Proceedings of the 16th Annual Student Research and Creative Endeavor Symposium

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This RESP program supports undergraduate students engaged in research and creative activities as defined broadly within the Strategic Plan of the RESP office. Successful applicants will receive up to $250 to defray the costs of research. Acceptable expenses include travel to research sites, equipment and expendable supplies.

Undergraduate Conference Travel Program
The RESP Undergraduate Conference Travel Program supports the efforts of IPFW undergraduate students who are involved in faculty-mentored research projects. To be eligible, a student must have a paper accepted for presentation at a professional conference held in the United States. Successful applicants will receive $250 to defray costs.
Congratulations on the Selection of your Poster for the 16th Annual Student Research and Creative Endeavor Symposium.
J. Albayyari, Associate Vice Chancellor for Research

STUDENT PARTICIPANTS and FACULTY MENTORS

1. Emin Afandiyev …. Nodir Adilov
2. Chinmayi Avasarala …. Todor Cooklev
3. Thomas Backof, Stephen Morreale, Thomas Riggall ….. Frank Paladino
4. Jacob Baily, Jerry Brown, Jeremy Hoffman …. Mohammad Alhassan
5. Amanda Bissell …. Elaine Blakemore
6. Sarah Brockman …. Carol Lawton
7. Chelsea Clyde-Brockway .. Frank Paladino
8. Christopher Culkin, …. Punya Nachapa
9. James Darabi …. Todor Cooklev
10. Srikanth Dasari, Greg Adams …. Mark Masters
11. Jessica Davis …. Andrew Downs
12. Kali Fridholm, Kamal Swatabdi, Tim Byers, Josiah McMillen …. M. A. Qasim
13. Irene Gichungeh …. Ae-Sook Kim
14. Elizabeth Goebel …. Ryan Yoder
15. Steven Groff …. Dong Chen
16. Ryan Harvey …. Ryan Yoder
17. Mohammed Hossain …. Ahmed Mustafa
18. Rachel Hunnicutt …. Jordan Marshall
19. Kevin Ann Hunt …. George Mourad
20. Ryan Hunt …. Mark Jordan
21. Philip Huynh …. Robert Sweazey
22. Audrey James …. Jay Jackson
23. Hyonam Jeong …. Jin Soung Yoo
24. Hasina Karki …. Ahmed Mustafa, Shree Dhawale
25. Sadie King-Hoffman …. Elizabeth Mannir
26. Seth Kirby …. Ryan Yoder
27. Nicholas Lawrence …. Nichaya Suntornpithug
28. Ashlin Long …. Carol Lawton
29. Lucas Miller, Zachary Roth …. Jay Jackson
30. Janet Minton …. George Mourad
31. Ryan Nooe …. Douglas Kline
32. Alexandra Okihiro …. Elliott Blumenthal
33. James Otto …. Mark Masters
34. Heather Palmer …. Jane Leatherman
35. Natasha Perrine …. Mark Jordan
36. Elizabeth Phillips …. Elaine Blakemore
37. Elizabeth Phillips, Heather Hicks, Manaal Sajiid …. Elaine Blakemore
38. Micah Rapp …. George Mourad
39. Vanessa Ray, Luis Flores, Afrid Sarker …. Suleiman Ashur
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46. Dexter Shipe …. Tanya Soule
47. Altun Shukurlu …. Peter Dragnev
48. Wes Stephens …. Talia Bugel
49. Eduardo Sztrajtman, Bruno Carvalho …. Mohammad Alhassan, Andres Montenegro
50. Elizabeth Tobin …. Michelle Drouin
51. Patricia Weiss …. Talia Bugel
52. Todd Welch …. Beomjin Kin
53. Audrey Whetstone, Sara Jackson, Nalani Keesler …. Mary Arnold Schwartz
54. Korynn Wible …. Damian Fleming

We are pleased to announce the 17th Annual Student Research and Creative Endeavor Symposium will be held March 28, 2014.
Causes of Dutch Disease and Ways to Deal with It: Literature Overview

Emin Afandiyev
Faculty Sponsor: Dr. Nodir Adilov
Department of Economics

The term Dutch Disease was originally used in 1982 in “Economics” Journal to describe poor management in natural gas sector in the Netherlands. Later, this term was used to describe events similar to one in the Netherlands: specifically, the boom in natural resource sector and the shrinkage of manufacturing sector. Corden and Neary, in 1982, were the first who put the Dutch Disease theory in economic model. In their original paper, they described the consequences of having a booming industry within a country on other industries of the country.

Initially it was assumed that the Dutch Disease can be caused only by the boom in the natural resource sector. However, evidence suggests that Dutch Disease can be caused by poor management in other sectors of industry as well. In this paper, I analyze different publications about Dutch Disease. The analysis shows the possible causes and consequences of Dutch Disease and the ways to deal with it. This paper also shows an example of country who successfully dealt with it. The paper particularly focuses on countries where Dutch Disease has occurred.

The countries from South Pacific region are currently experiencing Dutch Disease because of massive international aid from developed countries. Spanish islands, the Balearics and Canary, have possibility of facing the Dutch Disease in near future. And Botswana was the only country which successfully dealt with Dutch Disease.
IEEE 1588 and accurate Time Stamping Techniques

Chinmayi Avasarala
Faculty Sponsor: Dr. Todor Cooklev
Department of Electrical & Computer Engineering

When the clocks in our lives get out of sync, bad things happen. We arrive late for meetings, miss the train, or record all but the last few minutes of our favorite television show. Wouldn’t it be helpful if clocks were always set to the correct time?

Actually, if they were networked together and using the IEEE 1588 Precision Time Protocol, they could all be set to same time, typically within 100 nanoseconds of each other. The IEEE 1588 protocol enables rapid convergence (typically less than a minute, depending on the network topology) to sub-microsecond time synchronization between heterogeneous distributed devices controlled by clocks of differing resolution and stability.

IEEE 1588 can be implemented solely in software to give accuracy in the sub-100 microsecond range. This is similar to that seen with other software implemented protocols such as NTP that operate across the same network topology. However, if time stamping is performed in the application layer, interrupts and other unpredictable software processes can introduce jitter and latency which may impair the synchronization. Even the use of a very precise external oscillator won’t overcome the stack jitter associated with a software-only 1588 implementation.

Most applications require the higher accuracy achieved by time stamping packets at the interface between the physical (PHY) and data link (MAC) layers (“hardware time stamping”). IEEE 1588 hardware time stamping typically improves accuracy to 100 nanoseconds or better for certain network configurations, which is better than NTP.

My undergrad research focuses on the hardware implementation of time stamping techniques and the efficiency improvement methods of IEEE 1588.
Thermal and spatial tracking of inter-nesting loggerhead turtles (*Caretta caretta*) in Kyparissia Bay, Greece.

Thomas F. Backof, Stephen J. Morreale, Thomas E. Riggall
Faculty Sponsor: Frank V. Paladino
Department of Biology, Master of Science degree program

Loggerhead sea turtles are globally endangered cold blooded reptiles. As with all sea turtles, they return to the same beach to nest, making each distinct beach and population important for species survival. Time spent between nesting attempts is referred to as the inter-nesting period and is a short but vital part of a turtle’s life. As turtles are able to behaviorally thermoregulate, temperature is thought to be an important aspect of inter-nesting location. Determining where a turtle spends her inter-nesting period is an important research topic for the conservation of the species. Kyparissia Bay, Peloponnese, Greece is the second most important loggerhead rookery in the Mediterranean, and has no national park protection. The beach is 44 km long with a dense nesting area in the southern 9.5 km, and averages 620 loggerhead nests each year. This study, in conjunction with ARCHELON, the sea turtle protection society of Greece, investigated the inter-nesting habitat of female loggerhead turtles nesting along Kyparissia Bay through the use of TDR data loggers, radio and satellite transmitters deployed on female inter-nesting loggerheads. Turtles remained very shallow, spending 99.6% of time at depths less than five meters. Turtles experienced a wide range of temperatures, spending 90.8% of time between 23 C and 29 C. Spatially, turtles largely remained within 5 kilometers of the dense nesting area during the inter-nesting period. Two post-nesting migrations were also recorded, including one into the Adriatic Sea and one unique track travelling through the strait of Sicily into the Western Mediterranean.
Design of Reinforced Concrete Beams Strengthened with Fibers

Jacob Bailey, Jerry Brown Jr., Jeremy Hoffman
Faculty Sponsor: Dr. Mohammad Alhassan
Department of Engineering/Civil Engineering

This project presents a methodology for shear design of reinforced concrete beams with fibers to explore the feasibility of using fibers as a complimentary shear reinforcement method. The purpose for conducting this design is to determine whether strux fibers can be used to replace congested stirrups in high shear areas in both structural lightweight and normal weight concrete and to determine what the cost benefits would be if the strux fibers are implemented into the beam shear design. The amount of shear strength generated from the fibers is the parameter that is needed to complete the proposed shear design for beams with fibers. The proposed shear design methodology or design procedure is needed to predict the amount of fibers as well as the spacing and number of stirrups that are needed to replace the congested stirrups. Once the design procedure is completed, the cost of the fibers and stirrups, as well as the cost of labor, which will be reduced dramatically with the reduction in stirrups, can be evaluated to compare the costs of a reinforced concrete beam strengthened with fibers and a reinforced concrete beam with congested stirrups.
Stereotype Threat and Math Performance: The Role of Self-Esteem and Gender

Amanda Bissell
Faculty Sponsor: Dr. Elaine Blakemore
Department of Psychology

This project, which is my honors thesis, is designed to better understand the reason behind the difference in math performance based on gender on standardized tests, such as the GRE. Research has shown that typically men out perform women on standardized math tests, which may be due to stereotype threat. Stereotype threat is a phenomenon that hinders performance in a group that is expected to perform more poorly. In this case, females are often stereotyped as poorer in math, so it is expected that they would perform worse than men on the same math task.

One method of reducing the effects of stereotype threat is to introduce another role that is on the positive side of the stereotype, in this case college student. College students are generally expected to be better at math than those who didn’t attend college. Some research has found a buffering effect of self-esteem on math performance when the other role is present. However, this has only been studied in women. Therefore, my project will look at both men and women’s performance on a math task under five different conditions related to stereotype threat, and a parallel process called stereotype lift (where the group stereotyped as better – in this case men – have higher performance when the stereotype is highlighted). While the research is still on-going, I believe that a relationship between gender, condition, and self-esteem will be shown. That is, women with high self-esteem will perform higher in the condition where they have a chance to identify with the college student role. Because there is no data on male performance related to self-esteem, those results will be strictly exploratory.
Gender Differences in Wayfinding of a Virtual Building

Sarah Brockman
Faculty Sponsor: Dr. Carol Lawton
Department of Psychology

Past research has found that men and women have different navigational strategies; women pay closer attention to landmarks and associated turns in reference to their body positions, while men use more global cues to form a perspective of the larger environment (Lawton, 1994, 1996). The current study aimed to further examine these differences in strategies using a virtual building which contained 10 common household objects (e.g. TV, lamp, etc.) that were randomly placed throughout the floor plan. In one condition, the hallways were painted with a progression of various colors, whereas, in the other condition, all hallways were colored gray. The study included 133 participants, 59 males and 74 females, who were randomly assigned to either the color or gray building. Participants were asked to find their way from the TV to the lamp for 10 trials in the learning phase and then asked to reverse their path on a successive trial, called the reversal trial. Navigation efficiency was based on the number of errors made. The results found that efficiency improved more dramatically in the color building than the gray building for both genders as they progressed through the learning phase. During the reversal trial in the color building, women experienced a greater disruption in navigation than men. In the gray building, however, there was no significant difference in navigational disruption between men and women on the reversal trial. These results suggest that women used the colors as positional visual references to make right and left turns (e.g. turn right at the blue wall); therefore, when the route was reversed, this learning strategy was a hindrance. On the other hand, men might have used the colors to provide directional information, in addition to positional information; therefore, this strategy aided them in navigating the reversal trial.
Preliminary Satellite Telemetry of Eastern Pacific Green Turtles Nesting on Playa Cabuyal, Costa Rica

Chelsea Clyde-Brockway
Faculty Sponsor: Dr. Frank Paladino
Department of Biology

The eastern pacific green turtle (*Chelonia mydas agassizi*) is endangered and nests along the Pacific coast of Central America. Understanding where turtles are going when they are not nesting on the beach can help us to better preserve the resources and ocean habitats that are important to these species. There are three characteristic behaviors of adult sea turtles when in the water: they are either migrating to or from foraging areas, foraging, or spending time in off-shore habitats in between depositing clutches of eggs. I studied post nesting migrations and interesting movements in eastern pacific green turtles nesting on Playa Cabuyal, Montes de Oro, Puntarenas, Costa Rica. The scientific questions I am answering are: 1) what locations are the utilized by as inter-nesting turtles, and 2) where do these nesting turtles go to forage after nesting and do the migrations vary from year to year or within the season.

In Cabuyal we patrol the beach every night looking for turtles. Once a turtle has started nesting we check that her carapace for abnormalities. If she has a suitable carapace, when nesting is completed we attach a Spot5 Wildlife computers satellite transmitter to the upper center of her carapace using Powers T-380 epoxy. These satellite transmitters connect to the Argos system every time the turtle surfaces to breath or when on land nesting and we map the movements using this information. I created a complete map of initial oceanographic factors that affect turtles in conjunction with the turtle track data. I currently have data on one post-nesting migration and two inter-nesting turtles. This research will dramatically increase our understanding of the population and how to implement conservation efforts.
Effect of drought stress on population growth rate of an insect pest, soybean aphid (*Aphis glycines* Matsumura)

Christopher Culkin  
Faculty Sponsor: Dr. Punya Nachappa  
Department of Biology

Soybean (*Glycine max*) is an important crop due to its versatility as a food source as well as various applications in industries such as biofuel and textiles. In Indiana alone, there are 40,000 farmers growing soybeans on 5.4 million acres, contributing approximately $1.5 billion to state’s economy per year. In 2012, however, the state of Indiana received less than 1 inch of precipitation in the months of June and July, which severely impacted agriculture, including soybean. Soybean yields dropped significantly to 39.3 bushels per acre, the lowest since 2003. In addition to the direct impact of drought stress on yield, drought is also thought to promote outbreaks of insect pests and pathogens. On soybeans, the soybean aphid (*Aphis glycines*) is a major pest contributing to reduced yields not only due to direct feeding but also transmits various economically important viruses such as *Soybean mosaic virus*. The objectives of our study are to: (1) determine the effects of drought stress on soybean aphid populations and (2) determine the impact of drought stress on the activation of soybean plant defense pathway genes. To determine the effect of drought stress on soybean aphid, we placed twenty aphids on soybean plants that were subjected to various levels of drought stress (30%, 50%, 70%, and 100% soil water content) in a growth chamber. The population growth rate of soybean aphids was monitored for 7 days. Preliminary results indicate that aphid populations are significantly greater on plants exposed to 70% soil water content than 30%, 50%, and 100% (*P*<0.015). Reverse-transcriptase-PCR analysis of soybean plant defense genes in response to drought stress and/or aphid infestation indicated distinct gene expression patterns. Knowledge of the ecological and molecular mechanisms underlying drought stress on insect pests and plant yield can be applied to development of sustainable crop management practices.
Optimized Orthogonal Frequency-Division Multiplexing (OFDM)

James Darabi
Faculty Sponsor: Dr. Todor Cooklev
Department of Engineering

Orthogonal Frequency Division Multiplexing (OFDM) techniques use a guard interval (GI) between symbols to eliminate the inter-symbol interference (ISI). Zero padding (ZP) a known GI technique, resulting in ZP-OFDM. ZP-OFDM can guarantee symbol recovery regardless of the presence of channel spectral nulls, but then it suffers from a complexity problem. There are low-complexity receivers, but their performance is inferior. This paper introduces two improved receiver designs for ZP-OFDM, which make the channel matrix $\omega$-circulant. These receiver designs require one-dimensional optimization at the receiver. Due to the complexity is slightly increased, but remains comparable with known low-complexity receivers. The proposed receivers perform better than other ZP-OFDM receivers.
A Mechanical Analogue of NMR

Srikanth Dasari, Greg Adams
Faculty Sponsor: Dr. Mark Masters
Department of Physics

There are a number of different forms of Nuclear Magnetic Resonance (NMR) - scanning magnetic field, scanning rf frequency, and pulsed rf. The trouble is that the NMR is a black box system in which it is difficult to visualize what is physically happening. What is resonance in NMR? Using plastic spheres with embedded Nd Magnets rotating in an air-bearing, two large plate magnets to set the guide magnetic field and a pair of Helmholtz coils to the “rf” excitation fields we are able to mechanically simulate each of the different types of NMR so that the students can gain insight into how NMR works.
Finding the Education Gap in Allen County

Jessica Davis
Faculty Sponsor: Dr. Andy Downs
Department of Political Science

Education is an issue that affects us all. It is not something that you buy once and never use again, but rather an investment. It is something that no one can ever take away from you. Education allows for growth in all areas of life. Higher levels of education result in lower crime rates and boost the economy. If education is such a powerful force, then an opportunity for higher education should be granted to every citizen. The way that the United States attempts to achieve this is through thirteen years of elementary, middle, and high school education. However, this system has not always proved to afford the same opportunities to every student. Our country has had a long history of discrimination within education, from before Brown v. The Board of Education (1958), and continuing today. While courts and legislatures have tried to rectify overt discrimination it is clear that minority students still face a less transparent battle in equal educational success. This inequity can be seen at not only at a national level, but also at a local level here in Allen County.

My research focuses on educational outcomes in the Fort Wayne Community, East Allen County, Southwest Allen County, and Northwest Allen County school districts. I have analyzed different testing measures of the students such as IRead3 scores, ISTEP+ scores, SAT and ACT scores, diploma types, graduation rates, and other indicators that will determine a student’s success in education after high school. The data sets are from 2007 to 2011 and include the most recent data. This analysis of college success indicators show that minority students within our area schools, while improving, are still not achieving at equitable achievement rates to their white counterparts. Moreover, Allen County students are not meeting benchmarks that are predictive of college success.
Exceptional Stability of Kidney Bean Inhibitor to Temperature and Pepsin Digestion

Swatabdi Kamal, Kali Fridholm, Tim Byers, Josiah McMillen
Faculty Mentor: Dr. M. A. Qasim
Department of Chemistry

Background Information: Proteins are one of the most important compounds present in living organisms. Humans are believed to contain about 25,000 different proteins, each involved in a specific function. The function of proteins is strongly dependent on their structure. Exposing the proteins to external factors such as high temperature (~100°C) or to the digestive enzyme of the stomach (pepsin) generally affect their structure and hence their function. In this poster we present our results on the effect of heat and pepsin digestion on the function of a kidney bean protein. The kidney bean protein we have studied functions as an inhibitor of the intestinal enzymes such as trypsin and chymotrypsin.

Aim: The main aim of this study was to investigate the effect of temperature and pepsin digestion on the chymotrypsin and trypsin inhibitory activity of kidney bean inhibitors.

Experiments and Results: The kidney bean extract was separately exposed to a temperature of 100°C for up to 3 hours and to pepsin digestion up to one week. The heat treated and pepsin digested samples of kidney bean extract were analyzed by the techniques of gel filtration and electrophoresis and their inhibitory activity against chymotrypsin and trypsin were determined by the spectrophotometric technique. The results suggest that the activity of kidney bean inhibitor is unaffected up to one hour of heating and up to several hours of digestion with pepsin. The main conclusion of this study is the exceptional stability of kidney bean inhibitor to heat and pepsin digestion.
Do Nonprofit Nursing Homes Perform Better Than For-Profit Nursing Homes?
-Empirical Evidence in Indiana

Irene Gichungeth
Faculty Sponsor: Dr. Ae-Sook Kim
Department of Public Policy

Long term care services, especially nursing homes, are crucial elements of the healthcare system in the United States. With an increasing number of the elderly population, nursing home services have become more desirable and sought after. Proficient care in nursing homes is thus a paramount factor in ensuring the elderly population receives superior health care. Quality of care in nursing homes, in particular, attracts great attention. Linked to this, difference in quality between nonprofits and for profits nursing homes have been substantially debated for years. Compared to for-profit nursing homes, non-profit nursing homes are often thought to exhibit higher quality care. Since nonprofit nursing homes provide services that are more centered on the public needs (as opposed to profit maximization endeavors), their overall approach of care appears to be qualitatively different from for-profit and county nursing homes.

This study sought to unravel the linkage between nursing home ownership (for profits, nonprofits and government-owned nursing homes) and the quality of care in the state of Indiana by taking into account the context of staffing mix. Staffing mix used include Registered Nurses (RNs), Licensed Practical Nurse (LPNs) and Certified Nurse Assistant (CNAs). The overall quality rating and staffing mix were obtained from the Center of Medicare and Medicaid database and Online Survey Certification and Reporting database (OSCAR). Preliminary analysis confirmed that nonprofit facilities perform better than for-profits. In addition, RNs’ and CNAs’ staffing hours positively contributed to the quality. The sensitivity of these results was tested in this study.
Male and female mice show similar navigation performance in darkness

Elizabeth Goebel
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Department of Psychology

The survival of most species depends on accurate navigation, which enables them to find food and shelter as well as potential mates. The strategies used for navigation vary among species, and recent studies have shown that navigation strategies can vary within species depending on the season or environment. For example, some species of mice show sex differences in navigation whereas other species have produced mixed results (Galea et al., 1994; LaBuda et al., 2002; Jonasson, 2005). Importantly, these studies have only tested landmark navigation in light, but it is possible that sex differences may manifest in darkness, where mice must use non-visual navigation strategies. To test this, we evaluated the non-visual navigation performance of male and female C57BL/6J mice, a strain commonly used in research. We food restricted young adult mice for one day prior to training and then tested them with a Lashley III maze where each mouse had five trials to navigate through the maze to reach the food reward. Latency to reach the food cup and the number of errors (wrong turns or turning around in an alley) were used to quantify performance. Our results indicate no sex differences in navigation performance of the Lashley III maze. Further studies are needed to determine if sex differences occur in other non-visual navigation tasks.
Detecting Chloride Corrosion of Carbon Steel

Steven Groff
Faculty Sponsor: Dr. Dong Chen
Department of Engineering

The corrosion of steel is an unavoidable problem for aging structures. One of the most common causes of corrosion is due to chlorides, as they are abundant in nature and have the ability to pass through the coating of stainless steel and allow corrosion to occur. With the large amount of infrastructure that is currently around, the cost to manually check and repair damage done by corrosion would cost billions of dollars. It is also difficult to know the amount of corrosion from the current methods of inspection, as they lack accuracy and require a large amount of time for professionals to travel and inspect each site. In some instances manual inspection is not an option, such as pipelines at the bottom of the ocean or other extreme and remote environments. In order to try to monitor corrosion, a sensor has been developed in order to find the electrical properties of steel as it is exposed to corrosion. These results will make it possible to remotely monitor the degree of corrosion that the sensor is attached to. This allows for the acquisition of data without the need for a site visitation, and thus more efficient and cost-saving.
The head direction signal contributes to accurate navigation in darkness

Ryan Harvey
Faculty Sponsor: Dr. Ryan Yoder
Department of Psychology

The neural representation of directional heading is carried by head direction cells located in several brain regions. Surgical lesions to these brain regions impair navigation in darkness, suggesting involvement of head direction cells in non-visual navigation. However, these lesions often disrupt additional brain signals, and this collateral damage may underlie the observed navigation deficits. We therefore tested whether the head direction signal contributes to navigation in otoconia-deficient tilted mice, which have intact brains, but degraded head direction signals. Homozygous tilted mice and their heterozygous control littermates performed a Lashley III maze across five trials in darkness, which forces animals to rely on self-movement (idothetic) cues to guide navigation. Performance measures included latency to reach the food reward and number of errors, which included incorrect turns or turning around in an alley. The heterozygous control mice showed gradual performance improvements across five trials, whereas tilted mice showed a greater number of errors and greater latency to complete the task. Surprisingly, tilted mice improved abruptly during the last two trials. These results suggest that the head direction signal is related to the use of idiothetic cues for navigation.
Puerarin: from the roots of kudzu, an invasive plant, to the front lines in modulating stress within farmed salmonids

Mohammed Rumman Hossain
Faculty Sponsor: Dr. Ahmed Mustafa
Department of Biology Graduate Program

According to recent estimates, global annual farmed salmonid production exceeds 2 million metric tons (mt). In British Columbia alone, the salmon farming industry accounts for CAD 600+ million annually and employs 3500+ people. One of the problems associated with aquaculture is the risk of disease outbreak through pathogenic infections. There are natural reservoirs of microbes within the salmonids and the risk of sickness is lower in the wild; however, due to the husbandry practices in farming, the potential of infections is elevated. In aquaculture, salmon are reared in conditions where they are crowded, handled, chased, and caught repeatedly. Hence, stress response pathways are activated within salmonids to mount fight/flight response and energy wastage. Prolonged exposure to such stressors leads to the secretion of cortisol, which produces a compromised immune response in fish. An 8-week long study was performed to determine the effects of puerarin, which is the most bioactive isoflavone in the roots of kudzu, *Pueraria lobata*. The study was designed to determine the consequences of puerarin-supplementation in commercial fish feed through inducing chronic stress in laboratory conditions. Chronic stress was generated by exposing the fish to acute stress by chasing them with nets for 5 minutes daily for 8-weeks. Our findings indicate that puerarin reduces blood-glucose concentrations, hematocrit, plasma protein levels within a 24-hour period. After 8 weeks, puerarin-fed fish had lower plasma cortisol, hematocrit, plasma protein, and had improved spleen-somatic indices (SSIs) and macrophage activity. Our findings indicate puerarin modulate stressors encountered while farming which are in concurrence with prior studies with puerarin on other animal models, where puerarin lowered blood glucose and improved blood circulation. The results of this project are significant since this was one of the first studies with puerarin on fish and has culminated in 2 scientific papers and 1 conference presentation.
Feeding preference of emerald ash borer adults on tolerant and susceptible ash foliage

Rachel Hunnicutt
Faculty Sponsor: Dr. Jordan Marshall
Department of Biology/M.S. Science

Emerald ash borer (EAB) has caused significant mortality of North American ash (Fraxinus spp.) since its introduction from Asia during the 1990s. While a large proportion of ash does succumb to EAB infestation, some trees are able to survive the attack. These surviving individuals still are infested by EAB and show signs of the infestation; however, some mechanism exists allowing them to tolerate attack and continue to grow vigorously. Following emergence, EAB adults spend time in ash canopies feeding on foliage during a maturation period. A choice feeding study was established comparing the preference of female:female, male: male, and female: male feeding pairs on foliage from green ash trees, that are growing on the IPFW campus, categorized as tolerant and susceptible to EAB attack. The EAB adults were reared in the lab from green ash logs from Allen County, IN and Shiawassee County, MI that were placed in barrels with attached containers, exposed to the light, so that the adult beetles could be collected. Tolerant and susceptible trees did not differ in diameter and both groups of trees were currently experiencing attack from EAB with evidence from bark splits, EAB exit holes, and woodpecker activity. The trees also had the same amount of beetle activity due to the similarity in crown light exposure. However, susceptible trees had significantly more crown dieback than tolerant trees and also had a significantly higher numeric vigor rating (one is healthy and five is half dead). Foliage was collected from wild-grown green ash and replaced in each feeding cage every 1-3 days. Leaf area was measured before exposure to EAB adults in cages and after removal. Beetles that died during the experiment were frozen, dried, and weighed at the end. In comparison, the females and males in the female: male pairs weighted more than the females in the female: female pairs and the males in the male: male pairs this result was due to the formation of sex gametes making the females and males in the female: male pairs heavier than the beetles that were paired with the same sex. The mean body mass of the females together weighed more than the male beetles, which was expected since female beetles usually weigh more than the male beetles. The different feeding pair treatments (F:F, M:M, M:F) did not differ in the ratio of the mean area of susceptible: tolerant leaf consumed; suggesting that a preferential difference did not occur between sexes or mating pairs. However, pooled adult pairs fed significantly more on susceptible leaves than tolerant leaves. Previous research has demonstrated a feeding preference between host species by EAB adults. The identification and subsequent selection of one host species over another is likely related to the possibility of a host chemical or structural component that can drive EAB to select the tree to feed and oviposition on.
Functional characterization of the Arabidopsis Nucleobase-Ascorbate Transporter family (NAT) reveals distinct transport profiles and novel substrate specificity

Kevin Ann Hunt
Faculty Sponsor: Dr. George S. Mourad
Department of Biology

The Nucleobase-Ascorbate Transporter (NAT) family is found in every major taxa with over 2000 putative members. Despite the structural similarities amongst putative members, the less than 20 characterized NATs have distinct transport profiles. Microbial, plant, and non-primate mammalian NATs are specific for uracil, xanthine, and/or uric acid; whereas, mammalian NATs transport vitamin C. These hugely different specificities make NATs candidates for the rational design of antifungal and antibacterial drugs, as human and microbial NATs transport different substrates. The Arabidopsis thaliana genome contains 12 putative members of the NAT family, whose functions have previously eluded discovery. Radiolabeled uptake studies of AtNAT1 through AtNAT8 heterologously expressed in Saccharomyces cerevisiae deficient in native nucleobase transport revealed each AtNAT, except AtNAT3, to share the canonical plant NAT specificity profile of xanthine and uric acid. Conversely, a novel substrate specificity of xanthine, adenine, guanine, and hypoxanthine was revealed for AtNAT3. In planta radiolabeled uptake studies utilizing an AtNAT3 insertion knockout mutant confirmed xanthine transport. This work functionally characterizes 8 more NATs and identifies the novel specificity profile of AtNAT3, despite high sequence similarity, greatly adding to the structure-function information available for this ubiquitous family.
Ambystoma Species and the Ambystoma jeffersonianum-hybrid Complex: A Comparison of Abundance in Established and Restored Wetland Habitats

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Ephemeral wetlands in the United States are under consistent threat from human encroachment. Amphibians that use these habitats, including Ambystoma salamanders, are forced to inhabit areas of decreasing size and habitat quality. It is not clear how species respond to the availability of restored habitat and barriers among habitats. The goal in performing this research is to provide insight into how different Ambystoma species respond to disturbed habitat. We trapped and recorded Ambystoma species (A. tigrinum, A. texanum, and unisexual hybrids of the A. jeffersonianum complex) that occur in two neighboring properties that are divided by a railroad track: Fox Island, a county park with a relatively wide area of forested wetlands expected to be suitable to Ambystoma and Eagle Marsh, a private land preserve that also has forested wetlands but primarily consists of emergent wetlands that were reestablished following decades of agricultural use. Tissue samples were collected from all individuals and microsatellite loci were used to confirm the hybrid status of individuals identified as A. jeffersonianum complex in the field. We compared the abundance of each species group in the range in the available habitats and assessed their likelihood for navigating the railroad barrier. The genetic analysis confirmed hybrid identifications in all cases and resulted in the first observation of a triploid genome consisting of A. laterale, A. texanum, and A. jeffersonianum (LTJ) in the state of Indiana. Initial results of habitat association show strict aversion to emergent breeding pools in A. texanum while others, A. tigrinum and A. LTJ, showed lower numbers within such habitats but an ability to make use of them. Our preliminary analysis suggests greater plasticity in habitat use found in A. tigrinum and A. LTJ while A. texanum demonstrates high fidelity to forested wetlands.
Apoptotic and Necrotic Processes in a Rat Organotypic Hippocampal Slice Culture Model of Ischemic Stroke without Reperfusion

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Organotypic hippocampal brain slice cultures (OHCs) are widely used in vitro models of ischemic stroke. This model simulates an in vivo environment where neurons retain their cellular connections and functions. Detection of neuronal cell death is a standard procedure to assess the severity of damage in tissue culture models of neurodegenerative diseases. However, information about the time course of injury during an ischemic event is limited; therefore we examined the time course of apoptosis and necrosis in a rat OHC model of ischemia.

We exposed OHCs from postnatal day 6–9 Sprague-Dawley rats to varying periods of oxygen and glucose deprivation (OGD) to mimic conditions following cerebral ischemia. All analytical tests were run immediately after OGD to avoid reperfusion effects. The viability of the hippocampal slices exposed to OGD was determined qualitatively and quantitatively using YO-PRO 1 iodide, which stains apoptotic cells, and propidium iodide (PI), which stains necrotic cells.

Apoptosis in the OHCs increased gradually with increased time of OGD as shown by changes in the YO-PRO 1 iodide fluorescent intensity. Quantitative analysis showed a small number of PI stained cells which could also be detected as early as 1 hour following OGD. The data gathered suggest that the most suitable length of ischemia without reperfusion for the maximization of apoptosis is between 4 - 8 hours. Within this time frame we see a large increase in apoptotic cells which are potentially salvageable and are easily accessible for application and assessment of neuroprotective interventions.

In conclusion, our in vitro model provides us with the unique opportunity (1) to select the severity of the ischemic insult by varying the period of OGD, (2) estimate the amount of damage by evaluating the effects on viability through generation of apoptotic and necrotic cells, and (3) test potential new treatments for hypoxic-ischemic stroke.
The number of obese adults and children in the United States has risen dramatically over the past few decades (Centers for Disease Control, 2011). As a result, there has been increased attention given to how overweight people are perceived and treated (Crandall, et al., 2001). There is clear evidence that overweight people tend to be more negatively evaluated and stereotyped than their normal weight counterparts (Lieberman, Tybur & Latner, 2010). This is a form of prejudice referred to as weight bias. We conducted a study to examine the psychological determinants of weight bias, with a focus on the “Big 5” personality traits (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness), causal attributions (the extent to which people prefer to consider multiple causes for people’s behavior or prefer to make simplistic, internal attributions), and contact experiences with overweight individuals. From a person x situation model of prejudice (Jackson & Poulsen, 2005), we hypothesized that expression of weight bias would be inversely related to Openness and Agreeableness, attributional complexity, and favorable contact experiences with overweight individuals.

We administered a survey to 166 male and female PSY 120 students. The survey included the Aspects of the Big Five scale (DeYoung, Quilty, & Peterson, 2007), the Attributional complexity scale (Fletcher, Canilovics, Fernandez, Peterson, & Reeder, 1986), a measure of the quality and frequency of contact experiences with overweight individuals (adapted from Tzeng and Jackson, 1994), and a measure of weight bias (the “Anti-Fat Attitudes” scale, Crandall, 1994).

The results of correlational, regression, and other analyses were consistent with our primary theoretical predictions. Aspects of Openness and Agreeableness predicted more favorable contact experiences and greater attributional complexity; these variables, in turn, predicted less weight bias. These results replicate and extend the person x situation model of prejudice and have practical and theoretical implications.
Educational Data Mining: How Student’s Self-motivation and Learning Strategies Affect Actual Achievement

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Educational data mining deals with developing methods for discovering uncovered information from educational context data. This study uses a dataset collected from online courses. The data record is composed of 45 attributes including: student’s year, gender, ethical background or weekly activities, and assessment values such as grade, intrinsic motivation, self-efficacy, effort regulation, metacognitive regulation, and interaction regulation. The goal of this study is to discover how self-motivation (intrinsic motivation and self-efficacy) and learning strategies (effort regulation, metacognitive regulation, and interaction regulation) are related with actual achievement behaviors which are represented by grade and score. Various data mining techniques such as association, classification, and clustering are applied to the dataset. Contrary to typical assumptions in Education Domain, our results show there is no particular evidence of correlations between self-reported motivation and grade and between learning strategies and grade. The research suggests that traditional measures such as exams, total time spent, weekly activities, familiarity with assignment instruction and discussion are more related to student’s actual achievement.
Do Hatchery-raised Tilapia and Coho Salmon Have Antibiotic Resistant Bacteria in Their Guts?

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Tilapia and coho salmon are commercially important aquaculture fish. Antibiotics and antibiotic resistant bacteria have been detected in the aquaculture system. These two fish species were tested for presence of antibiotic resistant microbes in their gut samples. The objectives were to look for the presence of antibiotic resistant bacteria their guts, determine antibiotic resistance phenotype of resistant bacterial isolates and further test for the presence of plasmids in selected resistant isolates. Tilapia (Oreochromis niloticus) and coho salmon (Oncorhynchus kisutch) were obtained from hatcheries and maintained in a fish laboratory at IPFW. The antibiotic resistant bacteria were isolated on the basis of their resistance to ampicillin. Out of 8 tilapia 6 (75%) yielded bacterial isolates with antibiotic resistance. As for salmon, out of 8 only 3 (38%) yielded antibiotic resistant isolates. The results indicated prevalence of antibiotic resistant bacteria in fish guts. Comparatively tilapia had higher percentage (75%) of fish with resistant isolates. Antibiotic sensitivity tests were performed for all 45 bacterial isolates using six additional antibiotics - penicillin, vancomycin, chloramphenicol, tetracycline, streptomycin and gentamicin. Many isolates showed multidrug resistance. From this group six bacterial isolates were selected to test for the presence of plasmid because plasmids are known to carry and spread antibiotic resistant genes. Only two bacterial isolates were found to have plasmids which suggest that antibiotic resistance in many isolates is of chromosomal origin. Two isolates containing plasmids were identified as Pseudomonas alcaligens or P. pseudoalcaligenes and Aeromonas salmonicida subspecies smithia from tilapia. At this point we don’t know whether the plasmids found in these two isolates are responsible for conferring antibiotic resistance to these microbes, future studies are necessary. However, the presence of antibiotic resistant bacteria is worrisome because fish handlers and consumers may acquire resistant bacteria and transfer resistance genes to pathogenic bacteria.
Growing A Group Project: Service Learning in the WOST Classroom

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Typically, students cringe when they learn a course will involve a group project. The students of IPFW’s Spring 2012 Women’s Studies course, “Feminism & Food,” were no exception. This pilot course required the class to collaborate on a student-developed service learning project. At first, many students were panicked and stressed, but learned within less than a month that they were able to design and carry out an impressive and rewarding service learning project. Individual students came together as a team and were able to nearly quadruple their projected fundraising goal for Community Harvest Food Bank, while also raising awareness about healthy eating, local businesses, and feminist activism on campus. I will examine this classroom experience as a case study supporting the use of service learning projects in Women’s Studies courses. The project combined WOST program goals and concepts with the universally accessible topic of food, and students of interdisciplinary backgrounds gained valuable skills and experience in the process. Connections were made on campus and beyond as the class worked together to orchestrate a smoothie sale, and the class learned that undoubtedly, food is a feminist issue.
Head direction signal contributes to landmark navigation on the radial arm maze

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Head direction cells appear to provide stable representations of directional heading that contribute to navigation. Damage to brain structures containing these cells has been shown to interfere with performance on spatial tasks. Indeed, surgical brain lesions to the postsubiculum have been found to impair radial maze performance, suggesting involvement of head direction cells in this task (Taube, Kesslak, & Cotman, 1992). However, these lesions often cause collateral damage and disrupt additional brain signals, and this collateral damage may underlie the observed spatial deficits. As a complementary approach, we evaluated the navigation ability of otoconia-deficient tilted mice, which have intact brains, but have degraded head direction signals. We therefore compared navigation between tilted mice and their control littermates on a landmark navigation task using extramaze cues, and a cued navigation task using intramaze cues. Performance was quantified by the percentage of correct arm choices per trial, as well as the frequency of working memory-correct errors (re-entries into baited arms), reference memory errors (first entry into unbaited arms), and working memory-incorrect errors (re-entries into unbaited arms). The landmark navigation task indicated that control mice reached asymptotic performance near 90% correct arm choices by day 7, whereas tilted mice did not exceed 60% correct arm choices by day 10. In addition, reference memory and working memory-incorrect errors were more prevalent for tilted mice. On the cued navigation task, there were no significant differences between groups. The increased frequency of reference memory and working memory-incorrect errors in tilted mice performing the landmark navigation form of the radial arm maze suggests the head direction signal is involved in landmark navigation.
Department Stores: Organizational Culture, Customer Survey and Employee Empowerment

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In the world of retail little research has been conducted on how employees resolve customer issues and why customer issues arise in the first place. Successful department stores have been able to differentiate themselves from their competitors by creating a pleasant shopping experience and by providing excellent customer service. One of the primary factors that contributes to a pleasant shopping experience and excellent customer service are the frontline employees. The quality and amount of training these employees receive is critical and affects the interactions they have with customers—contributing to an overall positive or negative experience. This study surveys sales managers at nine different Macy’s department stores in the state of Indiana. Sales manager are able to give a unique perspective since they are the primary individuals coaching and assisting associates with resolving customer service issues.
Sex Differences in the Relationship Between Motion Sickness and Handedness

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Previous research indicates that virtual environments may elicit visually induced motion sickness (Stanney, Hale, Nahems, & Kennedy, 2003). Women typically experience more motion sickness symptoms than men (Flanagan, May, & Dobie, 2005). The current study explored the possibility that gender differences in brain lateralization might play a role in gender differences in motion sickness. Motion sickness is thought to result when conflict arises between one’s perception of themselves as moving and whether they are actually moving in the environment (e.g., motion sickness in a car). In virtual environments the person is not moving, but looking at a moving pathway on a computer screen causing this conflict. Left and right hemispheres of the brain may control different aspects of movement perceptions. We used handedness as an indirect measure of brain organization that might interact with discrepancies in movement perceptions that may lead to motion sickness. We hypothesized that the more “balance” between the hemispheres (indicated by ambidexterity), the less conflict between self-movement perception and actual movement within the environment, therefore the less motion sickness. Participants (79 male, 103 female) completed Simulator Sickness Questionnaires before and after immersion in the virtual environment. Participants were told to learn object locations throughout the building and later mark them on a floor-plan. This activity was used to keep participants focused while experiencing moving within the virtual environment. The findings for men showed no significant relationship between handedness and motion sickness. Women did show a significant linear and quadratic relationship between handedness and motion sickness. Women who were strongly left handed were more affected by visually induced motion sickness than ambidextrous women and strongly right handed women, and strongly right handed women were slightly more affected than the ambidextrous women. These findings suggest a complex role for brain lateralization in women’s susceptibility to motion sickness.
Narcissism Moderates the Relationship between Provocation and Intergroup Aggression

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Intergroup aggression may be defined as any behavior intended to hurt another person because of his or her group membership. We tested a person x situation model of intergroup aggression that integrates group identity processes, situational forces, and personality. Since social norms prohibit unjustified aggression (Otten, et al., 1996), we expected aggressive responses only after provocation. Drawing from research on individual-group discontinuity (Wildschut, et al., 2003), we expected provocation to stimulate more aggression in an intergroup condition than in an interpersonal condition. Finally, we expected participants with “dark” personalities (high levels of narcissism, psychopathy, and Machiavellianism) to have exaggerated responses to intergroup provocation (Jonason & Webster, 2010).

Participants (N=212) completed measures of personality and exchanged essays with an online partner, characterized as a local student (interpersonal condition) or an international student (intergroup condition). Participants then received either insulting feedback (provocation condition) or praise (no provocation condition) from their partner. Next, participants completed the positive-and-negative-affect scale. Finally, aggression was assessed using the tangram paradigm (Barlest & Anderson, 2011). Participants selected 11 tangram puzzles for their partner to solve to potentially win a prize. Aggression was defined as the number of hard tangrams selected (an act intended to hurt the partner’s chances of winning).

We found that narcissistic participants reacted more aggressively toward an outgroup member after provocation compared to their low narcissistic counterparts. Additional analyses determined that feelings of anger accounted for the high levels of aggression expressed by the insulted narcissists. The results support a person x situation approach to intergroup aggression and have implications for integrating personality and social psychological approaches. In general, it seems that there are some distinct factors that uniquely influence intergroup aggression, including the dynamics of ingroup bias, individual-group discontinuity, and certain personality dispositions.
Two NCS1 transporters of the moss *Physcomitrella patens* share substrate specificities with other members of the NCS1 family but express novel phenotypes and distinct transport profiles

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The two genes PpNCS1A and PpNCS1B of the moss *Physcomitrella patens* are nucleobase transporters and putative members of the purine-related transporter (PRT) or nucleobase:cation symporter 1 (NCS1) family. Previously characterized members of this family include the uracil transporter (FUR 4) of *Saccharomyces cerevisiae*, the adenine-guanine-hypoxanthine-cytosine transporter (FCY2) of *S. cerevisiae* and the recently characterized adenine-guanine-uracil transporter (AtNCS1) of *Arabidopsis thaliana*. The two NCS1 genes of *P. patens* were cloned into yeast expression vectors and expressed in yeast strains lacking their own NCS1 genes. Transport profiles of the two *P. patens* NCS1 genes were discovered by radiolabeled nucleobase uptake and competition assays, and toxic analog growth studies. Interestingly, the two genes exhibit overlapping yet distinct solute specificities. PpNCS1A transports adenine, cytosine and uracil, but not guanine, while PpNCS1B transports adenine, cytosine and guanine, but not uracil. Future work will confirm the results presented here by yeast growth studies on media containing a sole nitrogen source, and kinetic parameters will be determined by radionucleobase homologous and/or heterologous competition assays.
Human overpopulation is not, by any means, a new topic. However, it is often overlooked in politics and in the minds of the general public. Even those who are aware of the topic tend to be unaware of its importance or potential imminence. Multiple times, I have attempted to present human overpopulation, either through an actual presentation or in general conversation. What I have found is that the average person typically neither understands the gravity of the issue nor logical solutions for it. The reality of the situation is that overpopulation is a problem and, more importantly, it is unavoidable. The purpose of this project is to clearly present the topic of overpopulation, to explain why it is a problem, and to propose what I have determined are the three most basic solutions. This is, quite simply, a persuasive argument based on common sense that also utilizes population data to make projections and estimations about human numbers and available space on Earth. A part of this argument will be the approach taken in viewing the topic at hand, which I have called the “Exo-human” perspective. This is an attempt to remove our view of the subject from the bulk of our human biases so that we may judge the problem of overpopulation objectively, without the interference of personal feelings, morals, etc. This project will take many factors relative to the issue into account and use a from-a-distance perspective to propose logical solutions.
Elderberry (Sambucus nigra) shows promise as a naturopathic treatment against melanoma in vivo and several elderberry fractions decrease melanoma and neuroblastoma cell proliferation in vitro

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It is widely accepted that elderberry (Sambucus nigra) has many positive health benefits, some of which might slow the rate of cancer growth. The objective of this research is to identify active components of elderberry capable of modulating melanoma cell proliferation in both in vitro experiments and in an in vivo murine model. Melanoma is of interest because incidence of melanoma increases annually and treatment of melanoma is crucial before stages of metastasis. A diet including elderberry extracts may be a naturopathic strategy to slow melanoma growth in at-risk patients, including elderly and immune-suppressed individuals.

In a murine model, groups of mice were given intraperitoneal injections of either sterile water (control) or sterile crude elderberry (treatment) before challenge by murine melanoma. 13 days following successful cancer cell challenge, mice were sacrificed and tumor size and weight were recorded. On average, control mice had larger tumors compared to treatment mice in both tumor size and weight. Also, two out of three control mouse tumors metastasized into the peritoneal cavity (whereas all treatment mouse tumors remained local), suggesting that crude elderberry may also decrease risk of tumor metastasis.

Elderberry extracts were separated and purified. Human melanoma (MeWo) cells were supplemented with individual elderberry fractions to examine tumor suppressive activity by radioactive thymidine uptake assays. Several elderberry fractions showed in vitro evidence of decreased melanoma proliferation and were pooled based upon similar suppressive abilities. These pooled fractions suppressed human neuroblastoma (SH-545Y) and murine melanoma (B16 F10) growth in vitro, suggesting that pooled elderberry fractions are effective in suppressing multiple lines of cancers.

I am currently preparing active pooled elderberry fractions to use in a similar murine model. Proper identification of melanoma-suppressing elderberry fractions may lead to diet-based strategies for natural suppression of melanoma.
Examining Inelastic Collisions

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In introductory physics, we talk about inelastic and elastic collisions. Generally, students are quite happy about elastic collisions because they have conservation of momentum AND conservation of energy. But if we setup a perfectly inelastic collision, the student’s dilemma is the decrease in kinetic energy after the collision. The student’s question of “where does the energy go?” generally relies upon our describing unmeasureable loss mechanisms such as deformation of the object and sound. But, that is our telling rather than letting the students discover. What if the students could perform an investigation which the they can visually see where what happens to the energy? To this end we built a collision system in which a spring is compressed during a collision and a ratchet holds the spring at maximum collision. This allows us to actually find the “lost” kinetic energy.
How to Use Music Therapy to Promote Communication Skills with Individuals with Autism

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First year music therapists are often unprepared when finding the most appropriate means of working with individuals with Autism. As Autism is the second largest population currently being served by music therapists (American Music Therapy Association Membership Sourcebook, 2011) it is important that they have a clear understanding of the common characteristics, need areas and interventions that are the most appropriate to fit their specific needs. An extensive literature review was conducted in order to determine the themes and need areas in the ten question survey. This survey was provided to seven board certified music therapists in order to compare the knowledge and understanding. All seven surveys were completed and analyzed to look for emerging themes and patterns in the therapists responses. This survey revealed that first year therapists have the basic understanding of interventions and characteristics of autism but do not line up with current research and evidence-based uses of interventions. While the therapist were familiar with a few interventions and characteristics they still need additional resources and more specific training with individuals with autism.
An Independent Observation of Facultative Parthenogenesis in the Copperhead (*Agkistrodon contortrix*).

Natasha Perrine  
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Department of Biology

In general, vertebrates reproduce sexually, thereby promoting genetic variation that could lead to increased fitness and a reduction in the accumulation of harmful mutations in the species' genome. Although sexual reproduction is most common, some species reproduce asexually using parthenogenesis and may do so facultatively. The Copperhead (*Agkistrodon contortrix*) is one such species. To date, this alternative reproductive strategy has only been observed in one population, and the widespread use of this tactic is not known. In this study, we explore a possible instance of parthenogenesis in a snake from southern Indiana. In 2010, after eight years in captivity, a female copperhead produced a litter containing four infertile ova and one near-term stillborn neonate. To test the hypothesis that the neonate was produced asexually, we developed a panel of microsatellite loci for use in DNA fingerprinting and utilized this method to genotype the mother and her offspring, as well as wild-caught individuals in the maternal population. Based on previous research, we expected heterozygous maternal loci to be homozygous in the offspring, indicating terminal fusion automixis. Four loci displayed this pattern and, using allele frequencies in the female's population of origin, we were also able to show that the probability of paternity for this offspring is low. Together, these results further confirm that Copperheads are facultatively parthenogenic and extend the geographic range of this reproductive mode in the species.
An Examination of the Relationship between Age and Children's Gender-Related Interests and Attitudes

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For this presentation, the relationship between age, gender-related preferences, and gender-related attitudes in children was examined. These data were taken from a larger study looking at the impact of parental gender-related attitudes on their children's gender development. Participants consisted of 3- to 11-year-olds (35 male; 51 female; M age = 6.26 years; SD = 2.79). Because data collection is ongoing, these numbers may be different at the time of presentation. The children completed a measure of children's stereotyped attitudes and preferences, the Occupation, Activity and Traits Scales (Liben & Bigler, 2002). We only used the activities and occupations scales, which ask participants about their interests in doing various activities and occupations, which are stereotypically masculine, feminine, or gender-neutral. Analyses showed that girls do prefer feminine activities and occupations more than boys, but boys only preferred masculine activities more than girls did. Preferences for masculine occupations did not differ between boys and girls. Older children preferred feminine activities less than younger children.

We also measured the children's gender-related attitudes about activities and occupations. There were no age or gender effects in most of the attitude measures, except that younger girls were more likely to stereotype activities as feminine than older girls. This means older girls were more flexible in their opinion regarding which gender should participate in the included activities. Furthermore, for boys, there were few relationships among age, preferences, and attitudes. However, the more the girls stereotyped occupations and activities for others, the more they preferred gender stereotyped activities themselves.
Are Parents’ Gender-Related Interests and Attitudes Associated with their Children’s Gender-Related Interests?

Elizabeth Phillips, Manaal Sajiid, Heather Hicks
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This study examined the relationship between parent’s attitudes about the desirability of their children engaging in certain gender-related activities, and their children’s gender-related interests and traits. Participants included parents (24 male; 62 female) of 3- to 11-year-old children (35 male; 51 female; $M$ age = 6.26 years; $SD$ = 2.79). Data collection is ongoing so there may be a larger sample at the time of presentation. Parents completed three measures. First, the Child Gender-Socialization Scale (CGSS, Blakemore & Hill, 2008), which measures parental attitudes regarding the desirability of gender-related interests and behaviors in their own children. Second, they completed the Occupations and Activities Scales of the OAT (Liben & Bigler, 2002), which measures parents’ interests and attitudes regarding gender-related occupations and activities. Finally, the Preschool Activities Inventory (PSAI, Golombok & Rust, 1993), which is a measure of the child’s gender-related traits and interests, was completed.

Results showed that parents’ gender-related interests and attitudes were rarely associated with their children’s gender related-interests and traits. However, parents’ attitudes about the desirability of their children engaging in gender-related activities were consistently related to their children’s gender-related interests and traits. With this study, we can explore the implications of the findings for research on children's gender socialization, as well as, the measurement of parents' attitudes and children's gender-related interests.
Heterologous Complementation in Yeast Reveals the Solute Specificity of the Nucleobase Cation Symporter 1 proteins of the plants *Zea mays* and *Setaria viridis*

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Nucleobases and their precursors are vital organic molecules in all living cells due to their role in nucleic acid biochemistry, sugar metabolism, as well as serving as energy molecules. In plants, the salvage and catabolism of nucleobases requires an intricate membrane transport mechanism that ensures their movement between cells and also within cells between the organelles and cytoplasm. One of several nucleobase transporter membrane families that have been identified is the Nucleobase Cation Symporter 1 (NCS1). In this report the specific nucleobase substrates transported by the sole NCS1 protein of corn (*Zea mays*), ZmNCS1, and by its relative grass *Setaria viridis*, SvNCS1, are identified. The genes encoding ZmNCS1 and SvNCS were PCR-cloned then spliced into a yeast expression vector. The yeast vectors containing the plant genes were transformed into yeast cells lacking their native NCS1. Such yeast cells were then used to identify the substrate specificity of the expressed plant NCS1 proteins using three approaches. First, by growing on media containing toxic structural analogs of various nucleobases. Second, by growing on medium where nucleobases are the sole nitrogen source. Third, by assaying for the uptake of a panel of radiolabeled nucleobases from the growth medium into the cells. In addition, homologous and heterologous competition between radiolabeled substrates and an array of non-radioactive nucleobases revealed the kinetic properties of uptake for both plant NCS1 proteins. The results revealed that ZmNCS1 and SvNCS1 proteins have novel functions, in that they are both strict transporters of the purines adenine and guanine. In addition, SvNCS1 transports hypoxanthine, a unique function when compared to other known plant NCS1s.
Alternative Designs for Operation and Safety at Coliseum Boulevard

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There are nine intersections along Coliseum Boulevard in Fort Wayne, Indiana from Crescent Avenue to Lima Road. Of these nine intersections, three are among the most dangerous intersections in the State of Indiana based on a recent study by INDOT. Coliseum Boulevard has approximately 50,000 vehicles per day and serves as a major arterial to industrial, commercial, and educational zones. Our goals include: improving operation for the nine signalized intersections in the study corridor during peak traffic hours, and increasing traffic safety at the most critical intersection. These goals will be accomplished using short term and long term alternatives that would be unique to the Fort Wayne community and will reduce the congestion/delay and emissions during the AM and PM peak hours along with increasing vehicle travel speeds and safety.
Despite of extensive research for malware and Trojan horses, covert channel (CC) attacks are still considered as one of the topmost insider attacks in information security. The most virulent feature of this attack is that it can be launched through either specially crafted content, or manipulated timing characteristics to transmit sensitive inside information to outside adversaries, all the while, its malicious behavior remains undetectable.

In a mobile cloud environment, the CC is particularly harmful and difficult to detect because malicious mobile users can freely join and leave the cloud and harvest the collected information through CCs. In addition, information can be hidden in some features, which are unique to mobile devices. Previous technologies mainly focused on designing proof-of-concept CCs on mobile devices, which suffer from the low-bandwidth of its communication channel and easy to be detected.

We present MediaChannel, a CC generator that leaks the sensitive information to malicious mobile users and outwits most security defenses. The information can be hidden into video and audio streams, and be conveyed through WIFI or bluebooth traffic. To ensure robustness of the hidden information and higher bit-rates than most of the known CCs, we proposed a scheme that dynamically embeds information into video frames. Once the information is been embedded into the frames, it is difficult to detect and remove it. The proposed encoding and decoding algorithms ensure sender and receiver follow the same protocol and no additional information is needed to be transmitted. To facilitate robust communication, various error-correction mechanisms have been applied to MediaChannel, such that it can automatically correct errors due to signal interference. Our implementation demonstrates MediaChannel can archive the bandwidth several orders of magnitude higher than the previously studied covert channels on mobile devices. which prove Mediachannel a realistic threat to mobile users.
Heritage in Decline: The Detriments and Dangers of Heritage Language Loss

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A heritage language is a “language with which [people] have a personal historical connection, most often because they come from homes in which the language is spoken” (Bateman & Wilkinson, 2010). Many heritage language speakers and families live in the United States, and many parents within these families make the effort to teach their children the native language in addition to the dominant language of the society. However, some bilingual parents decide against this, instead solely favoring the more mainstream language. Even among parents for whom teaching the heritage language is a priority, for a number of reasons, the amount of Spanish language that they are able to expose their children to is significantly lower than the amount they themselves received, which may adversely affect their ability to acquire the language (Potowski, 2004). The neglect of one’s native language can be viewed as a stepping stone to abandoning one’s culture, which has been shown to have negative effects on self esteem and sense of identity (Schwartz, Zamboanga, & Hernandez Jarvis, 2007).

Additionally, the children of bilinguals who were not given the chance to become proficient in the heritage language often report embarrassment for not being able to speak what they perceive as their native language, as well as the missed opportunities for jobs and a deeper cultural connection and understanding (Cho, 2000). In this presentation, the motivations behind only teaching the dominant language will be explored, and the positive aspects of maintaining one’s native language in addition to the language of the dominant culture will be presented. In addition, a case study of a bilingual Spanish and English speaker in the U.S. who opted not to teach his children Spanish will be presented in light of the major claims found in the literature.
Copper Chloride as a Selective Precipitation Agent for Purifying Endohedral Metallofullerenes

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In our lab we are pursuing separation strategies for isolating new molecules discovered in our lab. Our new molecules consist of clusters consisting of metals, nitrogen, and/or oxygen entrapped within fullerene cages. We have shown previously that these metallofullerenes contain an electron rich carbon cage, which in turn is well-suited toward reaction and subsequent complexation with electron-deficient Lewis acids, such as aluminum chloride. In this research project, we report the feasibility of using a different Lewis acid, copper (II) chloride, in metallofullerene isolation schemes. Our results indicate that we can successfully and selectively precipitate metal oxide and metal nitride metallofullerenes. Metallofullerenes consisting of only metal atoms entrapped can also be selectively complexed, precipitated, and decomplexed to recover pristine metallofullerenes.
Activation of soybean plant defense signaling pathways in response to soybean aphid (*Aphis glycines* Matsumura) and *Soybean mosaic virus*

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Soybean is the major source of both protein in animal diets and vegetable oil for human consumption. Currently, U.S. is the leading producer of soybean in the world. Indiana ranks fourth in the U.S accounting for approximately 10% of the nation’s production. Over the last decade, soybean production in the U.S. has been threatened by an exotic insect pest, the soybean aphid (*Aphis glycines* Matsumura). The insect pest not only causes damage through feeding but also transmits several plant viral diseases such as *Soybean mosaic virus* (SMV). Since soybean aphids were only detected in the U.S. a decade ago, soybean plant defenses against aphids has not been well-characterized. Identification of plant genes that contribute to host resistance or susceptibility to insects and pathogens may be used to develop resistant cultivars by either over-expressing or silencing target genes. Hence, the objective of this study was to determine the timing and nature of plant defense responses against soybean aphid and SMV infection. Plant defense responses against insects and pathogens are carried out by plant hormones or phytohormones. For instance, insect feeding predominantly activates a defense pathway mediated by the phytohormone, Jasmonic acid (JA), whereas, pathogens such as viruses primarily activate defenses regulated by the phytohormone, Salicylic acid (SA). To determine plant defense responses against soybean aphid and SMV, we exposed cohorts of plants to three treatments: 1) uninfected-aphids, 2) SMV-infected aphids, and 3) healthy plants (control). Following the experiment, we analyzed JA and SA defense gene expression in leaf tissues from each of the treatments using Reverse-transcriptase-PCR. Preliminary results indicate that exposure to soybean aphids and SMV predominately activated the SA pathway in soybean plants. Results of this study will shed light on the ecological and molecular interactions between soybean plant, aphid and SMV, which may be applied to biotechnology-based pest management programs.
The nucleobase cation symporter 1 of *Chlamydomonas reinhardtii* and that of the evolutionarily distant *Arabidopsis thaliana* display parallel function and establish a plant-specific solute transport profile.

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Nucleobase biochemistry is essential during a plant’s life cycle. Purines and pyrimidines are central to nucleic acid biochemistry, ATP synthesis, carbohydrate, glycoprotein and phospholipid metabolism, as well as the biosynthesis of many secondary metabolites. Previous studies show the single cell alga *Chlamydomonas reinhardtii* is capable of importing purines as nitrogen sources. An analysis of the *C. reinhardtii* genome indicates the presence of at least three distinct gene families encoding for known nucleobase transporters. The nucleobase cation symporter 1 (NCS1) family of transport proteins has been shown to transport purine and pyrimidine nucleobases. In this study, the solute transport and binding properties for the sole *C. reinhardtii* NCS1 (CrNCS1) are determined using heterologous complementation in *Saccharomyces cerevisiae*. CrNCS1 is shown to act as a transporter of adenine, guanine, uracil, and allantoin. This substrate profile is parallel to that of the previously characterized *Arabidopsis thaliana* NCS1 suggesting that the solute specificity for plant NCS1 developed early in plant evolution. Also, the solute transport specificity seen in CrNCS1 and AtNCS1 shows a stark difference when compared to specificities of single cell fungal NCS1 proteins.
Classical Connections

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According to the Audience Demographic Review (2009) conducted by the League of American Orchestras, “The overall classical music participation rate of the U.S. adult population has decreased consistently between 1982 and 2008.” Many studies done in the past five years reflect an even steeper decrease that can be attributed to the financial crisis, but it is clear that audiences had become disengaged before the recession. One of the primary challenges facing modern orchestras is remaining loyal to long-time patrons and keeping the traditions of classical music alive while also engaging new audiences who are living in a new technological era. To bridge this gap, orchestras have begun investing in educational programs as a way to both assist music education professionals and cultivate future audiences from the students of today.

In this pilot project, the researcher has traveled to retirement facilities in the Fort Wayne area. After attending an on-site concert of classical music given by musicians from Indiana University – Purdue University Fort Wayne, residents were given the opportunity to complete a short, voluntary, and anonymous survey. This survey gathered residents’ reactions to the day’s program, their childhood music education experiences, and their current tastes for classical music. The researcher will be presenting the findings from these surveys.

In the data collected through the Classical Connections project, there was no statistical significance in the link between music education as a child and classical concert attendance as an older adult; however, the data did show that classical concert attendance as a youth and classical concert attendance as an older adult were positively correlated, suggesting that habits of classical music attendance may be influential. By comparing past music experiences with current attitudes about classical music, the researcher hopes to continue more clearly defining a link between a well-rounded, comprehensive music education while in school and a lifelong enjoyment of and active attendance at classical music concerts.
Slime production associated with sunscreen-producing cyanobacteria

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UV radiation affects almost all organisms through direct damage to DNA and proteins or indirectly through free radical sensitization. While natural protection from UV in humans comes from the production of the photoprotective pigment melanin, organisms that do not produce melanin have to find alternative strategies. As phototrophic bacteria, cyanobacteria must protect themselves from the UV-B and UV-A radiation from exposure to sunlight. Some cyanobacteria are able to protect themselves through the use of scytonemin, an indole-alkaloid sunscreen that is deposited into the extracellular sheath of the cells that produce it. *Nostoc punctiforme* ATCC 29133, a scytonemin-producing cyanobacterium, serves as a model organism for understanding scytonemin biosynthesis. While a genomic region that is responsible for scytonemin biosynthesis has been identified, many of the genes within this region remain to be characterized. In particular, it is unknown if the extracellular nature of the sunscreen is coupled to extracellular slime production. Thus, it is necessary to determine if a mutant that lacks the ability to produce scytonemin, SCY 59, is able to produce slime levels comparable to the wild type under the same conditions. Using a wild type strain of *N. punctiforme* and SCY 59, the relationship between extracellular slime and scytonemin production was investigated using the Phenol-Sulfuric Acid (PSA) test for measuring extractable extracellular carbohydrates. Following the exposure of *N. punctiforme* and SCY 59 to either white light or white light supplemented with UV-A the amount of extractable carbohydrates was measured. While the carbohydrate production was similar for both strains under white light only and the wild type under UV-A, SCY 59 exposed to UV-A had significantly more slime production. This suggests that scytonemin and extracellular slime production are not coupled and that SCY 59 may be compensating for the lack of scytonemin with excess slime for protection against UV-A radiation.
Generalized Thomson Problem for 5 points

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Optimal configurations on the sphere have various applications in physics, chemistry, biology, and computer science. The Generalized Thomson Problems is to place N points on the unit sphere so that their energy (sum of all weighted reciprocal distances) will be minimized. This paper investigates the case for N=5. We show that among all configurations with two antipodal points the best one is the triangular bipyramid. Computational comparison with the square pyramid is provided and open problems discussed.
Reflections on Service Learning in the Fort Wayne Hispanic Community

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The National Kidney Foundation of Indiana will run its annual Kidney Early Evaluation Program (KEEP) for the Fort Wayne Hispanic and minority Population on March 20th. The event will focus on providing education and medical services for those who attend. Kidney disease affects 1 in 8 American Adults, but early detection can help prevent the progression of this disease. The event will be offered to a portion of our population that does not have easy access to these medical tests and education. The tasks that are required will include translation of material, help in spreading the word throughout the Hispanic Community, event organization, and day of event activities. The goal is to create a service learning opportunity to gain experience in the field I will enter after college. Service learning provides an individual with engagement on community service activities with intentional academic goals for reflection that connect with an individual’s academic discipline.
Rio 2016 Olympic Tennis Stadium

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The Olympic Games is the most important sports event in the world. The next edition of this major international event is going to be held in Rio de Janeiro, Brazil, in 2016. The city is not yet prepared to host the games, since it does not have many of the venues needed for the Olympic sports. One of the venues that have to be designed from scratch is a tennis complex. The complex to be designed in this project will use already existing complexes as a model. The last Olympic Games were held in London, Great Britain, which is a city that is already prepared for a tennis event of this magnitude, since it hosts a major event yearly, the Wimbledon Championships. Therefore, the All England Club tennis complex, in London, and many other complexes around the world will be used as a model for the one to be built in Brazil. Basic models of tennis complexes have a main stadium, two smaller stadiums, and several ground courts.

The main objective of this project is to develop the structural design of the main stadium, taking into consideration mainly safety, aesthetical and economical characteristics. The structural model of the main stadium is intended to be developed using the SAP/ETABS software. In addition, an overall architectural project for the whole complex is also intended to be developed using the Autodesk® Maya® 3D software. Information provided by the Brazilian Olympic Committee and the International Olympic Committee are intended to be used to define key aspects of the project, such as the location of the complex, capacity of the main stadium, and the budget available for the facility.
Sexting: A New Route to Sexual Coercion?

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Text messaging has become almost ubiquitous in our society (Smith, 2011). Accordingly, researchers have become interested in the ways in which individuals use this medium to communicate in interpersonal relationships. Within romantic relationships, researchers have begun to examine sexting (transmission of sexual material via text message) and its prevalence and correlates within committed relationships (e.g., Drouin & Landgraff, 2012). One area of research that has received no empirical attention is coercive sexting, or engaging others in unwanted sexting. This is an important line of inquiry, as sexting may provide a potential vehicle for covictimization (i.e., both physical and sexual victimization during the same time period; Smith, White, & Holland, 2003).

In this study, we examine the relationship between unwanted but consensual sexting and physical abuse in committed romantic relationships. Based on previous research on physical and sexual covictimization (e.g., Katz & May, 2008), we expect unwanted but consensual sexting to be positively related to physical abuse in committed romantic relationships. Undergraduate participants (105 women, and 81 men) completed an anonymous online survey in which they rated their frequencies of sexting, physical abuse, and consenting to unwanted sexual activities. They also completed the Experiences in Close Relationships survey. Descriptive and correlational analyses and linear regression analyses were used to examine the prevalence of these behaviors and relationships between variables.

Engaging in unwanted but consensual sexting with one’s committed relationship partner was fairly common (approximately 50% engaged in it), and it was significantly related to physical abuse by a romantic partner. Physical abuse was also related to being talked into sexting and masturbation in all relationship contexts; however, it was not related to being talked into kissing, sex, or other sexual behaviors. Meanwhile, in women, both physical abuse ($b = .21$, $p = .05$) and attachment anxiety ($b = .19$, $p = .06$) were unique predictors of frequency of unwanted but consensual sexting, whereas in men, only physical abuse was predictive of unwanted but consensual sexting ($b = .29$, $p = .03$).

Unwanted but consensual sexting, although fairly common, might provide a vehicle for physical and sexual covictimization in both men and women. Campaigns and interventions to curb sexting, especially among adolescents, might focus on the personal and relationship issues that lead to anxious attachment, physical abuse, and sexual coercion.
Pervasive Health Ailments of the Hispanic Community of Fort Wayne

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Fort Wayne is the residence of people from many different cultural and ethnic backgrounds, many of whom speak English as their second language. While this provides the Fort Wayne area with a diverse cultural basis, a significant problem exists because of the diverse population: a language barrier. Without the necessary knowledge and skill set, this language barrier has developed into a hindrance, preventing local businesses and services providers from conducting business and providing services to members of the immigrant population. Among such monolingual immigrant groups, a population of great importance is the Hispanic population, as North America not only is inhabited by but is also in close proximity to many Spanish-speaking countries. Preliminary research is being conducted regarding the health status of the Hispanic community of Fort Wayne in order to determine if the language barrier is preventing such individuals from receiving adequate health care, and thus to establish the presence of pervasive health ailments of those members of the community. While in its initial stages, identification of such health issues of concern among the Hispanic population in Fort Wayne is in progress. Roughly 10 area experts on the health status of the Fort Wayne Hispanic community were contacted and interviewed in order to develop an idea of the prevalence of diseases or conditions ailing a significant portion of Hispanic community members. Such experts are defined as area officials who work directly or indirectly with the local Hispanic population, including but not limited to area health officials, health care providers, and those individuals who have conducted research regarding the Hispanic population. With this information, the goal is to publish informational literature or to provide a skill set to local businesses or service providers in order to better serve the Hispanic members of society. Thus, the research is being conducted to create a foundation for future research about potential health issues of the Hispanic population in the Fort Wayne community.
IPFW Mobile Application

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With the advancement of handheld computing devices, mobile application development is a popular and important subject among computer scientist. Unlike other computing hardware, the mobile device, either a smart phone or tablet, supports various services such as GPS, accelerometer, Bluetooth, camera, sensors, etc. These unique features provide users many conveniences, but introduce new challenges in application development. The user can access the data and information from anywhere and anytime. The goal of this project was developing mobile applications to provide existing functionality via handheld devices and introduce new services by utilizing sensors on the mobile devices.

An application for IPFW was implemented in order to gain experience in mobile application development and enhance my career growth. The implemented application offers a variety of services for IPFW students, faculty, and visitors. The application is composed of several mini applications that offer a specific service. The services include: a map application to help users navigate campus by providing building information and walking/driving directions, an events application that lists the upcoming events at IPFW, a course schedule application that displays available courses and information about each course, and a service that prevents the user's phone from ringing while on campus.

The application was fully implemented over the summer of 2012. The introduction of mobile applications to existing IPFW services and new features will provide many benefits to our students, faculty, and guests. Considerable research was necessary in several areas including: mobile application development, interface design, and server technologies. There are many other features that should be developed in the future such as a calendar that can sync with the users Blackboard account. Our system is designed to incorporate new features easily to the existing services.

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CASA/Writing Center

A disconnect frequently exists between the expectations of student writers and the services offered within the IPFW Writing Center. For example, student writers have expected consultants to edit their papers or to direct their composition efforts. The purpose of this poster presentation is to convey the rationale behind the non-directive approach taken by the IPFW Writing Center and how we work to balance the desire of student writers for a more directive approach with our non-directive style. In our presentation, we will define and illustrate the differences between directive and non-directive consulting and discuss the complexities of the debate. Drawing on the work of Brooks, Shamoon and Burnes, Trimbur, and others, we will show the benefits of writing consultations that employ a non-directive approach while meeting the writers’ real need to learn during the consultation.
Holy Cow! The Etymology, Definitions, and Uses of the Word “Holy”

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Department of English

How did the religious term *holy* evolve into the common expressions “holy cow?” This linguistics research project expounds upon the origin, definitions, and various uses of the word *holy*. 