The objective is to reduce set up time. Reduction of set up time will be accomplished by creating part families, which can be run through the furnace under the same temperatures and line speeds. Families will be composed of sheets with similar firing parameters. Different combinations of line speeds, temperatures, and set up times will be tested to determine if certain types of plates can be combined into part families. This kind of testing is called a designed experiment and accounts for the effects of each variable and the effects caused by the interaction of these variables on the response. The response in this case is whether or not a good sheet is produced. The goal is to reach the minimal set up time without reducing the quality of the enameled steel plates. Designed experiments and other Industrial Engineering tools, such as time studies and simulation will be used to accomplish this goal without detriment to the efficiency of the rest of the process.
Authors: Johannes Niederberger & Andrew De La Torre
Faculty Mentor: Nicholas Pohlman
Department: Mechanical Engineering
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

In various industries, sampling liquids in-line of the process is a daily requirement to ensure a quality product. This sampling process can be dangerous and create an unsafe work environment and therefore Safely Sampling™ has created a sampling device that allows an operator to extract these samples without ever coming in contact with the samples. Currently, the sampling device is a manual operation, where an operator manually collects the sample by opening and closing a system of valves. In this project, the manual operation is being converted to an automated sampling system using various on/off valves and a controller. The automated sampling system should increase the accuracy and consistency of the sampling process. After executing multiple test runs, the accuracy and consistency of the automated sampling system versus the manual sampling system were compared. In the automated sampling system, we consistently filled the graduated cylinder to about the same volume while the manual operation had much more variation. The larger variation in the manual sampling system is created because of the human error of instantly closing the inlet valve. In conclusion, it can be accurately stated that the automated sampling system was much more accurate and consistent than the manual sampling system by eliminating the human error that is involved in the manual system.
Our senior design project was to create a device that will measure and transmit the oscillatory frequencies of a cantilever armature connected to a belt drive track. The belt drive track is driven by a servo motor that is controlled by the Yaskawa Sigma-V Servo Amplifier. The problem our team has undertaken is to analyzing vibrations occurring output at the armature. The armature will oscillate (wobble) from side to side when the track is in motion and inertia upon stopping will cause these oscillations to accelerate. The scope of our project is focused on sensing the oscillations; then informing a user of the oscillation frequency through a computer interface. Our design solution will be focused on creating a frequency sensor. The sensor will be a wireless Bluetooth battery powered 3-axis accelerometer controlled by an Atmel microcontroller. The accelerometer will be located at the top of the armature, and the remaining parts of the device will attach to the armature saddle. The weight of our device, including the battery, weighs 2.5 ounces. The sensor will send its data via Bluetooth wireless signal to a PC program. The PC program will compute the Oscillation frequency at the armature.
E7  DAVID KORCZAK & RODRIGO GUTIERREZ

ADVANCED CASTING SIMULATION

Authors: David Korczak & Rodrigo Gutierrez
Faculty Mentor: Behrooz Fallahi
Department: Mechanical Engineering
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

The design experiment conducted contains a series of tests and analysis for metal castings. The investigators utilized MAGMAsoft®, a metal casting simulation software package that simulates filling, solidification, and stress. The initial part called the yoke, is a crucial part of a pump assembly, which was the primary focus for the simulation and analysis process. The part design was initially given to the investigators from Eagle Alloy, Inc. in order to run a series of simulations due to cracks/defects that occurred on approximately 90% of the casting being produced. A sound casting, directional solidification, proper feeding, as well as reduction of concentrated stresses, among other factors, were needed to reduce the defect.

The investigators obtained design specifications from Eagle Alloy, Inc., in order to redesign the tooling required for a four-cavity shell casting process. These parameters and the results from the simulations, determined the final design for the tooling as well as modifications done to the original casting.

The use of advanced metal casting simulation enhances the engineering approach to finding a solution for a complex process such as metal casting.
E8 ZACHARY LAZOWSKI

DETECTION AND SYNTHESIS OF NOVEL INHIBITORS OF ISPF

Authors: Zachary Lazowski
Faculty Mentor: Timothy Hagen
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

The fight against malaria, tuberculosis, and other infectious diseases is growing more difficult due to the emergence of drug resistant forms of these diseases. One strategy to address the resistance problem is to develop novel anti-infective agents that employ new mechanisms of action. In recent studies, it has been shown that bacterial and parasitic organisms, such as those involved in malaria, tuberculosis, and melioidosis, use the methyl-erythritol isoprenoid (MEP) biosynthetic pathway, to produce isoprenoids, which are the basic building blocks of many essential substances found in plants and animals. Fortunately, humans do not use this process, which means any foreign pathogen in the human body that uses the MEP pathway can be targeted due to the different enzymes it puts to use. The overall goals of this project are to design and create different analogs of oxodihydropyrimidine carboxylic acid (ODHPC) that will inhibit the IspF enzymes of the MEP pathway. In completing these objectives, the use of sophisticated chemistry drawing software will be required for the theoretical design of compounds and tools used in a biochemical lab will be needed for the synthesis, purification, and analysis of those compounds.
The project I am presenting is a culmination of my Undergraduate work at NIU. Knowing very little when I came to the school, I made a point to meet good people and to get as much out of the resources that were available to me. From spending hundreds of hours in the Final Cut Lab in Watson, to working directly with my professors on my independent study credits; I believe I can leave NIU more than satisfied with my accomplishments. I have learned a great deal, and I want to share what I have experienced with others. I hope that the work I have done will inspire others to really push the limits of their education.
E10 Gabrielle Wright

Authors: Gabrielle Wright
Faculty Mentor: Craig Seymour
Department: Communication
Research Category: Social Science, Humanities and Arts
Judging Time: 11:30AM-12:45PM
This project was not about numbers or hard data. It was about the human condition during a time of high unemployment, rising prices, and a growing population facing home foreclosures and ultimately the loss of a place to live. Most of the people photographed for this project had jobs and homes but now live on the streets of Chicago. Many passers-by simply turn away and ignore “street people.” This project aspires to give people who are homeless a sense of identity, and to give people viewing the photographs a chance to feel and express their compassion by doing something to help eradicate homelessness from our vocabulary.
A shocking but all too noticeable trend has been emerging over the past few years. While much of the world has made strides in the reduction of poverty and income inequality, America however has only been witnessing its poverty and inequality skyrocket through the roof. Starting from roughly 1 in 7 Americans living below the poverty line in 2009 to - now - roughly 1 in 6 a mere three years later. To prevent themselves from facing a similar fate many high school students have begun to blindly rush off into college completely unprepared and unaware of the challenges they’ll face. Which may explain why more then 40% will drop out of college over a six-year period. That said my research focuses on how going to college unprepared may actually increase poverty and income inequality, what can be done to stem the problem, the positive effects putting off college can have on the economy and how it all, can help reduce poverty and income inequality in America.
This project is the design of a virtual museum exhibit about the history of medieval European knights and Japanese samurai. By looking at specific battles in successive time periods, the exhibit follows the developments of these two warriors by examining the evolution of weapons, clothing, armor, art, and written documents. The exhibit begins with a selection from some of the epic tales about these warriors which demonstrate the idealized knight or samurai. The main portion of the exhibit focuses on various battles and the life of the warrior in that period. The exhibit concludes with the decline of these warrior classes. The intended goal of this exhibit is to demystify these warriors and give the visitor a better understanding of the historical realities of knights and samurai.
A motive is defined as being a reason for doing something, especially one that is hidden or not obvious. In music, the same term is described as a recurring rhythmic or melodic unit that serves a developmental purpose. In music history, composers have generally been predictable in their adherence to specific compositional guidelines. Erik Satie chose to be a character of unpredictable genius and satire. His witty remarks to the performer (“provide yourself with clairvoyance,” “On the tip of your thought,” etc.) and curious titles (Three Pieces in the Shape of a Pear, Vexations, etc.) provide deep insight into the early stages of avant-garde music, but also into the head of a self-proclaimed madman. Through my research into the music and biographical background of Satie, I present a character study through a survey of his life’s work. I present material based on his most-discussed works (for piano), Satie’s remaining personal letters, and research from various musicologically based forums and Web biographies. A personal inclusion of thanks to the informational contributions of Dr. Robert Fleisher and Dr. Brian Hart of the NIU School of Music.
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**Example: Smith, John - page number (poster number)**

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