Showcase of Undergraduate Scholars

WEDNESDAY
APRIL 28, 2010
4:00 p.m.
STUDENT CENTER GRAND BALLROOM
Fifth Annual Showcase of Undergraduate Scholars
Abstract Book

Logistical Involvement:
Department of Nutrition & Food Science
Photography: Emily Remy
Design: Doug Pham

Student Involvement:
UK Theatre Department

Planners/Editors
Evie Russell
Kathy Logsdon
Lesley Mann
Alecia Fields
Jenna Brashear
Jessalyn Ubellacker
Lindsey Smith
James Rossi
Megan Schultz
McKinley Heflin
Geraldine Goh

Experiences in Undergraduate Research and Kreative Activities
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Fifth Annual Showcase of Undergraduate Scholars

Wednesday, April 28, 2010
Student Center Ballrooms
4:00-7:00pm

4:00 pm  Opening Remarks and Moderator
Dr. Michael D. Mullen
Acting Director, Office of Undergraduate Research and Creativity/eUreKa!
Associate Provost for Undergraduate Education

4:05 pm  Welcome
Dr. James W. Tracy, Vice President for Research

4:15 pm  Presentation of the Oswald Awards
Dr. Mullen

4:30 pm  Presentation of the Third Annual Faculty Mentor Awards
Lesley Mann, President of SPUR (Society for the Promotion of Undergraduate Research)

4:40 pm  Opening Act – Pajama Game, musical excerpts presented by UK Theatre Department showing at the UK Guingol Theater

5:00-7:00pm  Presentation and Viewing (Posters & Orals)

Catering provided by the Nutritional and Food Science undergraduates enrolled in Dr. Sandra Bastin’s NFS 342 - Quantity Food Production class.

Dr. Bastin teaches the capstone course in quantity food production, commonly known as the "Lemon Tree," to dietetic and hospitality management and tourism students.
Welcome to the 2010 Showcase of Undergraduate Scholars

The University of Kentucky is dedicated to supporting and encouraging undergraduate scholarship, research, and creative activities. These undertakings are the hallmark of an excellent education, especially at a Research I university, such as UK. The extent to which our students engage in these activities and the quality of their scholarship are clear indicators of the level of achievement of the undergraduate programs of the University. This annual Showcase of Undergraduate Scholars is an important opportunity for our students to share the results of their studies and also a chance for the University to assess its success in supporting its undergraduates. On both of these measures, this fifth annual Showcase demonstrates the progress we have been making and the dedication of our students to their educations.

Research and active scholarship know no disciplinary boundaries. Therefore, it is significant that students from disciplines across the University are represented in the Showcase. Just as we expect every faculty member, regardless of department, to be an active scholar, we want every student to become involved in scholarship beyond the classroom. Not only is such scholarship appropriate for a Research I university, but all pedagogical research confirms that students who are active in undergraduate research are more successful: they have higher grade point averages, they are retained at the university at a higher rate, and they benefit from close relationships with their faculty mentors who can guide, support, and write recommendations for them, among other benefits.

It is my great pleasure to recognize and thank all of the faculty members who serve as mentors for the student scholars. The mentoring relationship is certainly a two-way street. I know how much I have learned from and benefited from the contributions of students for whom I served as mentor when I was an active researcher. Also, I know how proud I am of the success and achievements of the undergraduates who worked with me. I hope that every faculty member at UK will consider mentoring undergraduates in her or his research, too.

My congratulations to every student who is presenting at the Showcase. You are taking an active role in your education. That is as it should be. The faculty will provide the mentoring, but you must take the primary responsibility for your own education. By participating in scholarly activities and then presenting the results at the Showcase, you are taking a major step in this direction. We are proud of you and of your success.

Sincerely,

Lee T. Todd, Jr.
President
Welcome from the Associate Provost for Undergraduate Education

It gives me great pleasure to welcome you to the fifth annual University of Kentucky Showcase of Undergraduate Scholars.

The eUreKa! Office provides support for undergraduate scholarship in many different ways. It administers various awards and grants for students, such as the Beckman Scholars, the Oswald awards, the UK Summer Research and Creativity awards, the Undergraduate Research Travel awards, and the UK entrants to the National Conference on Undergraduate Research (NCUR). eUreKa! also administers the AMSTEMM program (Appalachian and Minority Science, Technology, Engineering, and Mathematics Majors) and publishes Kaleidoscope, the UK journal of undergraduate scholarship.

In addition, eUreKa! coordinates and supports this annual Showcase of Undergraduate Scholars in cooperation with S.P.U.R. (Society for the Promotion of Undergraduate Research) — the undergraduate scholarly inquiry club. The Showcase is the opportunity for undergraduate students from every discipline within the University to present their creations. We have student musicians, artists, and scientists; designers and authors; engineers and nutritionists; as well as dozens of other specialties. We celebrate the wonderful breadth of scholarly experience available to undergraduates at UK.

A few of the students who are presenting worked entirely on their own. They deserve considerable respect. However, the vast majority of students worked with one or more faculty mentors. This mentorship speaks to the dedication and devotion of our faculty. I have often told students and their parents that they might get a fine classroom education at other colleges, but only at a research university such as UK can they enjoy the opportunity to work with active scholars in every discipline and share in the creation of new knowledge. Clearly our students have availed themselves of this opportunity and have benefited greatly from it. On their behalf, I thank the faculty mentors for all of their care and support.

Any event like this one requires a great deal or work and support. I want to thank President Todd for his continuing support of Undergraduate Research at UK, and Vice-President for Research Dr. Jim Tracy for his continued support. I also thank the students from S.P.U.R. who have worked countless hours to organize and coordinate the Showcase. In addition to the students, I also thank Ms. Evie Russell, the Student Advisor/Program Coordinator, and Ms. Kathy Logsdon, Administrative Assistant, for their unwavering dedication to the eureka! office and in making this program a success. Finally, a heartfelt thank you goes out to all of the faculty mentors for making it possible for the students to be successful in their efforts.

Congratulations to each and every student involved in this wonderful event. Independent work in creative research adds greatly to the quality of your education. Learning by doing is a powerful process, and you all should be proud of your efforts!

Sincerely,

Michael D. Mullen,
Associate Provost for Undergraduate Education
Welcome to the 2010 Showcase of Undergraduate Scholars. SPUR has been working with the Office of eUreKa! to coordinate this spectacular event. We hope you will leave excited about undergraduate research and proud of the University of Kentucky and its students. Please take the time to enjoy the work completed in the field you are familiar with and those that are foreign to you. Thirty-seven departments are represented tonight among the 250 students that have contributed to this event.

Personally, research has been the foundation of my experience at the University of Kentucky. It is impossible for me to imagine my college experience with research removed. Not only do I treasure the project I have been working on in the Department of Plant Pathology, but I would not be the same person or scholar without the influence of my mentor (Dr. Chris Schardl), Evie Russell, and SPUR. Many student presenters would say the same about their experience with research, so I would like to personally thank all of our mentors on campus for taking the time to invest in us. You truly make a difference in the lives of your students.

Tonight we hope you leave with a greater awareness of the undergraduate research conducted on campus and the power it has to enhance the undergraduate experience. Please enjoy the creativity around you. Welcome to the Showcase!

Lesley Mann
President of SPUR

Executive Council (As pictured left to right)
Geraldine Goh, Alecia Fields, Jenna Brashear , Lesley Mann, Jessalyn Ubellacker, McKinley Heflin
Lindsey Smith, Megan Schultz, James Rossi, Laura Crawford (not pictured)
2010 Faculty Mentor Award Recipients

David Rodgers, Department of Molecular & Cellular Biochemistry
Chana Akins, Department of Psychology
Honorable Mention: Sara Lyons, Department of Anthropology

2009 Faculty Mentor Award Recipients

Diane Snow
Dr. Diane Snow is a Professor in the Department of Anatomy and Neurobiology and an Endowed Chair with the Spinal Cord and Brain Injury Research Center (SCoBIRC) at the University of Kentucky. She earned a PhD in Neuroscience from Case Western Reserve University, Cleveland, OH. Dr. Snow has received continuous funding from NIH, Americans Veterans Association, and the Christopher and Dana Reeve Foundation, and others. Her studies focus on the role of an inhibitory extracellular matrix molecule, chondroitin sulfate proteoglycan, in nerve regeneration following CNS injury. She has published in the Journal of Neuroscience, Neuron, Experimental Neurobiology, Journal of Cell Science, Spine, and others, and has received numerous Wethington Awards for her research. In 2008 and 2009, Dr. Snow received three Abraham Flexner Master Educator Awards, in 2008 she received a research award from the Kentucky Academy of Science, in 2009 she received the Society for the Promotion of Undergraduate Research mentoring award, and in 2010 she received the Sarah Bennett Holmes Award for contributions to the advancement of women at UK. She has been nominated by UK to compete for the 2010 NSF President’s Award in Science, Math and Engineering Mentoring (PAESMEM), to be announced in fall of 2010.

Elzbieta Wala
Dr. Elzbieta P. Wala is Associate Professor and Clinical Research Coordinator in the Department of Anesthesiology, College of Medicine at the University of Kentucky. She earned MS and Ph.D in pharmaceutical sciences from the Jagiellonian University, Krakow, Poland and completed her post-doctoral training in pharmacokinetics at the Czech Academy of Science, Prague, Czech Republic and the SUNY, Buffalo, NY. Dr. Wala received NIDA/NIH, KSEF and industrial funding for pre-clinical and clinical studies on pain. Her research focuses on the development of novel drugs and drug combinations for management of pain, with emphasis on chronic refractory pain. In particular, she is interested in pain-enhancing properties of opioids and gender-related differences in responsiveness to analgesics. Dr. Wala is the author of more than 160 articles and abstracts. She has been published in Pharmacology Biochemistry Behavior, Pain, Anesthesiology, Pharmacology Research, Drug and Alcohol Dependence, Psychopharmacology and European Journal of Pharmacology and serves as a reviewer for several journals.

2008 Faculty Mentor Award Recipients

Dr. Patricia Burkhart, Department of Nursing
Dr. Nicholas McLetchie, Department of Biology
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Daniel Birkenhauer  
Department of Plant Pathology  
Mentor: Lisa Vaillancourt  

*The Potential Use of Corn Stalk Rot Fungi for Pretreatment of Corn Stover*

We are testing the hypothesis that filamentous fungi that naturally degrade lignocellulose can be used for biological pretreatment of plant biomass to make saccharification for ethanol production more efficient and less expensive. I characterized several strains of *F. graminearum* that had been mutated with UV radiation and then selected for increased growth on hemicellulose (xylan). Previous work demonstrated that these mutants have xylanase enzyme activities that are several-fold higher than the wild type. I started the process of genetic analysis of the mutations by crossing a green fluorescent transgenic strain of the *F. graminearum* with the mutant strains. I used single nucleotide polymorphisms (SNPs) as neutral molecular markers to characterize the crosses. I also characterized the mutant phenotypes, including growth rate on various solid and liquid media, spore production, pathogenicity to corn stalks, and ability to colonize and degrade corn stover and xylan compared to the wild type. The mutants differed from the wild type in growth rates, effect on medium pH, spore production, fertility, and hyphal morphology. The mutants were not significantly different from the wild type in pathogenicity or ability to colonize and degrade corn stover and xylan.

John Collins  
Department of Biology  
Mentor: Vincent Cassone  

*The Role of Circadian Rhythms in Gastrointestinal Diseases*

Inflammatory bowel disease (IBD), including Crohn’s disease and ulcerative colitis, is a debilitating condition for which there is little etiological information. Previous studies have shown that many genes in the distal colon are expressed in a rhythmic fashion corresponding to the 24-hour day, suggesting that they are regulated by the organism’s circadian clock. Furthermore, a subset of these rhythmic genes is implicated in inflammatory bowel disease. It is not known, however, whether there is a direct relationship between altered signaling pathways implicated in the diseased state and endogenously rhythmic gene expression. In other words, does IBD disrupt the clock or does a disrupted clock promote IBD?

The experiments presented here will analyze the direct effects of several signaling molecules on the rhythmic expression of mPer2, a canonical clock gene. Gastrointestinal tissue was taken from adult C57BL/6 mice expressing firefly luciferase under the promoter of the Period 2 gene. 2-3mm explants of whole intestinal tissue were cultured in medium supplemented with L-Name (a nitric oxide synthase inhibitor), D-Name (the inactive enantiomer of L-Name), carbachol (acetylcholine agonist), isoproterenol (norepinephrine agonist), or melatonin. Real-time bioluminescence in cultures was recorded for one week. The preliminary data has shown that L-
Name has no effect on Per2 expression; however, the study is currently being repeated. The data from this study will further clarify the relationship between the endogenous circadian clock and gastrointestinal physiology.

Roel Flores  
Department of Physics & Astronomy  
Mentor: Chris Crawford

**Precision Neutron Polarimetry**

Symmetries are a fundamental concept in physics, important in many mathematical theories, and also appealing aesthetically. In classical physics, symmetries in the translation of space, time and axis of rotation are directly responsible for the conservation of momentum, energy and angular momentum, as shown by Noether’s theorem. However, because of the nature of quantum mechanics, Noether’s theorem doesn’t hold for discrete symmetries such as charge conjugation - C, spatial parity - P and time reversal - T. The CPT theorem states that the three symmetries are collectively conserved, but not any one individually. Spatial parity symmetry violation, or P-violation occurs in weak nuclear interactions, and our group is focused on better understanding these interactions on the experimental level. In fundamental nuclear physics, spin angular momentum, or spin, is an important property because it can help us study this curious asymmetry. A technique called polarization is a way that we can control spin, and we are focused on precision measurements of neutron polarization. Our experiment, performed at the Los Alamos Neutron Science Center, attempts to measure polarization with the highest precision to date, approximately within .1%. Helium-3 spin filters were used in accord with basic concepts of quantum mechanics in order to polarize a neutron beam. Perfecting this technique is important for future experiments, such as the NPDGamma experiment or the abBA experiment. These two experiments will seek to experimentally verify aspects of P-violation. A precise and careful measurement of neutron polarization must first be made in order for these two experiments to be successful, and this is our focused goal.

Kevin Luley, Donna J. Corley, Debra K. Moser  
Department of Nursing  
Mentor: Terry Lennie

**Evidence that Both Individual and Community Level Interventions are Needed to Help Residents of Rural Eastern Kentucky Adopt a Heart Healthy Diet**

Rural eastern Kentucky has one of the highest rates of cardiovascular disease in the nation. Teaching people how to adopt a heart healthy diet is a common intervention used by health care providers in managing and treating of cardiovascular disease. To date, no studies have been done to evaluate the feasibility of implementing the necessary dietary changes given available resources. The purpose of this study was to conduct an environmental assessment of grocery stores and restaurants in Perry County, Kentucky, to evaluate the availability of heart healthy foods. Heart healthy foods were defined according to the United States Department of Agriculture and the American Heart Association dietary guidelines. Data were taken from 9
stores and 6 restaurants using a standardized survey instruments, which determined heart healthy food availability, cost, and quality. Of the 437 menu items available at the 6 restaurants only 26 (5.9%) were heart healthy. Beverages comprised 61.5% of the heart healthy items. The stores offered, on average, only 61% of the fresh fruits listed on the survey instrument, the most offered by any store was 71%. The 3 stores that carried the greatest number of heart healthy items were located in an urban area, while the stores with the least number of heart healthy items were in rural areas of the community. The availability of heart healthy foods was limited in all stores, especially those in rural areas. Restaurants offered almost no heart healthy options. Teaching residents how to adopt a heart healthy diet will only be effective if healthcare providers also intervene at the community level. With the necessary community support supplying the proper environmental resources people will be able to make the appropriate life style changes.

**Rebecca Major**  
Department of Anthropology  
Mentor: A. Gwynn Henderson

*Knee Deep in Trash: A Comparison of Middle Fort Ancient and Late Fort Ancient Ceramics from Fox Farm*  

This project focuses on Fort Ancient ceramic attributes associated with Middle Fort Ancient (A.D. 1200-1400) and Late Fort Ancient (A.D. 1400-1750) time periods. Middle and Late Fort Ancient ceramic styles are quite different. By studying these materials, we can better understand the settlement patterns at Fox Farm and how they may have changed over time. The ceramics were recovered from three different trash pit excavations at the Fox Farm site during the eight-week University of Kentucky summer field school of 2009. By studying ceramic attributes (the exterior surface treatments, the lip shape and rim orientation, the appendages of the vessels, the clay temper, the manner of decoration used), it will be possible to distinguish the earlier ceramics from the later ceramics and therefore ascertain a more accurate timeline of human occupation at Fox Farm. By identifying Middle Fort Ancient and Late Fort Ancient ceramic locations at the site, the location of where the Middle Fort Ancient or Late Fort Ancient people were living on the site also can be more accurately estimated. A comparison of the number of trash pit features and their depths in the three different excavations can provide contextual information regarding population size at Fox Farm. By investigating the differences in the ceramics, we can better ascertain whether or not there was a difference in settlement patterns.
Meaghan Mroz-Barrett  
Department of Landscape Architecture  
Mentor: Brian Lee

*Lexington-Fayette County as a Study Area for Examining Urban Growth Management Policies*

This presentation argues that Lexington-Fayette County, Kentucky and surrounding counties are an ideal study area to test various urban growth management policies and particularly urban growth boundaries. A limiting factor for testing these types of policies is the lag time between policy implementation and the time in which effects are potentially observed. Separating short term effects from longer term effects is a consideration for analysts and decision makers as well as real estate market dynamics. No two cities are identical so that the traditional practice to scientific experiments of having control and treatments with replications is not a viable approach. Much of the research in this area has focused on larger metropolitan areas that do not necessarily represent the urban dynamics of the majority of U.S. cities. Oregon, particularly Portland, dominates the literature on this subject. However, Lexington is more closely aligned to the majority of U.S cities in critical comparisons such as population size and trends as well as providing diverse living environments, from urban to rural settings, in a relatively short commuting distance. Lexington is also ideal because it was the first city in the U.S. to institute an urban service boundary. In addition, Lexington has expanded this boundary only five times in its fifty plus years of existence as compared to Portland’s dozens of expansions since the early 1970s. This presentation synthesizes the peer reviewed literature concerning the implications of this land use planning tool in a variety of policy implications with an emphasis on housing. A recommendation is made to conduct similar studies with other U.S. cities. By replicating the hedonic price framework approach of a Portland, Oregon study in the Lexington-Fayette County area, local planners and community leaders would have a better basis for determining whether changes to existing growth management policies are appropriate.

Myrah Scruggs  
Department of Sociology  
Mentor: Kenneth Royal

*Conspicuous Consumption's “Evolution” to the 21st Century*

Using nationally representative data on consumption, this study investigates the allocation of net income in both Metropolitan Statistical Areas and non-Metropolitan Statistical Areas with regard to the consumption of visible goods (clothing, jewelry, alcohol and cars) in an effort to determine if meaningful differences exist between persons from these demographics. Targeting Veblen’s statement, “Conspicuous consumption claims a relatively larger portion of the income of the urban than the rural population […]” (88 The Theory of the Leisure Class),” descriptive and inferential statistics will provide a picture of today’s societal distribution of visible consumption. The study concludes with an assessment of the role of conspicuous consumption in 21st century America’s purchasing trends and a discussion of its relevance in today's society.
Table Abstracts

Myrah Scruggs, Kacey Marr, Christina Wemer, Kaylin Andress, Jeffrey Howard, Thomas Quite, Andrew Lov, John Enzweile
Department of English
Mentor: Devanathan Sudharshan

Gatton Student Research Publication

The Gatton Student Research Publication (GSRP) offers undergraduates a new and unique opportunity to showcase their work to the University and the surrounding community. GSRP was created in the spring of 2009 by business students. The Editorial Board is a student run committee responsible for reviewing submissions and compiling the online research journal. The Editorial Board along with the Advisory Board seek to develop and maintain a publication representative of the University’s undergraduate business-related talent.

Scott Southerland, Michael Delfino, Matt Hudgins
Department of Computer Science
Mentor: Jerzy Jaromeczyk

Three Video Games -- Three Goals and Technologies

Playing games is entertainment, enjoyment and fun for many or waste of time for others. However, developing video games is a highly advances activity that involves sophisticated technologies, algorithms, ideas and creativity. Three different types of video games and technologies behind them are demonstrated. The first game, Tetrominoes is a multiplayer falling blocks game similar to the classic Tetris. The game is played over a network. Making networked multiplayer games forces the programmer to think about the minimal amount of information to send to another computer so both players are always aware of the state of the game.

The second game, Hex Wars, is a strategy-based game played against increasingly more sophisticated artificial intelligence algorithms. It is developed for iPhone. The development requires considerations for limited screen and other limiting factors related to iPhone.

The third game, Ythin, is unconventional. The intended purpose is to surprise the player, encourage exploration and convey story and themes via game play mechanics rather than dialogue and intro scenes. All the games are original developments.
**Class Scheduling Made Simple with UKCLASSLIST.COM**

Every semester, as a part of the advising and registration, students select courses from hundreds of offerings in order to fulfill departmental, college, and university requirements. Finding right sections, avoiding time conflicts, identifying all courses that satisfy specific USP requirement is a tedious process. In order to ease the difficulty of scheduling classes, a more efficient on-line course catalog was created. It allows users to search for courses in a manner similar to a search engine, as well as filtering based on various attributes of the course such as day, time, professor, etc. The current course information is pulled directly from the UK course catalog and stored in a proprietary database in order to make it easier to search and filter. Features of the UKCLASSLIST.COM will be demonstrated on the newest course catalog.

**Finding Faith**

The ages between thirteen and twenty-five are a tremulous time for people. Their bodies change and they are exposed to the world around them. As a person grows older they are pressured to conform to an image that may be detrimental to their body and spiritual souls. They often lose sight of who they are and what they stand for and many lose touch with their faith, while others never had a faith to rely on. The changes become more real as teens experience the ‘freedoms’ that college offers. Without their parent’s influence the responsibility is often lost as they sink into a quagmire of decisions. They fall prey to the temptations of drinking, partying and fornication. Often these decisions leave a student paralyzed with hopelessness and desperation and begin an endless, destroying cycle as the young adults seek a way to fill the empty void, often turning to what brought them those feelings in the beginning. Sometimes, the only resolution they can see is merely giving up or death. This project seeks to show them alternative solutions through drama. Each drama portrays people in similar situations left hopeless and alone and finding Christ. Through discovering their spirituality, they find the love, hope, and acceptance that await them in His arms. The dramas include Chi Alpha Christian Fellowship and will be performed throughout various times of the semester during the church service and around campus. Some of these will be filmed and performed in public. The purpose of this project is to show an alternative lifestyle than that depicted by media. The statistics of deaths by suicide, drug overdose, and drunk driving is staggering for this age group and it is the goal of this project to help alleviate the statistic through a positive drama.
158. Shane Turner, Brittany Hampton
Robinson Scholars Program
Mentor: Pamela McFarland

Giving to Those in Need

The Hope Center in Lexington, Kentucky is a center which serves 200 + men, eighteen years and older. The Center serves people who have encountered hardships and sudden unfortunate circumstances in their lives such as homelessness, addiction, mental illness, and the uneducated. The mission of the Hope Center is to care for homeless and at-risk persons by providing life-sustaining and life-rebuilding services that are comprehensive and address underlying causes. Providing basic essentials, which include basic personal hygiene products, to the Hope Center, is one way to lighten the burden of collecting supplies that are essential for everyday life. The goal of this project is to provide the Hope Center with basic necessities that are in very high demand, such as personal hygiene products. The necessities that will be donated are: hair care products, body wash, deodorant, toothpaste, toothbrushes, and mouthwash. The project will be funded by the University of Kentucky Robinson Scholars Program and will fulfill the requirement of UK 100: Career, Community and Leadership Development. The expected outcome of this project is to assist the Hope Center in meeting the material needs of its residents. By helping the Hope Center acquire supplies that are needed by their residents, the staff can focus their energy toward the other services that are provided to help the residents. Hopefully, this project will help the residents have a sense of belonging to the Lexington Community and convey that people outside of the Center are willing to help them meet their personal and future goals.
Poster Abstracts

Adult Dentistry

1. **Ravi Mahajan**, David Puleo, Matt Brown, Rebecca Peyyala, Yuan Zou  
Department of Adult Dentistry  
Mentor: Karen Novak

**Controlled Release Drug Delivery Agents**

In diseases such as periprosthetic osteolysis and osteomyelitis, bacterial contamination initiates an inflammatory response that results in bone destruction. Elimination of these microbes from the local environment is necessary to allow bone healing. The availability of a biodegradable implantable device that combines slow release of antimicrobial agents and osteotropic biomolecules would facilitate both the elimination of infection and regeneration of bone. As a first step in developing these devices, the efficacy of the antimicrobial agent of interest against relevant bacteria must be determined. The objective of this study was to determine the efficacy of an antimicrobial peptide on the growth of *Staphylococcus aureus*, a common contaminant in periprosthetic osteolysis and osteomyelitis. For the purpose of this study *S. aureus* was grown overnight in broth media. For the peptide challenge 12.5mM, 25mM, and 50mM concentrations of the antimicrobial peptide, WLBU2, were incubated for 30 minutes in a 96 well plate with 10^5, 10^6 and 10^7 dilutions of the bacteria. As a negative control, additional wells included *S. aureus* that was not exposed to the peptide. Following incubation, aliquots from each well were plated onto blood agar plates, which were placed in a 37° incubator overnight. The following day colonies were counted and compared to non-peptide-treated controls. The amount of WLBU2 that reduced the bacterial counts by 3 orders of magnitude defined the minimum bactericidal concentration. A thousand-fold decrease in colony forming units was achieved at 25mM. WLBU2 effectively killed *S. aureus* and is therefore an appropriate antimicrobial agent for incorporation into an implantable slow release device.

Agricultural Education

2. **Ashton Martino**  
Department of Agricultural Education  
Mentor: Diane Kelley

**Equine Reality Store**

The equine industry has a tremendous economic impact on the state of Kentucky. People tend to think of the thoroughbred racing industry specifically when considering that impact. However, an often forgotten and large part of the equine industry in Kentucky, are the smaller horse farms that specialize in breeds other than thoroughbreds. Horses used for recreational activities outside of racing generate millions of dollars each year for the state. With that being said, the smaller...
equine industry is declining due to increasing and overwhelming costs associated with horse ownership. The Equine Reality Store is an activity for children and adults who already own or think they may be interested in owning a horse. The store walks each participant through the costs associated with owning and maintaining a horse properly, allowing them to see firsthand how much of their monthly budget needs to be allocated to horse ownership. The activity gives participants a chance to have a “trial run” to see if they’re financially prepared to own a horse, and if not, what they need to do in order to be prepared. Originally designed to teach children the benefits of gaining higher education and to be financially prepared for horse ownership, the program has also sparked interest in being used to teach adults about the long-term costs required for horse ownership.

Anatomy & Neurobiology

3. Michael Bricken, Charlotte Randle
Department of Anatomy & Neurobiology
Mentor: Luke Bradley

*Expression, Purification, and Characterization of Proteins from High-Quality Combinatorial Libraries of the Calmodulin Central Linker*

A multitude of cellular processes, ranging from cell survival to neuronal excitation, are regulated by proteins with a pervasive binding specificity. To further our understanding of how these conserved sequences recognize and bind to a large number of diverse and physiologically vital binding partners in the healthy and diseased cell; it is necessary to understand and ultimately alter protein binding specificity. For nearly 30 years, calmodulin (CaM) has been a model system to study pervasive binding specificity. However, after numerous structural and biochemical studies, the molecular basis of this pluripotent binding activity of the ubiquitous primary calcium signaling transducer remains unclear. Given that CaM binding affinity arises from a combination of hydrophobic contacts, steric, hydrogen bonding and electrostatics, we are able to further explore the nature of the interactions conferring the enigmatic binding specificity in CaM through protein engineering. Protein combinatorial libraries offer an attractive approach towards identifying novel members with altered CaM binding specificity for downstream structure/function studies. To maximize this search, productive regions of protein sequence space (*i.e.*, folded and soluble) must be sampled. Here is presented the first application of the binary patterning approach of combinatorial protein library design to CaM. This high-quality approach translates very well to the CaM protein scaffold: All library members over-express and are functionally diverse, having a range of conformations in the presence and absence of calcium as determined by circular dichroism spectroscopy. Collectively, these data support that the binary patterning approach, when applied to the highly conserved CaM protein, can yield large collections of folded, soluble and highly-expressible proteins which will facilitate downstream identification of proteins with altered CaM binding specificity.
4. Tuoxin Cao, Amanda Lisembee  
Department of Anatomy & Neurobiology  
Mentor: Jonathan Lifshitz

**Diffuse Brain Injury Induced Inflammation Does Not Promote Neuro Plasticity Gene Expression in Rats**

Morbidity following traumatic brain injury (TBI) is a long term disability experienced by 5.3 million patients in the United States. In diffuse brain-injured rats, behavioral morbidity is evident by increased sensory sensitivity to whisker stimulation. Our lab hypothesizes that unregulated neuroplasticity in response to TBI forms maladaptive circuits that underlie post-traumatic morbidity. Here we explore the role of neuro-inflammation in promoting neuroplastic circuit reorganization by examining concomitant inflammation and neuroplasticity gene expression in fluid percussion injured (FPI) rats using quantitative PCR. Gene expression of inflammatory (Arginase 1, TSPO, CD45, TGFβ-1, and TGFβR-2) and neuroplasticity markers (GAP43, synaptophysin, MAP2) from the somatosensory barrel field (S1BF) and the ventral posteromedial nucleus (VPM) of the thalamus were compared between sham, 7 days and 28 days post-injury. The results show chronic inflammatory processes by the sustained increase of inflammatory gene expression (TSPO and CD45) as well as anti-inflammatory cytokines (TGFβ-1 and TGFβR-2) at 7 days and 28 days post-injury, compared to uninjured rats. Neuroplasticity gene expression showed a non-significant increase between brain-injured and uninjured groups. Furthermore, the effect of the anti-inflammatory drug ibuprofen on neuro-inflammation and neuroplasticity gene expression in FPI injured animals is explored. Compared to vehicle-treated FPI animals, decreased expression of both inflammation (CD45, TSPO) and neuroplasticity genes (GAP43, synaptophysin) in chronic ibuprofen-treated FPI animals was expected. The results suggest that inflammatory processes occur after FPI, but neuro-plastic event may not evolve through gene expression.

Laura Crawford, Gabrielle Curinga  
Department of Anatomy and Neurobiology  
Mentor: Diane Snow

**A Methodology to Determine Binding of Chondroitin Sulfate Proteoglycan Variants in an Inhibition Assay**

Chondroitin sulfate proteoglycans (CSPGs) are one of the major inhibitory extracellular matrix guidance cues that are upregulated following spinal cord injury (SCI). CSPGs have a negative effect in that they inhibit axonal regeneration, however, they have positive effects as well, given that they cordon off the injury site, repair the blood-brain barrier, regulate the immune response and limit cellular degeneration. Thus, it is important to target only the most-inhibitory aspects of the CSPG molecule when considering SCI treatments. CSPGs are composed of a protein core with covalently attached glycosaminoglycans (GAGs; sugars), which are heavily hydrated and give elasticity and flexibility to tissues. CSPG GAGs consist of the repeating disaccharide β-D-N-acetylgalactosamine + β-D-glucuronic acid. CSPGs are a highly heterogeneous group of
molecules that differ in GAG chain number, length, charge density, and sulfation pattern. Importantly, previous studies show variation in sulfation pattern results in differing levels of inhibition. For example, sulfation on carbon-4 of the disaccharide renders CSPGs more growth permissive than if carbon-6 sulfation predominates. Oversulfated CSPGs even promote outgrowth in some instances. Our overarching goal is to link the characteristics responsible for CSPG heterogeneity to the degree of outgrowth inhibition by CSPGs. To accomplish this, we have developed Designer PGs, which are specially engineered PGs that have specific, pre-determined modifications in protein and carbohydrate composition. By examining the response of adult neurons in vitro to a variety of structurally different CSPGs, we are identifying specific components of large, complex CSPGs that are the major contributors to deterred regeneration. This identification is a precursor to future studies that will manipulate CSPGs in vivo to promote regeneration. To evaluate the effect of these Designer CSPGs on neuronal outgrowth, it is essential to know the binding characteristics of each. Thus, the present study is focused on determining the degree of binding for each Designer PG using a modified and highly sensitive Western blotting technique. Through analysis of known quantities and structures of CSPGs, identification of maximally inhibitory regions of the CSPG molecule and eventual ablation of these substructures, regeneration may be enhanced following SCI, contributing to recovery of function. [Support: NINDS NS053470, and The Dana and Christopher Reeve Foundation].

5. Elizabeth Deel, M.L. Stephens, F. Pomerleau, P. Huettl
Department of Anatomy & Neurobiology
Mentor: Greg Gerhardt

Understanding Glutamate Neurotransmission Before, During, and After Status Epilepticus in Young and Aging Rats

Temporal lobe epilepsy results from uncontrolled excitability of neurons, often in the hippocampus. The primary neurotransmitter affecting neuronal excitability in the adult hippocampus is glutamate, which is known to be altered during aging, manifesting as a loss of learning and memory capabilities. We believe that age-associated dysregulation of glutamate could also be a contributing factor to the increased onset and severity of seizure disorders in the elderly population. Our objective was to gain a better understanding of changes in glutamate regulation during aging, and how this may affect seizure severity in an animal model of human aging. We implanted novel microelectrode arrays into the hippocampus of young, late-middle aged and aged rats to measure real-time glutamate neurotransmission in awake rats. The aged hippocampus had significantly elevated basal glutamate compared to young rats (n = 30, p<0.05). Increased glutamate is known to be toxic to neurons. We also measured glutamate before, during, and after experimentally induced seizures. Based on our preliminary observations, the intensity of the seizure behavior correlates with age, showing that aged rats experience prolonged and more intense seizures. Additionally, during the seizures, we have repeatedly observed rapid and periodic glutamate oscillations indicating that glutamate is playing a critical role in seizure pathology. In the immediate future, we will be continuing these experiments in both young and aging animals. This research will provide valuable insight into
the potential role that glutamate plays in human epilepsy, especially in the elderly population, and may lead to the development of improved diagnostics and therapeutics.

6. Zachary Kiser, Dustin Stephens  
Department of Anatomy & Neurobiology  
Mentor: Andrew Deane

*Platyrrhine Incisal Curvature and Diet: An Independent Test of the Incisor Morphological Correlates with Dietary Proportions Reported for Extant Hominoids*

Despite the relatively large size of anthropoid incisors in relation to the remainder of the dental arcade, and the prominent role that these teeth occupy in the pre-processing of food prior to ingestion, comparatively little is known about the functional morphology of anthropoid incisor shape and crown curvature. The relationship between incisor allometry and dietary proportions has been well documented for both platyrrhines and catarrhines; however, similar relationships between incisor shape and crown curvature have to date been reported for only living and fossil members of the superfamily Hominoida. Given the limited taxonomic diversity among the extant members of that group, it has been difficult to firmly establish the relative influence of phylogeny and dietary function in the governance of incisor crown curvature. Unlike hominoids, which are represented by only five living genera, extant platyrrhines are a more varied group that includes 16 ecologically diverse genera. The present study employs high-resolution polynomial curve fitting in an effort to clarify the functional relationship between maxillary and mandibular incisor crown curvature and dietary proportions for a taxonomically diverse platyrrhine sample (n=104). Results were consistent with prior studies of hominoid incisor curvature and identify a significant and positive correlation between incisor crown curvature and dietary proportions such that increasing curvature is associated with a proportionate increase in frugivory. These results are independent confirmation of the results reported from previous analyses of hominoid incisor curvature and provide new evidence to suggest that diet is the primary governing factor influencing anthropoid incisor curvature.

7. Kelsey Lewis, Kathleen M. Franklin, Sandra J. Legan  
Department of Anatomy & Neurobiology  
Mentor: Marilyn Duncan

*Effect of Phenobarbital Administration on c-fos Expression in GnRH Neurons at the Time of the LH Surge*

The suprachiasmatic nucleus (SCN) in the hypothalamus is involved in regulating daily circadian rhythms, including rhythms involved in female reproduction. Female rodents ovulate once every 4 days in response to a surge of pituitary secretion of luteinizing hormone (LH). The LH surge in female hamsters, mediated by the circadian timing system, peaks at Zeitgeber time (ZT) 9 (with ZT 12 defined as time of lights-off). The LH surge is triggered by gonadotropin releasing
hormone (GnRH) neurons. Administration of the barbiturate phenobarbital at ZT5 delays the LH surge for 24 hours, presumably by interfering with the neural mechanisms inducing this surge. Based on these findings, we proposed the hypothesis that phenobarbital, given at ZT 5, would inhibit activation of GnRH neurons. In order to test this hypothesis, we investigated expression of c-fos, a marker for neuronal activation, after treatment with phenobarbital on proestrus. Hamsters were first injected at ZT5 with ethanolic saline (vehicle) or phenobarbital, and later anesthetized and perfused transcardially with fixative at times when mean plasma LH levels are basal (ZT6) or maximal (ZT9). Blood samples were collected just before perfusion and were used for radioimmunoassay of plasma LH levels. Sections were prepared from the dissected brains and single and dual immunohistochemistry (IHC) procedures were conducted for GnRH and c-fos. The numbers of single- and double-labeled neurons were counted without knowledge of treatment condition. As predicted, plasma LH levels and expression of double labeled c-fos/GnRH neurons at ZT 9 were both higher in vehicle-injected hamsters than in phenobarbital-injected hamsters. Furthermore, vehicle-injected hamsters euthanized at ZT6 had low plasma LH levels and did not show any c-fos expression in GnRH neurons. These data demonstrate that administration of phenobarbital at ZT 5 effectively inhibits c-fos expression in GnRH neurons, suggesting that this drug prevents the LH surge by decreasing activation of GnRH neurons.

8. Katelyn McNamara, Amanda Lisembee
Department of Anatomy & Neurobiology
Mentor: Jonathan Lifshitz

The Whisker Nuisance Task Identifies a Late Onset, Persistent Sensory Sensitivity in Diffuse Brain-Injured Rats

Post-traumatic morbidity reduces quality of life for traumatic brain injury (TBI) survivors. Affecting neuropsychological function, morbidity is likely due to diffuse injury and consequent neuroplastic responses. After midline fluid percussion brain injury (FPI), diffuse pathology in the ventral posterior nucleus of the thalamus suggests that somatosensory whisker function may be impaired post-injury. The goals of the present study were firstly, to design and validate a task to detect injury-induced behavioral morbidity, and secondly, to evaluate preliminary neurorehabilitative interventions to alleviate the morbidity. Male Sprague-Dawley rats were subjected to moderate FPI or sham injury. Over a post-injury time course, the whiskers on both mystacial pads were stimulated with an applicator stick (15 min) in an open field. The Whisker Nuisance Task was videotaped and the behavior quantified using objective criteria. Sham animals were ambivalent or soothed by whisker stimulation whereas brain-injured rats showed aggravated responses at 7 days, which became significant at 28 days and 56 days compared to sham, indicating chronic injury-induced sensory sensitivity. To implement the Whisker Nuisance Task, additional rats were subjected to mild injury, shaved whiskers, forced whisker stimulation, or tactile exploration of an enriched environment over 28 days post-injury. The results indicate that the Whisker Nuisance Task can detect mild brain injury, but not mitigated by the massed neurorehabilitative interventions. Following diffuse brain injury, the Whisker Nuisance Task is a promising tool to detect post-traumatic morbidity and the efficacy of therapeutic interventions that may translate to restoring discrete circuit function in brain-injured patients.
9. Kawthar Suleiman, Josh Fuqua  
Department of Anatomy & Neurobiology  
Mentor: Greg Gerhardt

*Examining Behavior and Glutamate Signaling in an Animal Model of Dopaminergic Dysfunction*

Research in Parkinson’s Disease is approached in many different ways — currently by focusing on monitoring glutamate changes after neurotoxin induced cell death of the nigrostriatal dopaminergic neurons in Fischer 344 rats. Based on the dopamine and glutamate interplay within the striatum, a reduction in dopamine input may result in a compensatory reduction in potassium evoked release, as well as basal concentrations of glutamate. Potassium hyperpolarizes the neuron that induces a release of glutamate into the synapse. Concentrations of glutamate are then recorded using a microelectrode array (MEAs). This study aims to uncover the inner workings of the striatum and the relationship between glutamate and dopamine. These past endeavors implemented the usage of microdialysis rather than MEAs. By using MEA’s less damage is done to the brain. This project is the continuation of a previous project that studied the ability of Dopamine Neuron Stimulating Peptide-11 (DNSP-11) to stimulate dopaminergic neurons in the striatum in rats previously lesioned in the substantia nigra with 6-hydroxydopamine (6-OHDA). These 6-OHDA lesions mimic the effects of Parkinson’s Disease. DNSP-11 is a new neuropeptide that needs to be further researched. To do so, rats receive DNSP-11 in the striatum six hours prior to receiving 6-OHDA lesions in same area. This experiment will determine if DNSP-11 provides neuroprotective effects similar to Glial Cell Line-Derived Neurotrophic Factor (GDNF.) In the past, GDNF in the midbrain has shown very promising results in non-human primate experiments in PD treatment. DNSP-11 is a proGDNF-related peptide that has shown promise in stimulating dopaminergic neurons. This experiment examines its possible neuroprotective effects. If such a relationship exists, there will be differences in neurochemistry between the two groups (lesioned and vehicle) that may manifest in behavior. DNSP-11 is a remarkable peptide that may hold the key to unlocking better treatment for patients suffering from Parkinson's.

10. Lauren Thompson  
Department of Anatomy & Neurobiology  
Mentor: James Geddes

*Calpain and Cell Death*

Spinal cord injury remains a major devastation in today’s society. For this reason, research investigating potential causes of cell death remains very important in hopes of one day finding a treatment for this type of injury. The overactivation of an isoform of calpain, calpain 1, is thought to contribute to the loss of neurons and functional deficits following contusive spinal cord injury. This hypothesis was tested using calpain 1 knockout mice and wild-type mice. Both types of mice were subjected to an experimental contusive spinal cord injury, which is comparable to a blow to the spinal cord that a car wreck might cause in a human. This surgery was conducted and then the spinal cord was removed, sectioned, and mounted on microscope
slides. These slides were stained and the extent of damage was visible to be measured using a microscope. The area of the lesion, the area of the grey matter, and the total tissue area were then compared for the wild-type mice and calpain 1 knockout mice. The results showed that there is a correlation between calpain 1 and cell death because the severity of neuropathology was less severe in the calpain 1 null mice as compared to wild-type mice. Further research is being conducted this semester to investigate more about calpain 1.

**Anesthesiology**

11. **Andrew Clark, Jonathan Walter**  
Department of Anesthesiology  
Mentor: Elzbieta Wala

*Effect of Age on Vincristine-Induced Peripheral Neuropathy in the Rat*

The development of neuropathic pain is a common dose-limiting side effect that occurs during and often persists after chemotherapy. The incidence and severity of chemotherapy-induced neuropathy is enhanced by several factors, i.e. dose, previous or concurrent therapies, preexisting pain states. Little is known if age also plays a role. The present study was conducted to characterize the effect of vincristine (chemotherapy agent) in male Sprague-Dawley rats of different age: two (2M), four (4M) and six (6M) months old (283.3±6.9g; 401±4g; 448.2±8.9g). Rats were given 10 injections of vincristine (100µg/kg/day IP) during two five-day cycles with a two-day break between the cycles. Controls were injected with saline. Responses to innocuous (alldynia) and noxious (hyperalgesia) stimulus were assessed every 2 days utilizing Von Frey filaments (VF= 4g, 8g, 15g) and paw-pressure test (PWT, 32g/s). The baseline pain sensitivity was greater in 6M than 2M (8g VF=47.1±4.2% vs. 34.8±1.8%; 15g VF=87.1±7.1% vs. 56.1±4.8%). Vincristine-related mortality increased with age (2M=0/6; 4M=1/6; 6M=7/7). Maximum body weight loss was similar in 2M and 4M (13.6±0.99% vs. 17±2.2 %). Vincristine-evoked neuropathy was demonstrated by alldynia (enhanced responsiveness to 4g and 8g VF) and hyperalgesia (enhanced responsiveness to 15g VF and PWT). Enhanced responsiveness in Von Frey test was shown to peak at day 12 and return to baseline on day 33. Mechanical hyperalgesia (PWT) also peaked at day 12, but did not return to baseline during the time of testing (33 days). Tactile alldynia was significantly greater in 2M than 4M (4g VF=691.2±115.3 vs. 324±91.4). Hyperalgesia was similar in 2M and 4M (15g VF=605.2±125.1 vs. 496±128.2; PWT=1297.1±158.4 vs. 1064.7±302.2). The present data suggest that chemotherapy-induced neuropathy may be related to the age of the rat. This interesting finding requires further investigation.
The Relationship Between Nutrient Intake and the Incidence of Injuries in Female Collegiate Athletes

In recent years, the United States has seen a tremendous growth in the number of female athletes. When Title IX was introduced in 1972, approximately 300,000 girls participated in high school sports. This number has since increased to 3 million athletes. Additionally, 30,000 women participated in college sports before Title IX, that number is now approximately 205,000. Due to the increasing number of participants and the increasing intensity and competitiveness of female sports, injuries are much more common in these athletes. This research examined the diets of female collegiate athletes to determine if there is a relationship between nutrient intake and risk of injury. The relationship was investigated in 34 female University of Kentucky collegiate athletes, ranging in age from 17 to 23 years old. The height of the participants ranged from 5’2” to 6’4” (mean = 5’9”) with an average body mass index (BMI) of 22.02 ± 1.6 kg/m². Participants came from a variety of sports, including volleyball (8), basketball (4), track and field (5), gymnastics (3), golf (2), soccer (5), tennis (3), and swimming (4). Of the thirty four participants, 70% had experienced a sports related injury. The most common injuries were broken bones, sprains, stress fractures, and torn ligaments. In order to evaluate the relationship with nutrient intake and prevalence of injury, the subjects were surveyed on daily nutrient intake. Nutrition is not the first thought that comes to mind when thinking of ways to prevent injuries; however, one of the fundamentals of quality training and staying healthy and injury free is good nutrition. Good nutrition involves an awareness of how food, fluids and timing impact our ability to train, recover, adapt and perform. When in regular season, on average, athletes trained for 3.75 ± 1.67 hours per day. When not in regular season, on average, athletes trained for 3.70 ± 1.25 hours per day. The athletes consumed approximately 2000 calories per day. Participants consumed approximately 5.88 ounces of grains per day. Of those, 4 ounces were whole grains. Athletes consumed approximately 3.7 servings of vegetables and 3.8 servings of fruits per day. Also, subjects consumed approximately 4.8 ounces of meat and beans per day. Lastly, athletes consumed approximately 3.1 servings of dairy foods per day. Based on this data, the under consumption of calories and grains can potentially be attributed to the high risk of injury among these female collegiate athletes. Good eating habits can be an effective part of injury prevention strategies. A properly nourished body is more likely to be able to withstand the rigorous demands that are put on collegiate athletes.
13. Elizabeth Chaney  
Department of Animal & Food Sciences  
Mentor: Jeffrey Bewley  

*A Survey of Dairy Value-Added Processors*

With changing dairy market conditions, many dairy producers are looking for a more reliable, less cyclical income stream. Across Kentucky and throughout the country, more producers are considering on-farm processing to add value to the milk produced on their farms. Like any other business venture, proper planning is imperative to establishing a successful business. However, resource materials for those individuals interested in starting an on-farm processing facility are limited. An effort to fill this void with a comprehensive resource guide is under way. Hopefully, this resource guide will prove useful to dairy farmers across the state. As part of this larger effort, an electronic survey was distributed to over 120 on-farm processing businesses across the United States. Questions focused on cash flow, financing, sources of information used to start a business, and advice given to prospective business owners. When asked to describe the most difficult part of starting the business, the most frequently cited challenge was dealing with regulations (33.3%) followed by securing funding, learning how to market the product, and learning the technical side of manufacturing (13.3% each). The majority of respondents indicated they were either extremely satisfied (40%) or satisfied (46.7%) with their decision to start on-farm processing while 13.3% of respondents were extremely dissatisfied. The most frequently used sources of information in developing the business were the Internet (80%), existing processors (73.3%), and books (73.3%). The results of this survey will be used to provide guidance to other producers considering on-farm processing of dairy products.

14. Curtis Coombs  
Department of Animal & Food Science  
Mentor: Jeffrey Bewley  

*Management Practices Utilized by High-Producing Kentucky Dairy Herds*

Dairy producers often make decisions based on what other producers in their region are doing. The objective of this research was to summarize management practices utilized by Kentucky Holstein herds with rolling herd average milk production greater than 10,000 kilograms per cow (N=21) using records obtained from the Dairy Herd Improvement Association. Interviews were conducted on-farm and over the phone. Herd size ranged from 25 to 1590 lactating cows with a mean (± SD) of 186.54 ± 317.22. Daily milk production per cow ranged from 25.95 to 39.59 kilograms with a mean (± SD) of 32.56 ± 3.44. Test day somatic cell count ranged from 102,000 to 432,000 cells per ml with a mean (± SD) of 256,140 ± 56,170. The most common management practices utilized by these producers were regular forage testing (100%), regular utilization of veterinary services for reproductive management (100%), fans or sprinklers (90%), artificial insemination for genetic improvement of lactating cows (86%), artificial insemination on heifers (86%), annual ration balancing (81%), annual hoof trimming (81%), sexed semen (71%), separate far-off and close-up dry cows (67%) and kernel processing of corn silage (67%). When asked to identify the management practice that contributed the most to their milk
production level, the most frequently cited reasons were (1) quality forages (N=4), (2) paying attention to detail (N=4), (3) cow comfort (N=3), and (4) balanced rations (N=3). These results may be used in extension programming to encourage other producers to consider these management practices.

15. Carilynn Gravatte, Curtis Coombs
Department of Animal & Food Sciences
Mentor: Jeffrey Bewley

*Evaluation of Dairy Cattle Lying Behavior in Commercial Freestall Barns*

Animal activity monitoring sensors have been developed to measure lying behavior automatically and have been validated using direct visual observations. These sensors may prove useful for assessment of facility functionality, cow comfort, and animal well-being. However, to properly evaluate results, within and across herd variations must be understood. The objective of this research was to describe physiological and management factors impacting automatically recorded lying times across multiple commercial dairy farms using freestall barns. The lying times of 247 Holstein cows were measured using an animal activity monitor in 12 commercial dairy herds in Kentucky. Herds were categorized by production level (high, medium, and low) using rolling herd average milk. Within herds, project cows were distributed equally among lactation stage (60 to 400 DIM, mid and late lactation) and production level (high, medium, and low) categories. An IceTag™ animal activity monitoring sensor (IceRobotics Ltd., Edinburgh, Scotland, UK), which measures posture (lying versus standing) and number of steps, was attached to the hind leg of each cow above the fetlock for 14 d. The MIXED procedure of SAS® was used to develop models to describe hours lying. Mean lying time (N=3298) was 11.19±2.70 h/d while mean locomotion score was 1.37±0.56. Cows that were in mid lactation (11.04±0.39 h/d) had significantly lower lying times than cows in late lactation (12.42±0.39 h/d, P<.0001). Lying time decreased with increasing milk yield (P=0.03). Though the difference only approaches significance (P=0.11), cows with a locomotion score of 3 spent more time lying (12.31±0.71 h/d) than cows with a locomotion score of 1 or 2 (11.16±0.14 h/d). Consideration of lactation stage, milk yield, and locomotion score is necessary for interpretation of results obtained from automatic animal activity monitoring sensors.

16. Kristin Heilmeier
Department of Animal & Food Sciences
Mentor: Alan J. McAllister

*A Comparison of Purebred and Crossbred Dairy Cattle for Herdlife and Lifetime Production*

Commercial dairies in the US overwhelmingly use dams and sires from the same breed, most commonly a Holstein sire and dam (HH) or a Jersey sire and dam (JJ). However, as milk production has become the focus of selection, other traits such as days in milk (DIM and length
of life in the herd (herdlife) have declined in many herds. This experiment is designed to test if a sire and dam from different breeds (crossbreds) will produce cows with longer life spans, and ultimately more lactations increasing the total life DIM and production. There are four genetic groups Holstein sire x Holstein dam (HH, n=33), Jersey sire and Jersey Dam (JJ, n=22), Jersey sire x Holstein dam (JH, n=19), and Holstein sire x Jersey dam (HJ, n=19) in the study. The genetic groups were recorded from 2004 to the present, and all animals in the study are managed under the same environmental and nutritional conditions. The hypothesis for this study is whether heterosis in the crossbred groups will increase the total life of the cow in the herd, thus increasing total life days in milk and lifetime production compared to the purebred genetic groups. The HJ and JH genetic groups do have an overall higher lifetime DIM of 630.8 and 666.3 respectively, compared to HH with 456.0 and JJ with 526.7 days. Life time yields continue to be collected. Failure to calve for the first time or subsequent failure to conceive again or culling or death has limited the lifetime days in milk.

17. Rebecca Russell
Department of Animal & Food Sciences
Mentor: Jeffrey Bewley

Characterization of Kentucky Dairy Managers’ Decision Making Behavior

To effectively address the needs of dairy clientele, industry professionals should have a basic understanding of how dairy producers make decisions. A survey was distributed to all licensed milk producers in Kentucky to understand the factors that influence decisions made by dairy producers. When asked about how important certain factors were in guiding their decisions the following were listed as “very important” by the top three producers: consultation with business partners/family members (43.6%), advice from consultants/nutritionists/veterinarians (42.4%) and intuition/gut feeling (28.8%). Large herds (≥200 cows) relied more heavily (P < 0.05) on information from consultants, nutritionists, and veterinarians, than small herds (1-49 cows). The top three producers chose factors which influenced decisions were: ability to cash flow (94.7%), ability of funds to pay for investments (80.5%), impact on the business’s long-term financial performance (70.8%). Producers with a total confinement system were more likely (P < 0.05) to use informal calculations to examine the financial impact of a decision (e.g. paper, spreadsheets) than producers with a pasture-grazing system. The percentage of producers selecting “impact on business’s short term financial performance” as a decision criterion increased with increasing herd size (P < 0.05). The top three reasons producers indicated that may impact modest adoption rates of new technologies were: not familiar with technologies available (54.9%), undesirable cost to benefit ratio (41.8%) and too much information provided without knowing what to do with it (35.9%). Utilizing this insight into dairy producer decision making should help industry professionals address dairy producer issues and concerns.
Anthropology

18. Darya Bukhtoyarova
Department of Anthropology
Mentor: Sarah Lyon

“*We Lived Two Different Lives*”: Socioeconomic Change and Adaptation in Post-Soviet Kazakhstan

The collapse of the Soviet Union and the emergence of the new nation-states in 1991 instigated enormous changes in the political and socioeconomic situation in Central Asia. On the level of everyday life it meant that individuals had to adjust to this rapid change by altering their livelihood strategies. In their struggle to feed their families as well as to make sense out of the dramatically changing reality, people migrated, changed their workplaces, learned new skills and applied ones previously known, used their safety network connections and created new systems of support. As one of my interviewees concluded, “Maybe we are lucky to have lived in both that and this times: it is as if we lived two different lives” meaning her personal experience and that of other people of her generation before and after 1991. This poster is based on the fieldwork I conducted in the summers of 2008 and 2009, mainly in the city of Shymkent in the southern part of the Republic of Kazakhstan. As in many other regions of the world that experienced drastic change, individuals and families often employed a variety of strategies (what Claude Lévi-Strauss called *bricolage*) rather than a single strategy in order to survive and gain professional success. While many of my informants claimed that the choices they made in this difficult time were simply “natural” or “the only ones that were available,” I explore how they were in fact often conditioned by an individual’s gender, ethnicity, age and other aspects of his or her identity. While some of the circumstances that accompanied the social change were unique to the city of Shymkent or the region of Southern Kazakhstan, many others were ubiquitous throughout the new post-Soviet nation-states. Therefore, I hope that by looking at changes in the livelihood strategies of individuals in this one city, as well as analyzing the ways in which these changes are narrated today, almost 20 years after the “unmaking” of the Soviet Union, we can further our understanding of the bigger socioeconomic change that began in the 1990’s in former socialist region.

19. Sarah Fogarty
Department of Anthropology
Mentor: Scott Hutson

*Notions of Theatre in Maya Ritual Practice*

The discipline of performance studies is on the rise in academia. It is an often overlooked field, the study of which can lead to many discoveries in each of the areas it incorporates: theatre and anthropology. Within this field, I was particularly interested in the way the Maya culture, primarily during the Classic Period, used performance and spectacle as a means of political legitimization. My goal with this venture was to discover the “secret” behind Maya ritual; I was
extra eager to tackle the topic because I thought that my background in theatre would be germane to the research. The discovery that my background in theatre had much less to do with the project than I thought led me to reformulate my original intent with this project. I still believe that it is important for me to incorporate some of my theatrical background into this paper because it helps to show why my view of this topic is unique. There are many problems that surround the comparison of Maya ritual to Western theatrical practices today. Any person outside of the Maya culture who attempts to tackle this comparison runs into the problem of having an etic perspective; it is difficult for one to fully understand the scope of the Maya ritual practice because they are not part of that culture. We can study these rituals all we want, but the reality is that we will never know exactly what this ritual practice means to the modern Maya as well as what it meant for the Ancient Maya. That being said, it is not futile to examine ritual practice of the Maya for there are many things that can be gleaned from such a study that tell us more about the ideology as well as everyday life of the Maya.

Art

20. Iredell Bouldin
Department of Art
Mentor: Jane Peters

*Leonardo and the Mystery of the Two Biancas*

On October 14\(^{th}\), 2009, the possible discovery of a previously unknown Leonardo portrait entitled *La Bella Principessa* was announced to the world. A partial fingerprint in the upper-left hand quadrant emerged through a multispectral scan, and while modern forensic experts require eight points of correspondence to positively identify a match, ten emerged that were analogous to a fingerprint left by the master in his rendition of Saint Jerome, located at the Vatican. Additionally, several art historians agree the non-descript, half-length profile is indeed by Leonardo; however, its date of origin as well as the identity of the sitter are still in question. Dr. Martin Kemp, Professor Emeritus of Art History at Oxford University, dates the portrait to c. 1496, and through stylistic and technical considerations, has identified the young woman as Bianca Sforza (1482-1496). Bianca was the illegitimate daughter of Ludovico Sforza (1452-1508, the regent of Milan and duke of Bari [from 1480], and duke of Milan [from 1494-1499]), and his mistress Bernardina da Corradis. However, based on historic social conventions, biographical data, developments in the Milanese mode of dress, and Leonardo’s stylistic and technical evolution, an argument is constructed stating the portrait originated between 1485 and 1490, and is instead the likeness of Bianca Maria Sforza (1472-1510). Bianca Maria was the legitimate daughter of Galeazzo Maria Sforza (1443-1476), who married Maximilian I, King of the Romans, in 1494 (1459-1519) and future Holy Roman Emperor (1508-1519).
21. Michelle Combs  
Department of Art  
Mentor: Bones Carpenter

*Ambiguous Spaces*

*Ambiguous Spaces* is a photographic project that asks the viewer to think about the nature of reality. As humans, we depend on sensory input to tell us about the nature of the world, but is this the whole story? With the advent of modern technology and the all-too-human desire to manipulate the truth for his or her own advantage, such sensory perception cannot always be trusted. By presenting the expected in an unexpected way, this project is a challenge to perception, which is unique from person to person and as dependent on his or her life experiences as sensory input. The project’s aim is to show the viewer that one cannot always believe what is before his or her eyes, but also that distortions of the truth can reveal to one a greater truth. By inviting the viewer to step beyond the realm of visual reality, these photographs operate as a portal to a world beyond the sensory and into the subconscious. Artistic influences on this project include Surrealism and the work of many photographers, including Jerry Ulesmann and Duane Michals. Philosophic influences include Plato and Immanuel Kant. The series was created using digital photographs that were combined in Adobe Photosop CS4 and printed as archival inkjet prints.

22. Justin Armbruster  
Department of Biology  
Mentor: Robin Cooper

*The Regulation of Synaptic Vesicles Pool In Nerve Terminals*

The reserve pool (RP) and readily releasable pool (RRP) of synaptic vesicles within pre-synaptic nerve terminals have been physiologically differentiated into distinctly separate functional groups. This has been accomplished in glutamatergic nerve terminals by blocking the vesicular glutamate transporter (VGlut) with Bafilomycin A (BA) during electrical stimulation of 20Hz and 40Hz of 10 pulses within a train, as well as continuous stimulation of 20Hz. Various concentrations of BA as well as pre-exposure prior to stimulation have been examined. The continuous stimulation of 20Hz decreased the EPSP amplitude in about 1 hour while controls lasted up to 3 hours. There was not a significant difference between the 20Hz train stimulation and 20Hz continuous stimulation in the run down time in the presence of BA since large variations among preparations exist. After BA induced synaptic depression, the EPSPs were rapidly revitalized in less than one minute by exposure to serotonin (5-HT, 1μM) in every preparation tested (p<0.05). 5-HT promotes an increase in the probability of vesicular docking and fusion at this glutamatergic nerve terminal. Thus, 5-HT recruited unused vesicles from the RP that were not rapidly depleted by acute BA treatment and electrical stimulation. The results support the notion that rapid electrical stimulation selectively activated the RRP and spared the
RP; however, the neuromodulator 5-HT can recruit the RP. This suggests at least two separate kinetic and distinct regulatory paths exist for vesicle recycling within the pre-synaptic nerve terminal. Use of threeo-beta-benzyloxyaspartate (TBOA), a pre-synaptic terminal uptake blocker, showed similar results but took longer for the terminal to depress with the same stimulation paradigms. Thus, stored glutamine or glutamate, or a renewable source of glutamate within the terminal may be able to package vesicles to offset rapid depression of the RRP.

23. Kody D. Carpenter, Leslie C. Davis, Jason A. Collett
Department of Biology
Mentor: Jeffrey L. Osborn

The Effects of Sodium Diet on Hypothalamic Angiotensin II Receptors and Sodium and Water Intake in Sprague-Dawley Rats

The renin-angiotensin-aldosterone system (RAAS) is a hormone system critical for the regulation of blood volume, sodium intake and excretion, and long-term blood pressure homeostasis. Studies have shown that hypertensive Sprague Dawley (SD) rats have elevated hypothalamic Angiotensin II-Type 1 (AT1) receptors. The purpose of this study is to relate Na\textsuperscript{+} sensitivity and hypertension to AT1 receptors in the brain. SD rats (n=23) were randomly assigned to 0.9% sodium chloride chow (normal salt) or 4.0% sodium chloride chow (high salt) at weaning. Rats (5) were raised on 0.9% sodium chloride chow at weaning and offered 2.0% saline; raised on 0.9% sodium chloride chow (7) and offered 0.9% saline; raised on 4.0% sodium chloride chow (6) and offered 2.0% saline; raised on 4.0% sodium chloride chow (5) and offered 4.0% saline. It was hypothesized that rats raised on 4.0% would desire ingestion of more salt, and that they would have higher hypothalamic AT1r expression. Rats raised on 4.0% sodium chloride chow and offered 2.0% saline (4.0%→2.0%) ate significantly more salt per day on average (5.44±1.74 mmol /day) compared to rats raised on 4.0% sodium chloride chow and offered 4.0% saline (4.0%→4.0%) and rats raised on 0.9% sodium chloride chow and offered 0.9% saline (0.9%→0.9%) (p≤0.05). Additionally, 0.9%→0.9% rats drank significantly less water per day on average (19.84±1.33 ml/day) as compared to rats raised on 0.9% sodium chloride chow and offered 2.0% saline (0.9%→2.0%) and 4.0%→4.0% rats (p≤0.05). Thus, lifetime high salt intake significantly reduces the ability to sense salt and regulate salt intake. Further analysis of AT1r expression will assess the possible role of brain RAAS in regulation of salt intake.
24. **Stephen Cole**  
Department of Biology  
Mentor: Philip Bonner

*DHT Overcoming CSPG Inhibitory Effects*

The ability to overcome axonal growth inhibition by chondroitin sulfate proteoglycans (CSPG) has long been the focus of scientific research. Chondroitin sulfate proteoglycans are components of the extracellular matrix, consisting of peptides chemically attached covalently to chains of glycosaminoglycans. After traumatic spinal cord injuries there are increased levels of CSPG expression. In culture, stripes of CSPG painted on a dish surface repel elongation of DRG neuron axons, perhaps by interfering with signaling during axon regeneration. I show that dihydrotestosterone (DHT) is able to overcome the inhibitory effects of CSPG, allowing axons to grow onto CSPG-coated surfaces. DRGs dissected from seven to ten day old chick embryos were cut into pieces and placed in culture dishes near spots of CSPG. Glass rings were placed around the explants and CSPG spots. This allowed for a better control of axon growth in the cultures. Currently, my research is focused on adding another component. The added component is a prepared collagen gel. Placing tissue explants into the collagen gel allowed for axonal growth in all directions. Axonal growth three-dimensionally allows for observation of inhibition by CSPG. Furthermore, as before, I hope to show the steroid hormone DHT overcoming the inhibitory effects of CSPG.

25. **Ann Cooper, C. Kim**  
Department of Biology  
Mentor: Robin Cooper

*The Effects of Enhanced Sensory Perception on Learning and Memory Retention in Drosophila*

Taste avoidance can be a learned behavior as well as an innate behavior depending on the sensitivity to the stimulus. If an animal has few receptors for a stimulus, where a stimulus might cause a mild repulsive reaction, an animal can be trained to avoid an environment. For this type of condition and with repeated training, animals can show associative learning to an unconditioned stimulus (US) such as to light. However, animals that are extremely sensitive to the same stimulus may show one-time trail learning and associate the US rapidly. The retention (memory) of the US would likely be stronger for the more sensitive animal. This is the topic presented with the use of a genetically engineered strain of *Drosophila* over expressing the TRVP receptor (i.e. the capsaicin receptor). The expression was targeted specifically for sensory neurons. The larvae from this strain are extremely sensitive to capsaicin and will even die when left on agar tainted with 10µM pure capsaicin. The wild type control larvae show no aversion to the capsaicin and survive well eating the compound. Experiments show that during the developing stages of the wild type larvae, none displayed abilities to learn. The over expressers of the TRVP receptor did not show abilities to learn during development. However, the background strain of the over expressers displayed a memory from 1st to 2nd instars. Novel
choice preference in adults and ones exposed as larvae provide clues to memory retention during CNS transformation.

26. Ryan Craycraft  
Department of Biology  
Mentor: Charlotte Kaetzel

*The mRNA Expression of pIgR and IL-8 within HT-29 Cells Following Application of Escherichia coli*

Various studies and research have been applied to understanding the cell signal pathways of the epithelial cells within the gut mucosa in response to commensal bacteria. Understanding the mechanisms and responses of epithelial cells to commensal bacteria will assist scientists and physicians in discovering solutions to various intestinal diseases and infections. Within this specific study, and in order to gain more knowledge of the signaling pathways, the levels of mRNA expression of pIgR and IL-8 were measured after introduction of *Escherichia coli* bacteria to the cells. *Escherichia coli nissle* was cultured to 1x10⁷ CFU/mL and heat-killed before being applied to HT-29 cells apically and basolaterally that were grown to confluency on Transwell inserts at different timepoints. The gene expression and protein levels of IL-8 and pIgR were measured after these timepoints. The expression of IL-8 mRNA peaked early near 3 hours and gradually decreased as time persisted and the pIgR expression gradually climbed up to its climax after nearly 12 hours. The expression levels of IL-8 and pIgR are consistent throughout multiple, identical experiments revealing a glimpse of the signaling pathways that a cell undergoes in response to bacteria. The HT-29 cells have a tendency to secrete more proteins apically than basolaterally.

27. Mary Devins  
Department of Biology  
Mentor: Nicholas McLetchie

*Are Males More Adapted to Drier Habitats Than Females?*

Spatial segregation of the sexes (SSS) is common among plants and, in vascular plants, SSS is often associated with environmental gradients. In non-vascular plants, which have the most extreme cases of SSS, this association is rarely made. Recently an association was made with increase male frequency in more open habitats in *Marchantia inflexa*. We wanted to verify and test if *M. inflexa* males were more adapted to open habitat than females. Thirty female and thirty male *Marchantia inflexa* were randomly collected from three road banks (open habitats) and thirty females and thirty males from five rivers (shaded habitats). All *M. inflexa* were grown in a common garden under two treatment conditions: with and without a neutral density filter. Initial analysis on growth rate found a treatment effect among river plants with non-lidded (open) growing faster than lidded (shaded) plants. Hence, there was a weak location effect. Among road plants there was a strong location effect with the plants from Guanapo road growing
roughly twice as fast as plants in the other two locations. In the road plants there was no treatment effect. There were no sex differences in growth rates. Water Use Efficiency (WUE, photosynthesis/ transpiration - carbon gain per water) has been assayed for 11% of the plants and though percentage of plants tested is low the results are promising and will continue to be evaluated. WUE results indicated that plasticity (treatment effect) and genetic differentiation (location effect) contribute to phenotypic variation and suggest that males are more water stress tolerant then females. If these patterns are maintained when all plants are assayed, then these results will support the hypothesis that males are more adapted to water stress, which is more likely to occur in open habitats than in shaded habitats.

28. **Sean Ehlman**, Ian Stewart  
Department of Biology  
Mentor: David Westneat

*An Investigation into Responses to Variable Bib Sizes in the House Sparrow, Passer domesticus*

In house sparrows, *Passer domesticus*, males possess a status signal in the form of a black throat patch, or bib, that varies in size from individual to individual and is correlated with dominance. In this way, the larger the bib an individual exhibits, the higher the social rank of that individual. However, little is understood regarding the development of response to such status signals. This experiment aims to clear confusion regarding the development of responses of certain “subject” birds to the status signals of other “partner” males. A pertinent question that the experiment focuses on is to what degree the responses to male bib size are environmentally determined or learned, and to what degree these responses are inherent behavioral reactions to given stimuli. By controlling the subject’s development from the approximate time of hatching and exposing it preferentially and systematically to manipulated partner birds with varying and controlled aggression and bib sizes, the subject will, hypothetically, be conditioned to learn a certain response to the given status signal. Pairing the conditioned subject birds with unmanipulated, wild-caught partner males will shed light on whether or not the subject birds learn a certain response to a status signal, or whether the response is innate. This bit of information is crucial to understanding the development of responses to a given bib size. By understanding this behavior more clearly, a host of related information concerning behavior in passerine birds can be explored more informatively.

29. **Lindsay Fleig**, Natalie Snyder, Mary Garcia  
Department of Biology  
Mentor: Francisco Andrade

*Insulin-Stimulated Glucose Uptake in the Rat Diaphragm*

The diaphragm is a type of skeletal muscle, that is constantly active and responsible for inhalation and exhalation. In contrast, other skeletal muscles are active during voluntary
movement or hormonal stimulation. Glucose is the primary substrate used for metabolic activity in muscles; glucose is transported into the cells via specific transporters, GLUT 1 and GLUT 4. Previous studies suggest that constantly active skeletal muscles may not be as reliant upon glucose as intermittently active muscles. The objective of this novel study is to measure glucose uptake in the rat diaphragm. The rate of glucose uptake will be measured with radioactive-labeled glucose into rat diaphragm with insulin and electrical stimulation. Western blots will be used to detect important proteins that play a role in the insulin-signaling pathway. The preliminary results indicate that in the diaphragm, glucose uptake is significantly higher upon insulin stimulation when compared to controls. In addition, GLUT 1 and 4 were detected in the diaphragm, indicating this muscle uses the same glucose transporters as other skeletal muscles. In summary, the preliminary results indicate that although diaphragm is an involuntary active muscle, glucose metabolism may not differ from other voluntary active skeletal muscles.

30. Brandon Franklin, Jason Collett  
Department of Biology  
Mentor: Jeffrey Osborn

**OSA and Metabolic Syndrome**

The aim of this study is to examine the relationship between hypertension, obesity and severity of obstructive sleep apnea (OSA). Using the apnea/hypopnea index (AHI) along with previously recorded blood pressures, this study will assess the correlation between severity of hypertension, OSA and the presence of specific indicators of metabolic syndrome. Specifically, this study will examine whether one aspect of metabolic syndrome, elevated fasting glucose concentrations, correlates to OSA severity when compared with other clinical indicators of metabolic syndrome, such as blood cholesterol and triglyceride concentrations. Hidekatsu Yanai, et al. (2008) concluded that OSA, among other factors, is a possible mechanism in the development of hypertension in metabolic syndrome and this hypertension likely is derived from elevated sympathetic nerve activity. Brooks, et al. (1997) reported OSA as a significant cause of systemic hypertension in dogs; however, this relationship has not been fully elucidated in humans. Also, it has been found that “obesity and physical inactivity may account for only about 50% of the variability in insulin-mediated glucose disposal” (Wolk, Somers 2007) and that metabolic abnormalities such as insulin resistance and glucose intolerance may be reversed by successful treatment of OSA (Wolk, Somers 2007). Furthermore, both insulin resistance and glucose intolerance have been identified as major factors leading to hypertension in both clinical and experimental animal models. This leads to the question of whether or not OSA could account for a portion of the remaining 50% of variability. Wolk, et al. (2006) also suggested that, due to a similar assemblage of the components of metabolic syndrome in OSA, OSA could be either a cause or component of metabolic syndrome and consequently the development of hypertension. The initial hypothesis of this study is that with increasing degrees of AHI, obesity, and hypertension will be significantly more prevalent. Secondly, this study hypothesizes that in patients diagnosed with metabolic syndrome, elevated fasting glucose levels will correlate significantly more with increasing values of AHI than do both plasma cholesterol and triglyceride levels in patients with OSA. It is predicted that in the presence of elevated fasting glucose, the severity of hypertension will be significantly exaggerated.
31. Allison Gilberts, A.J. Wigginton, S.M. Bierbower, S. Xu
Department of Biology
Mentor: Robin Cooper

Effects of Environmental Cd$^{2+}$ On Crayfish: Behavior and Physiology

As a noxious agent, Cd$^{2+}$ has deleterious ecological and environmental effects. It is evident that high doses of cadmium may result in rapid death of organisms, yet the physiological effects of exposure to low cadmium levels for prolonged time periods remain elusive. In an effort to provide insight into the acute effects of Cd$^{2+}$ exposure, the behavioral and physiological responses of crayfish were investigated. In this study, the action of cadmium on the established quisqualate/glutamate receptor subtype directly at the crayfish muscle was addressed. Contact with toxic Cd$^{2+}$ hinders overall physiological function, most likely due to its extensive actions on various tissues. In order to scrutinize the level of sickness in an animal, responsiveness to stimuli and behavior were observed. Specifically, examination of the classical tail flip escape response in crayfish was utilized as a behavioral index of health before and during cadmium exposure of assorted doses. Heart (HR) and ventilatory rate (VR) were also monitored as health indices during states of rest and various environmental stimuli, as a measure of responsiveness. A sensory-CNS-motor neuron-muscle circuit in the crayfish was used to address the action of Cd$^{2+}$; this circuit is a functional relevant circuit for behavior measures and is able to assess neuromodulator roles on behavior and sensory-CNS function. The capacity to distinctly separate pre-synaptic and post-synaptic contributions in synaptic efficacy at the crayfish neuromuscular junction is beneficial to investigation of the role of Cd$^{2+}$ in altering synaptic function. It is of particular interest to determine how Cd$^{2+}$ alters the functioning of the crayfish model animal in order to aid in establishing potential mechanisms of action in other organisms. In a dose dependent manner, Cd$^{2+}$ altered responsiveness to environmental cues based on HR and VR measures and Cd$^{2+}$ depressed synaptic responses and function of neuronal circuits.

32. Razan Haddad
Department of Biology
Mentor: Scott Gleeson

Microhistological Analysis

Scotch broom invasion in the Nilgiris grassland in India facilitates the colonization of ruderal plants (e.g. Isachne kunthiana, Digitaria sp., Justicia latispica, etc). Preliminary observations in the field suggest that the primary herbivore, the sambar deer preferentially consume broom and broom-plants rather than dominant grassland species. Broom is a nitrogen fixing legume, hence the foliar tissue of broom and plants growing under broom may have higher nutritional value, and hence the deer may prefer them better. Fresh dung samples (pellets) belonging to individual piles were collected in the field from 30 locations in February 2009, and subsequently frozen. At the same time collections of broom, broom-plant and dominant graminoids were made, these are the target plant species. Permanent references slides of the epidermal tissue of target species will be made to compare with leaf epidermis isolated from the dung. The dung samples will be
analyzed qualitatively and quantitatively by following the techniques described in Stewart 1967 and de Jong, et al. 1995. These techniques involve laboratory processing and preparation of samples to isolate identifiable fraction of plant tissue before screening grab samples under a microscope to: (1) qualitatively identify the epidermal cells, (2) estimate of proportion of epidermis from the different plant species.

33. Bradlee Heckmann  
Department of Biology  
Mentor: Edmund Rucker

Targeting the Barkor Locus

Barkor, also known as the Beclin-1 associated autophagy related key regulator, is a 68 kDa protein that was original identified as an ortholog to Atg14 in yeast, earning it the term Atg14-L or “like” protein, from in vitro studies and via tandem affinity-purification studies. From these studies it is evident that Barkor has a definite role in the Beclin-1 complex. Most of the primary literature regarding or mentioning Barkor/Atg14-L is from in vitro studies using cell lines such as those presented above. Due to the fact that Barkor was just recently identified (late 2008), as being a major component of the Beclin-1 complex, no known in vivo studies have been preformed. The goal of this project is to isolate the Barkor gene and regions of homology from genomic DNA, and use this to create a functional mouse model to allow for in vivo studies of the Barkor protein and the relationship it has with the Beclin 1 complex. Based on the primary literature and the significantly close relationship of Barkor to Atg14 in yeast, in vitro studies have demonstrated that Barkor seems to function as a regulator of autophagy. The Barkor mouse model will grant the ability to study multiple facets of the Barkor protein in vivo; such as were it localizes, interactions with other members of the Beclin-1 complex, and its overall function in regulating autophagy. In vitro studies suggest that Barkor positively regulates autophagy via direct interaction with the Beclin-1 complex. The hypothesis for this project is that Barkor will positively regulate autophagy in vivo as well as directly associate with the Beclin-1 PI3KC complex.

34. Alexandra Hurst  
Department of Biology  
Mentor: Nicholas McLetchie

Effects of Sexually Dimorphic Traits on the Competitive Ability of the Sexes

Many species are sexually dimorphic. While many of the most studied examples of sexual dimorphic traits occur in animals, sexual dimorphism also occurs in plants. Common sexually dimorphic patterns observed in bryophytes (hornworts, liverworts, and mosses) are larger size and less asexual reproduction in females relative to males. These patterns indicate that females will out compete males for local space, while males may colonize new space at a much faster rate. To investigate these ideas, we used the species Bryum argenteum. While the best method to
documenting competition between the sexes is to have direct interaction between the two sexes, in *B. argenteum* sex expression is infrequent and occurs rarely in the lab. Therefore, our plan was to assess competitive ability by competing each sex with a morphologically distinct species that co-occurs with *B. agenteum* in the field, *Ceratodon purpureus*. A single *C. purpureus* isolate was used as the control competitor to compare male and female competitive ability. The experiment had four treatments: 1) pure male *B. agenteum*, 2) pure female *B. agenteum*, 3) male *B. agenteum* with *C. purpureus* and, 4) female *B. agenteum* with *C. purpureus*. Data on the number of *B. argenteum* and *C. purpureus* shoots were taken throughout the experiment. The preliminary results indicate: 1) Growth rates did not differ between males and females. 2) Males in competition with *C. purpureus* tend to occupy more space than females in competition with *C. purpureus*, which is inconsistent with the hypothesis.

35. Adesuwa Ighodaro, Jason Collett  
Department of Biology  
Mentor: Jeffrey Osborn  

*Angiotensin Type I Receptor Expression and Development of Genetic Hypertension in Rats*

Hypertension is an epidemic that many Americans face today. In 2005, an estimated quarter of the world’s population was diagnosed with high blood pressure. Experimental studies in laboratory animals have shown that angiotensin II (AII) plays an important role in the regulation of blood pressure and the development of hypertension. Additionally, it has been reported that Spontaneously Hypertensive Rats (SHR) have increased hypothalamic angiotensin II, type 1 receptor (AT1r) mRNA. It is hypothesized that tissue AT1r expression of genes derived from SHR are linked to elevated blood pressure in offspring of SHR crossed with normotensive, Brown Norway (BN) rats. Isolation of the alleles responsible for genetic hypertension is brought about by breeding a SHR female with a BN male. The resulting offspring were then phenotyped using tail cuff plethysmography to calculate mean arterial pressure (MAP). Rats were phenotyped as normotensive (NT MAP < 105 mmHg), borderline hypertensive (BHT 105 ≤ MAP < 122 mmHg), or hypertensive (HT MAP ≥ 122 mmHg). From here the HT F1 females were bred back with the original BN male to generate the F2 generation. This procedure was repeated again by breeding to the normotensive BN male with subsequent hypertensive female offspring up to the F6 generation to dilute the alleles responsible for hypertension on a normotensive background. Hypertensive phenotype was dominantly expressed throughout six generations of SHR/BN with 32% (n=8) HT in the F6 generation, and a total of 46% (n=88) F1-F6 offspring hypertensive, 43% (n=81) BHT, and 11% (n=21) NT. AT1r protein expression is being evaluated (western blot analysis) between the normotensive and hypertensive offspring to assess the relationship between AT1 receptor expression and the development of genetic hypertension.
36. Jaclyn Ionna
Department of Biology
Mentor: Nicholas McLetchie

Troubleshooting PCR Protocol to Study Sex Ratio Variation

Population sex ratios vary across the environment and several factors, including disturbances, influence this variation. Studies on sex ratios in species that do not always have visible sex structures are difficult to work with, because the sex of non-sex expressing individuals is unknown. DNA sex-specific markers are a useful technique to identify the sex of an individual. For the plant *Marchantia inflexa*, specific male and female DNA-markers have already been verified using polymerase chain reaction, PCR. Recently, however, PCR in the laboratory has not been repeatable; therefore, improving PCR protocol and getting repeatable results has been the main focus of my research. I focused on four main factors contributing to the PCR problem: DNA concentration and quality, dNTP quality, general experimenter errors, and primer quality. Using another research laboratory as a control, these potential problems were looked at carefully in order to better the results of PCR in our laboratory. First, the DNA concentration and quality was tested using a nanogram machine and adjusting the concentration of DNA stock solution in order to find an optimum dilution for the DNA used in the PCR. Secondly, dNTP was manipulated to confirm and determine necessary levels of freshness needed. We found that the dNTPs currently in the lab were not working correctly. Therefore, new dNTP were ordered, diluted, and seemed to work repeatedly. Thirdly, experimenter error was not found to be a major problem since reactions worked when the PCR protocol was used in the other laboratory. Finally, primer quality of old solutions needed to be addressed. Primer dimers and other imperfections with the current primer solution could be part of the inconsistency of the PCR reaction. Primer testing is still in process. Overall, experiments are still being performed to get a consistent PCR that is repeatable and, eventually, to study the influence of disturbances on sex-ratio variation in *Marchantia inflexa*.

37. Imad Jaafar
Department of Biology
Mentor: Robert Sargent

Effects of Female Density on Male Sexual Harassment and Female Fitness in the Western Mosquitofish, Gambusia affinis

Past research on sexual conflict in mosquitofish has found that male sexual harassment increases with increasing male density, and with decreasing female density; whereas, the strongest effect on female fitness (survival, fecundity, and growth) has been a negative effect of female density. When female density was held constant while male density varied, male harassment increased and female growth decreased with increasing male density. In this study, we varied female density, while holding male density constant. We studied these phenomena in wading pools, where each wading pool had 8 males. There were two female density treatments: 4 females and 8 females, and there were 4 wading pools in each treatment. The experiment ran for 3 months. All females were individually marked and observed from 1 to 4 times per summer for 10 minutes per
observation period and the number of male forced mating attempts (our measure of male sexual harassment) per female was recorded. Female body size was recorded at the beginning and end of the experiment to calculate individual growth rates. In addition, we recorded female survival (0 or 1) and mean female fecundity. As female density increased, male harassment per female decreased and female growth decreased. Female survival and fecundity did not differ significantly among treatments. Our data suggest that female density has a significant effect on male harassment, but that female density has a stronger effect on female fitness than male harassment. These results reinforce past research that the effects of female density dependence and likely competition among females for food obscures the negative effects of sexual harassment on female fitness, and that detecting these negative effects of male harassment require holding female density constant.

38. Ashley Jaglowicz, Alex Palumbo, Deanna Morris
Department of Biology
Mentor: John Rawls

Determining Knockout CRMP Gene Rescue in Drosophila melanogaster

CRMP, (Collapsin Response Mediator Protein), has been found to be involved in neurogenesis in vertebrates, which have multiple gene copies. However, Drosophila have a single gene, CRMP, offering significant advantages in analyzing roles of this protein in neurogenesis. This gene encodes alternatively spliced transcripts that produce two proteins: DHP, a pyrimidine degradation enzyme, and CRMP. By using a machine that detects movement with a photoelectric cell, the normal circadian pattern, (12 hours of light and 12 hours of dark), trained the flies for four days, which was followed by 10 days of constant darkness to test the activity of the flies. The wild type flies maintained normal behavior “remembering” their period of trained light and dark and having a similar pattern in complete darkness. In contrast, the supK1 “mutant” flies that have the CRMP protein knocked out showed no pattern. The flies in which the DHP-specific exon had been disrupted also showed normal behavior. Thus DHP is not required for normal circadian rhythm activity and it is actually the CRMP protein form that controls circadian rhythm behavior. Once this was established, different transgenes were inserted into the flies to test if rescue would occur or not. Significant rhythmicity of {elavGAL}/Y; {UAScrmp}4a/; supK1 flies was determined after testing indicating that GAL4 rescues supK1 animals.
39. **Carrie Johnson**, Nathan J. Pauly, D. Kevin Kump  
Department of Biology  
Mentor: Randal Voss

*The Origin and Evolution of Ferritin Loci Among Tetrapod Vertebrates*

Iron is an essential element of life; however, it can be toxic and damaging to cells if it is not bound and sequestered by ferritin proteins. In humans, ferritin consists of heavy and light protein subunits that are transcribed from the *fth1* and *ftl* loci respectively. Interestingly, the chicken genome only contains *ftl* while multiple ferritin loci have been described in frogs. To investigate ferritin gene evolution, we identified ferritin-like transcripts from EST databases that have been compiled for the Mexican axolotl (*Ambystoma mexicanum*) salamander. These sequences were assembled and the resulting protein models were analyzed using phylogenetic methods. Presumptive *fth1, ftl, and ftm* were identified for the axolotl, as were several additional ferritin-like sequences with complete open reading frames. These additional sequences probably encode functional proteins because they were assembled from transcripts and many of the sequences were discovered in a closely related species (*A. tigrinum*). The presumptive *fth1* and *ftl* loci mapped to the same position in the axolotl genome. To better understand the evolutionary history of this genomic region, the positions of flanking orthologous loci were compared among the axolotl, human, and chicken genomic maps. Orthologous loci that flank *fth1* on hsa11, and *ftl* on hsa19 mapped to the axolotl ferritin genomic region. However, only orthologs that are syntemic with *fth1* in chickens mapped to the axolotl ferritin genomic region; loci that flank *ftl* in humans and axolotls are missing from the chicken genomic map. The results suggest that amniote *fth1* and *ftl* arose from an ancestral chromosomal region whose vestige remains intact in the axolotl genome. A chromosomal break subsequently isolated these loci in mammals while the *ftl* region was lost in the reptilian lineage leading to chickens.

40. **Ryan Johnson**  
Department of Biology  
Mentor: Louis Hersh

*Choline Acetyltransferase (ChAT)*

Choline acetyltransferase (ChAT) is an enzyme synthesized within the soma of a neuron. It catalyzes the synthesis of acetylcholine (one of the most-studied neurotransmitters), which catalyzes the reversible transfer of an acetyl group between acetylcoenzyme A (AcCoA) and choline, joining Acetyl-CoA to choline. Deficiencies or decreases in ChAT activity have been linked to many neurodegenerative disorders, perhaps most notably Alzheimer’s disease. Genetic mutations in ChAT have also been implicated as the cause of various congenital neuromuscular disorders. Relatively recent experiments have indicated that a different form of ChAT exists in peripheral tissues of the body- peripheral ChAT (pChAT). Two variants of ChAT mRNA can be obtained by alternative splicing, common type (cChAT mRNA) and peripheral type (pChAT mRNA). Interestingly, the pChAT mRNA differs from cChAT in that the cDNA (DNA synthesized from an mRNA template) sequence lacked 4 exons (6,7,8, and 9). Various molecular
biology experimental methods were used to investigate potential routes to gene replacement therapies through manipulation of pChAT DNA and various other DNA sequences related to this pathway.

41. Melissa Keinath, Daniel Wetzel  
Department of Biology  
Mentor: David Westneat

**Do Heterozygous Mothers Have the Touch?**

Parental care envelops the ability to provide offspring with proper care and all the resources necessary until their capabilities of personal care have peaked. One facet of parental care is food-provisioning because food is a basic need for growth and development of offspring. As it would seem better parental care would be beneficial to the survival of the young, it would make sense to see an inclination toward better care over time. This project seeks to test for a correlation between female heterozygosity and parental care in the house sparrow (*Passer domesticus*). Data for this study was collected from house sparrows nesting at the University of Kentucky farms. Parental care data was collected in 2008 and 2009 from 42 female house sparrows. Blood samples from these females was collected and stored in buffer during the breeding season. DNA was extracted and amplified at five microsatellite loci for each female using polymerase chain reaction (PCR). The amplified DNA was then visualized using gel electrophoresis to determine levels of heterozygosity. A correlation was performed to see if heterozygosity is related to parental care. Any additional confounding variables that could influence care were also tested for. The only significant effects found were the year, number and age of nestlings, and the male rate of provisioning. The hypothesis that heterozygosity is related to parental care was not supported by the findings. Whereas heterozygosity may increase fitness and parental care may increase fitness, the two may not affect each other.

42. Eric Kreps, Jason A. Collett  
Department of Biology  
Mentor: Jeffrey Osborn

**Adrenergic Receptor Control of Tail Hemolymph Flow in Procambarus clarkii.**

The neurotransmitter norepinephrine (NE) is a potent catecholamine that has numerous physiological functions in vertebrates. NE acts as a regulator of the cardiovascular system by vasoconstriction and subsequent increased vascular resistance. It can also act directly on the heart via beta-adrenergic receptors, increasing heart rate and cardiac output. Studies of NE’s mechanism of action on vascular flow of decapods are lacking. This study determined the effect of NE on abdominal muscle hemolymph flow, whether alpha adrenergic receptors mediated cardiac and/or vascular responses in the crayfish, *P. clarkii*. The hypothesis was that NE decreases hemolymph flow via alpha adrenergic mechanisms and increases heart rate in *P. clarkii* similar to other vertebrates. Crayfish specimens were anesthetized by cooling (20 min), and PE 20 tubing was inserted and secured to the carapace via the underside of the abdomen. A
laser Doppler probe was placed in a small hole in the carapace, above the dorsal abdominal artery. Hemolymph flow was continuously measured before, during, and after injection of NE. NE significantly decreased in flow in a dose dependent manner. Subsequent experiments showed significant attenuation of NE induced reduction of hemolymph flow with alpha adrenergic blockade using phentolamine (5 µg/kg/min). Thus in *P. clarkii*, hemolymph flow is significantly controlled by NE similar to that of mammalian vertebrates. Furthermore, the predominant adrenergic mechanism mediating NE induced vascular constriction is the alpha-1 receptor. These data suggest that adrenergic mechanisms of vascular function are evolutionarily conserved using similar receptor expressions in both vertebrate and invertebrate species.

43. Bonnie Leksrisawat, Ann S. Cooper
Department of Biology
Mentor: Robin Cooper

*Response Properties in the Crayfish Abdomen: Educational Aspects*

The best way for a student to truly learn and understand scientific concepts is through experimentation. We are designing a series of laboratory experiments that will compliment the material learned in a 300 level college animal physiology class. The particular experiment that I am involved in developing is based on the principles of proprioception and sensory adaptation. The primary purpose of the experiment is to understand how primary sensory neurons convey information of joint movements and positions as proprioceptive information for an animal. Proprioceptors consist of position and movement (kinesthetic) receptors, which detect joint position, direction, speed, muscle tension and muscle-length. The muscle receptor organs (MRO) of the crayfish abdomen are an ideal specimen for the study of proprioception, because they contain a fairly simple proprioceptive system of monitoring joint movements and positions as compared to other animals. The cell bodies of the MRO sensory neurons are relatively large (50–100 µm in diameter). The muscle spindle sensory neurons in mammals are challenging to investigate electrophysiologically because of the small nature of the sensory endings. In comparison, the MRO neurons in crayfish are readily accessible for extracellular and intracellular electrodes for long-term recordings. Limited sensory modulation research has been performed and documented on the MRO. Thus, there is a high potential for future basic scientific research in this area that could also be used as a foundation for future clinical applications. The intent of this laboratory is to involve students in an experiment that is relevant in today’s field and that will stimulate further interest in the subject matter while learning important neurological concepts.
44. **Jonathan Martin, Marti Robinson**  
Department of Biology  
Mentor: Robin Cooper  

*Modeling of Biological Cell Membranes Using a Classroom-Practical Laboratory Setup, with Emphasis on Neuronal Axon Ion Exchange*  

Biological cell membranes are vital parts of the cell physiology in that they play key roles in many of the processes studied. Cell membranes maintain a transmembrane voltage difference called the membrane potential. This basic electrical gradient is the driving force behind many cellular processes. One of these processes is neuronal signal transmission. A neuron is a specialized type of cell that conducts signals along their lengths to innervate other target cells. They are made up of a cell body, axon, and dendrites. The various aspects, dendrite, cell body and the axon can be modeled with changing various cellular and membrane properties within a bread board circuit. Like a wire carrying charge, the axon conducts a electrical difference from one site to another. In signal transduction, the ion channels act to carry the charge. The channels allow for extracellular ions to enter the axon and create a charge difference that activates adjacent channels along the axon in a chain reaction. These ions can be compared to the electrons carried by a wire in an electrical circuit. However, when molecules are carried through an axon the overall voltage drops due to the nature of the cell and its inherent resistance. To model this, resistors can be used in series and parallel to obtain a voltage drop as a function of distance from source. Capacitors can also be used to illustrate the membrane capacitance and alteration of the signal for a given source current. Therefore, to allow for the study of cell membranes in an undergraduate classroom setting, circuits and breadboards can be utilized to model the processes. We are using this approach at the University of Kentucky for a foundation experimental exercise in which other experiments with live tissue will build on.

45. **Charles Mounts, Justin Penticuff**  
Department of Biology  
Mentor: Elizabeth Debski  

*Nitric Oxide Synthase Activity in the Regenerating Axolotl Retina*  

Nitric Oxide (NO) is a short-lived chemical signaling molecule that has many diverse functions and is found in a range of tissue types. In the retina, one of things it is thought to do is to cause neuronal death following ischemia. In mammals, visual deficits resulting from cell loss are permanent since lost cells cannot be replaced. However, the axolotl salamander is able to both regenerate retinal tissue and restore retinal function. NO is synthesized by the enzyme, Nitric Oxide Synthase (NOS). We have been examining NOS expression in the axolotl retina following ischemic insult and optic nerve damage. Before injury, NOS is present at relatively high levels in several different retinal elements including plexiform layers, bipolar cells, and Müller glial cells. NOS expression in all of these elements are rapidly down-regulated after injury and remains at low levels during the subsequent degeneration and regeneration of the retina. This contrasts sharply with the response in mammals where NOS is upregulated after
injury. We are trying to determine whether the observed down-regulation of NOS is important to the ability of the axolotl to repair its retina after damage.

46. Ryan Penticuff, Gang Wang, Amit Trivedi  
Department of Biology  
Mentor: Vincent Cassone

House Sparrow

For years it has been believed that oscillators in the pineal gland, eyes, and suprachiasmatic nuclei of the hypothalamus dictate the circadian rhythm in most birds through the action of the hormone melatonin. It has been questioned whether removal of the pineal gland in the House Sparrow will affect physiological rhythmicity in the brain and peripheral tissue. Dr. Cassone’s experiment could very well falsify the idea that these tissues in the House Sparrow are directly dependent on the melatonin released from the pineal gland for metabolic rhythmicity and mRNA expression and disprove the published evidence that clock gene expression is completely dependent on pineal coordination. This experiment is going to examine more closely the role of the pineal gland in circadian rhythmicity as seen in metabolic activity and mRNA expression of time sensitive genes in the House Sparrow. The experiment will also add to our understanding of the complex relationship between the SCN of the hypothalamus, the pineal gland, and retinal oscillators, all of which have been hypothesized to regulate melatonin secretion in this species. What we hope to discover is whether or not these interacting components are essential for rhythmic expression of mRNA and/or metabolic activity, and if these peripheral tissues have some degree of autonomous rhythmicity.

47. Emily Popham, John Smolka, D. Kevin Kump  
Department of Biology  
Mentor: S. Randal Voss

A Comparative Study of Intron Size Among Three Salamanders

It has long been appreciated that salamander genomes are large because they contain abundant non-protein coding DNA. However, recently it was discovered that the protein-coding portion of a salamander genome is also large. In particular, a comparison of orthologous genes showed that introns within the Mexican axolotl (*Ambystoma mexicanum*) genome are on average 5-12 times larger than the size of introns from other vertebrate taxa. This suggests that large introns may be typical of salamander species. To test this idea, we compared the lengths of orthologous introns among two closely related salamanders, the Mexican axolotl and the Eastern Tiger Salamander (*A. tigrinum tigrinum*), and the more distantly related Siberian newt (*Salamandrella keyserlingii*). Nucleotide sequences for introns 2 and 6 of the calreticulin gene were obtained using a variety of approaches, including PCR, DNA fragment cloning, genome walking, and DNA sequencing. The resulting sequences from the tiger salamander and newt were assembled, and these were compared to existing orthologous intron sequences from the axolotl. Introns from
the three salamander species were similar in size (~3000-6000 bp) and dramatically larger than orthologous introns from the mouse and human (~200 bp). Thus, the data supports the idea that large introns are characteristic of large salamander genomes.

48. Martha Robinson, Michael Baker, Sonya M. Bierbower  
Department of Biology  
Mentor: Robin Cooper

Assessing Various Sensory Perceptions in Sighted and Non-sighted Crayfish Using Heart Rate as a Bioindex

Most organisms show diversity in the type and amount of peripheral sensors that enable detection of different sensory stimuli within and across multiple sensory modalities. Variation in sensory pathways allows organisms to monitor their environment, integrate sensory information from multiple sources, and respond accordingly due to refined integration of information. Most invertebrates possess chemosensory neurons that permit identification of environmental chemicals and are able to behave differentially between chemical compounds based upon the sensory pathway stimulated (i.e., attractive and/or repellant). Current literature shows that this is particularly true for decapod crustaceans in detecting chemical signals, especially in the cephalic and thoracic appendages. Crayfish are decapod crustaceans reliant upon visual and chemical environmental cues. Behavior studies alone often exclude “flight or flight” internal readiness changes and may conclude a lack of environmental awareness. Therefore, a ‘sympathetic-like’ autonomic response (i.e. HR/heart rate and VR/ventilation rate) in crayfish, (surface) Procambarus clarkii and (cave) Orconectes australis packardi, during chemical introduction establishes chemical and/or modality sensitivities that may be species-specific. Recurrent findings suggest crayfish showing no behavioral response display an internal response through changes in HR/VR. Specifically, rigorous statistical evaluation confirmed that potential food source cysteine and potential toxin/warning compound sodium chloride significantly increase HR. Using comparative photography to identify installment of new antennular segment growth (molted cast versus new antennule) provides a basis for further investigation of the structure of antennular sensillae and associated nerve clusters. Future research will include using cysteine and/or salt to induce electrical impulses to be recorded within antennular olfaction neurons.

49. John Smolka  
Department of Biology  
Mentor: Randal Voss

Genetic Mapping of the Ambystomatid Salamander Sex-Determining Locus

Very little is known about the basis of sex determination among non-mammalian vertebrates. In some species, and especially fish and reptiles, sex is determined by both genetic and environmental factors; however, in salamanders, sex has a strict genetic basis. A sex-determining factor (ambysex) has been identified in the Mexican axolotl (Ambystoma mexicanum), but the
corresponding locus has not been finely mapped. We identified genes near desmin in the human and chicken genomes because desmin is most closely associated with ambysex. Seven of these genes were successfully mapped in the Ambystoma genome using meiotic mapping. Four of these are closely linked to desmin on, and linkage group 9. These new data position ambysex between cyp27B1 and the desmin-associated genes that were mapped in this study. Utilizing these flanking markers, it will be possible to reliably determine the sex of salamanders at early stages of development and ultimately identify the sex-determining locus through map-based cloning.

50. Meredith Stone  
Department of Biology  
Mentor: Stephen Testa

*Visualizing Changes in Color Based Upon Sodium Permanganate, a Chemical Indicator*

The purpose of the research is to observe and measure the change in color of a solution. The solution involves a chemical indicator, Sodium Permanganate, so that a color change takes place. The solution also contains EDTA free Turner buffer solution and the samples contain Thymine, in the appropriate molarities and concentrations. In order to manipulate the color change in a certain direction in the delta E value, the pH has been manipulated to test the results. The delta E value refers to the difference in two colors that are measured by the given system. The delta L value, delta A value, and delta B value make up the delta E value. Though in this experimentation a color indicator is used to visually see a color change in the reaction with the eye, the delta E value was also measured to get a numerical value for this change. The goal of the experimentation is to increase the percentage of the color change in the delta A value of the delta E equation. Through experimentation, the delta A value has been found to increase when the buffer solution becomes extremely basic.

51. Jennifer Toyoda, Kay Shenoy  
Department of Biology  
Mentor: Philip Crowley

*In Utero Exposure to Endocrine Disrupters and Mate Choice in Female Guppies*

Atrazine is a widely used herbicide that has contaminated drinking water supplies and natural waterways. It is also a documented teratogen and an endocrine disrupter. It has been shown to induce aromatization with anti-androgenic and estrogenic effects in exposed animals. The presence of these chemicals in our natural environment can affect traits regulated by sex hormones. Atrazine degrades in the environment and small quantities persist for several years. Further, their impact may extend beyond the life of the compounds. Embryonic development is intimately tied to the actions of hormones. Thus, in utero exposure to hormones and endocrine disrupters can have life-long effects or even influence subsequent generations. Our model species is the guppy, Poecilia reticulata, a small freshwater fish. Choosy females generally
prefer brightly colored males, leading to phenotypic changes in populations due to sexual selection. Sexual behaviors are regulated by sex hormones, whose disruption can alter these behaviors. We are testing the hypotheses that in utero exposure to atrazine changes the sexual behavior of female guppies compared to control females. During behavioral trials, females were presented with a bright male and a dull male and data was recorded regarding how much time females choose to spend with each male. Data will be analyzed regarding differences in mate selection and differences in general interest towards males.

52. Scott Tracy  
Department of Biology  
Mentor: Stephen Testa  

*Effects of Temperature on Nucleotides for DNA Sequencing*

Sodium permanganate is a known indicator for DNA mismatches. This is used with a buffer solution and heat, and is tested with the four nucleotides of DNA: T, C, A, and G. The nucleotides react with the sodium permanganate and creates a color change. This color change occurs due to the change in oxidation state of the permanganate during the reaction. The color change is dependent upon the concentration and identity of nucleotide. In our lab, pyrimidines have been shown to provide a large color change. New conditions had to be found to cause the purines to react to a greater magnitude. The pyrimidines showed color change at room temperature, but the purines did not, therefore, temperature was the variable that was chosen to be changed. The temperature of the reaction was raised and the results show that at high temperatures, the purines react and change color as well. The pyrimidines react even faster than they do at room temperature, but not so fast that they cannot be quantified. The reaction rate is different for each rate, so at a given time, the four nucleotides will be different colors and have different quantitative values.

53. Michelle Tucker, Sonya M. Bierbower  
Department of Biology  
Mentor: Robin Cooper  

*The Effect of CO₂ on the Neural Circuitry of an Identified Behavior*

Carbon dioxide (CO₂), a necessary component of the earth’s environment, is universally found and impacts all organisms throughout their lifetime. Interestingly, although invertebrates and vertebrates are very different systemically, the effect of CO₂ is not. Crayfish serve as an excellent model to study the autonomic response, as these animals possess the complex ability to integrate sensory information and relay the information into motor output to target tissues. Through this motor output (i.e., locomotor activity, heart and ventilatory measures), we can assess the internal state of the organism. The effects previously identified in *Drosophila melanogaster* larvae were also shown in the crayfish with acute CO₂ exposure. While attraction to low levels of CO₂ has been documented in insects, this is a foundation study showing attraction/repellent behavioral responses in crustaceans. The identified effect (i.e.,
immobilization, cardiac arrest) is characterized by a cessation heart (HR) and ventilatory (VR) rates after approximately 10 minutes, a steady decrease in locomotor activity, as well as unresponsiveness to stimuli prior to HR and VR cessation. To identify mechanisms of action, we examined synaptic transmission (EPSPs) at the skeletal NMJ by introducing an excitatory neurotransmitter (glutamate). Results indicate that the anesthetic effect is characterized by a decrease in synaptic transmission resulting from CO2 induced glutamate receptor block; thus, this should be considered a paralytic effect. Due to glutamatergic insensitivity, the site of action was identified as post-synaptic at NMJs. Furthermore, to identify the effect of CO2 on chemical synapses within a complete circuit, the ‘sensory-ganglia-motor nerve-muscle’ of the abdominal superficial flexor muscle was used. Results show a reduction of neural activity from the CNS; therefore this research proposes a glutamatergic drive from the CNS to the motor nerve root.

54. Peter Wallenhorst  
Department of Biology  
Mentor: David Weisrock

Assessing Genetic Variability in the Babakoto Lemur, Indri Indri

Throughout the history of human habitation on Madagascar, numerous lemur species have gone extinct while many others remain endangered. Central to the extinctions and endangerments of numerous species of lemur is habitat fragmentation, which results in overcrowding and decreased habitat quality. In order to help guide successful conservation plans, current research is being conducted to investigate the relationships between habitat quality and lemur health. By quantifying lemur health at three different sites in Madagascar, a correlation may be found between decreased habitat viability, environmental stress, and human exposure. In order to corroborate the aforementioned research on a genetic level, this project investigates levels of genetic variation among lemur species and across populations in an attempt to provide more clues to the effects of habitat degradation and lemur health. The proposed hypothesis is that a correlation exists between levels of genetic variation and levels of lemur health. While decreased variation due to habitat fragmentation may result in greater vulnerability to disease, gene flow between populations may provide greater genetic variation that results in an increased immune response to disease. By genotyping approximately 10 to 15 microsatellite loci specific to Indri indri lemurs using samples obtained from three different localities, an idea of the gene flow and overall genetic variability among and between populations can be obtained. Ultimately, this data may be used to study correlations between genetic variation, habitat viability, and overall lemur health.
Chemical Engineering

55. Chris Barton, Nitin S. Satarkar, Samantha A. Meenach, Kimberly W. Anderson
Department of Chemical Engineering
Mentor: Zach Hilt

*Poly(ethylene glycol)-Based Hydrogel Nanocomposites with Iron Oxide and Single-Walled Carbon Nanotubes for Hyperthermia Cancer Therapy*

Since nanocomposites have been shown to have heating properties and biocompatibility, a variety of applications in medicine are possible, particularly in hyperthermia cancer therapy. Hyperthermia is a type of treatment in which body tissue is exposed to moderate temperatures (up to 45°C) to make cancer cells more sensitive to the effects of radiation and certain anticancer drugs. In this research, hydrogel nanocomposites are used to administer remote heating, which involves heating of the tumor sites using an external electromagnetic field to heat the hydrogel systems. Specifically, two types of hydrogel nanocomposites based on poly(ethylene glycol) (PEG), loaded with either iron oxide particles or single-walled carbon nanotubes, were fabricated via free-radical polymerization. Polymer-coated iron oxide nanoparticles have been shown to have immense heating properties and biocompatibility within the body. Carbon nanotubes are particularly interesting because they have been shown to enhance the mechanical properties of composites. Heating studies were done to see which composition of PEG and nanoparticles result in the optimal heating change. The nanocomposites were remotely heated via various electromagnetic fields to achieve surface temperatures in the hyperthermia range. Different particle loadings, combined with different power levels of the electromagnetic field, caused different heating results. In the future, the properties of these hydrogel nanocomposites will be further evaluated by examining the effect that varying loadings of the various particles have on heating properties.

56. Chelsie Bottom, Ashley Hawkins
Department of Chemical Engineering
Mentor: Zach Hilt

*RC Materials Based on Nanocomposite Sol-Gel Systems*

Remotely controlled (RC) drug release is a growing area of research for its biomedical applications and ability to alter drug releasing therapy after implantation. Thermosensitive block copolymer sol-gel systems are promising drug delivery vehicles for remotely controlled release because of their ability to go through temperature dependent solution-gel-solution phase changes. The phase transitions can be tailored by controlling factors such as solution concentration to create gelation upon injection of a polymer/drug solution into the body, trapping the drug. Through the incorporation of Fe₃O₄ nanoparticles that heat when exposed to an alternating magnetic field (AMF), the temperature of the system can be increased remotely to initiate the phase transition and resultant drug release. The release of a model drug from nanocomposite
polymer systems using polymers Pluronic F127 and a poly(ethylene oxide-b-propylene oxide) triblock copolymer upon AMF exposure is to be demonstrated. Phase diagrams for the studied polymers were determined through the test tube inversion method and specific systems were tailored to be in desirable ranges for in vivo purposes. As expected, the nanocomposite system proved to heat when exposed to an AMF. Drug release from the polymer was greater for samples in a near solution state than in the gel state.

57. Zhengwang (Lisa) He, Nitin S. Satarkar
Department of Chemical Engineering
Mentor: J. Zach Hilt

*Novel Nanocomposite Shape Memory Polymers*

Shape memory polymers (SMP) are a class of polymers that have the capabilities of actuating systems during their transition from a temporary shape to the permanent shape. In many systems, the shape memory effect (SME) can be stimulated by a change in temperature. Since direct heating may not always be applicable, nanocomposite systems that allow for the remote control of the heating have been developed. In these studies, the SMP that has been investigated is an epoxy-based system, and the nanoparticulates studied included iron oxide (Fe3O4) nanoparticles and esterified multiwall carbon nanotubes (CNT), which can be remotely heated in 300 kHz and 13.65 MHz radiofrequency (RF) fields, respectively. Different loadings of the nanoparticulates were incorporated into the SMPs to tailor their remote heating properties. FTIR, DSC, and DMA were utilized to determine polymer conversion and thermomechanical properties. Shape fixity and shape recovery ratios were calculated. In addition, a couple of potential applications of these systems were demonstrated.

58. Jenna Shapiro, Samantha Meenach, Dr. J. Zach Hilt
Department of Chemical Engineering
Mentor: Kimberly Anderson

*Characterization of PEG-Iron Oxide Hydrogel Nanocomposites for Combined Hyperthermia and Chemotherapy Treatment of Cancer*

Chemotherapy is a conventional cancer treatment that is still limiting for some types of cancer. Hyperthermia, the heating of cancerous tissues to 40-45°C, can increase the efficacy of some chemotherapeutics, specifically paclitaxel. It is hypothesized that iron oxide hydrogel nanocomposites can be used for a dual-therapy application to treat cancer. Hydrogels composed of the macromer poly(ethylene glycol) (PEG) methyl ether methacrylate and crosslinker poly(ethylene glycol) dimethacrylate were fabricated with iron oxide nanoparticles incorporated in the hydrogel matrix. These nanoparticles can be remotely heated by an alternating magnetic field (AMF), thus producing the hyperthermia effect. When imbibed with paclitaxel, the hydrogels have the potential to provide synergistic heating and chemotherapy in a local area. Swelling analysis indicated an inverse relationship between temperature and volume swelling.
ratio (Q), and between crosslinking density and Q. AMF heating of the hydrogel nanocomposites indicated higher crosslinked hydrogels exhibit a greater change in temperature. Specifically, the gel with the highest crosslinking experienced an average increase of 75.8°C, while that of the lower crosslinked gel was 40.2°C. A modified power law was used to analyze Fickian release from the gels and the lower crosslinked system released paclitaxel faster than the other systems. All hydrogels took approximately 36 days for complete release of the paclitaxel. Additionally, in vitro studies showed that lung carcinoma cells are more effectively killed with paclitaxel and heat versus either treatment alone. These results indicate an ability to tailor PEG-iron oxide hydrogel nanocomposite drug release and heating properties based upon changes in crosslinking density. Furthermore, these results support the use of these systems for combined chemotherapy and hyperthermia treatment applications.

59. David Spencer, Hariharasudhan D. Chirra, Dipti Biswal
Department of Chemical Engineering
Mentor: J. Zach Hilt

Functionalization of Gold Nanocomposites in Biodegradable Hydrogels

Agglomeration is a major issue in the functionalization of most nanoparticles. The swelling properties of biodegradable hydrogels in different solvents and its degradation in an aqueous medium can be harnessed to solve such agglomeration issues. Specifically, a biodegradable hydrogel matrix was synthesized in the presence of a gold nanoparticle solution to create nanocomposites. Degradation studies were conducted in PBS/water, and the swelling property of the matrix was also characterized in different solvents. Different reactions (e.g., initiator coating followed by surface initiated polymerization and biofunctionalization) were carried out over the particle surface. The change in the size of the gold nanoparticles with functionalization of the surface was determined using dynamic light scattering (DLS) and UV-Vis spectroscopy. Once the functionalization was completed, the modified gold nanoparticles were released through the degradation of the hydrogel matrix. The use of the degradable hydrogel matrix as the agglomeration inhibiting medium proves to be a simple yet powerful tool for carrying out reactions over various nanoparticles.

Chemistry

60. Nick Austin, Suresh Jayasekara
Department of Chemistry
Mentor: Robert Grossman

Synthetic Efforts Towards 7-epi-clusianone

Beginning with the discovery of penicillin and the synthesis of aspirin from salicylic acid, natural products have demonstrated wide-ranging uses in modern medicine. As a result, natural products are the focus of many synthesis projects and play an important role in contemporary
drug design. A better understanding of natural product synthesis may open new doors in pharmaceuticals and shed light on biological pathways of disease. The isolation of the natural product hyperforin from St. John’s Wort touched off the discovery of a group of biologically-active molecules called polycyclic polyrenylated acylphloroglucinols (PPAPs). Though synthetically-challenging, PPAPs pay dividends in biological activity, in some cases working as anti-microbial, anti-cancer, and anti-HIV agents. The target of this project is the total synthesis of 7-epi-clusianone, a PPAP which has shown promising activity against certain lines of HIV and cancer. This synthesis hinges on the Dieckmann condensation reaction in a molecule of moderate steric hindrance. Group members have investigated various routes to this molecule and has driven the synthesis to the point just before the critical Dieckmann reaction. Current work has concerns working up to this stage and eventually carrying out the critical step. The completion of this project will not only suggest a route to an important biomolecule, but it will also elucidate the chemistry of these structurally-complex substrates.

61. Elani Fourie, Bradley Newsome
Department of Chemistry
Mentor: Leonidas Bachas

Toxicological Study of PCB-nanoparticle Complexes

Nanoparticles are used in many industries including medicine, environmental remediation, and engineering. The cytotoxicological effects of these materials are increasingly coming into question. In nature, they are predominantly found in soil or are airborne. Due to their small size, nanoparticles are able to pass through cell membranes both actively and passively. Polychlorinated biphenyls (PCBs) have also been abundantly produced and, due to their long-term stability, have accumulated in the environment, resulting in a 1970s ban on their production. Due to the hydrophobic nature of PCBs, they tend to preferentially accumulate in mammalian adipose tissue instead of entering other cells. We hypothesize that nanoparticles may serve as carriers to introduce PCBs into cells and that this complex may have increased cytotoxicological effects. PCBs were adsorbed onto polystyrene and alumina nanoparticles. Adsorption was confirmed by GC-MS analysis and size analysis was conducted using dynamic light scattering (DLS). Cell viability of alveolar endothelial cells was studied to determine cytotoxicity as compared to nanoparticles and PCBs alone. Continued testing with a bacterial cell model will help determine additional environmental effects of these PCB-nanoparticle complexes.
62. Rawad Hallani  
Department of Chemistry  
Mentor: John Anthony

**Soluble Functionalized Pentacene for Organic Solar Cells**

Soluble functionalized pentacene have recently become a target for intense study as organic semiconductors because of their high mobility and their unique intermolecular interactions. It has been reported that 6,13-bis-(triisopropylsilylethynyl) (TIPS)-pentacene showed a high hole mobility in organic thin film transistors. The HOMO-LUMO energy levels of the TIPS pentacene can be tuned by adding electron withdrawing group and electron donating group on the pentacene chromophore. Chlorine was used as electron withdrawing group to lower the LUMO level of the TIPS pentacene so it can be used as an acceptor in P3HT solar cells. Similarly, trifluoromethyl was used as an electron withdrawing group for the same purpose, but the 2-CF3-offset TIPS pentacene was also designed to allow a better π-overlapping. The molecules’ behavior in solar cells and their mobilities in transistors were reported along with its crystal packing, and energy levels that were measured using cyclic voltametry.

63. Jeremy Maynard  
Department of Chemistry  
Mentor: Stephen Testa

**Quantifying the Color Change of Sodium Permanganate and DNA Nucleotides**

The color change of DNA nucleotides has been noted in previous research. However, the color change of permanganate during the oxidation of the DNA nucleotides has not been reported. Each of the permanganate nucleotide oxidations was evaluated using a digital camera and analyzed with Adobe Photoshop. As a preliminary study, the reactivity of each nucleotide in EFTB was calculated using Lab color values. This calculation gives reactivity as the value Δ. The reactivity based on Δ of each nucleotide from least reactive to most reactive was found to be adenine, guanine, cytosine, and thymine. The relationship between color change and time were observed, and the optimal time to distinguish the color change of each nucleotide was at 30 min. Using this time, the repeatability of obtaining the same Δ for a reaction was investigated to find the validity of this reaction analysis method. The results showed that Δ is a reliable method to represent the nucleotide interactions with permanganate. Pyrimidine mixtures were also analyzed, and a relationship between the solution composition and the color change was found. It was shown that the experimental Δ of a mixture matches the theoretical calculated Δ for a mixture. Therefore, Δ of a mixture is predictable based on the Δ of single nucleotide solutions.
64. Jenny Ross  
Department of Chemistry  
Mentor: Stephen Testa  

*Reducing the Amount of Solution Necessary to Perform the Permanganate/DNA Reaction*

The reaction between DNA and permanganate has proved very useful in research as it produces an exact color change from purple to yellow. However, currently the reactions require the use of at least 1mL of solution. Many reactions are performed each day, and these trials quickly use large volumes of permanganate, buffer, and DNA. Thus, the goal of my research is to reduce the amount of solution needed to perform this reaction, eventually down to microscopic amounts. The color of such microscopic reactions must be analyzed carefully in order to ensure that it is in fact the exact same color change that occurs with larger volumes. Specifically working with thymine and sodium permanganate, reactions in volumes as small as 10uL have produced visible color changes. Careful analysis of this small volume will lead to a reduction in the amount of materials needed for each trial. This will allow for more reactions to be performed at the same time as well as eliminate the majority of the waste produced from these reactions.

65. Avery Shaw, Suresh Jayasekara  
Department of Chemistry  
Mentor: Robert Grossman  

*TriButylTin Hydride Producing Hydrogenation Rather than Hydrostannation*

Hydrostannation of alkynes has been used for years for metal chemistry and reducing Alkynes. Hydrostannation occurs when an alkyne is reacted with tributyltin hydride and palladium catalyst to yield the tributyltin on one carbon and the hydrogen on the other carbon; this reaction results in a syn addition across the triple bond. However, a unique reaction occurred when a sterically hindered alkyne aldehyde was placed in the normal reaction conditions (completely in a nitrogen environment, dry THF as a solvent, 0 degrees Celsius). Instead of the expected syn hydrogenation across the triple bond (with the tributyltin on the beta carbon and the hydrogen on the alpha carbon), the reaction yielded syn hydrogenation across the double bond (a syn addition of hydrogen atoms across both carbons of the alkyne). The project of Dr. Grossman’s group is to investigate the cause of the unique reaction. Firstly, steric effects were decidedly the most probable explanation to the phenomenon. Also, the original molecule contained a ketone and an allyl group near the reactive center of the alkyne; thus, electronic effects could also have played a role in the strange reaction. Another interesting note about the hydrogenation reaction of tributyl tin in the presence of an alkyne aldehyde is where the other hydrogen atom is coming from. Tributyltin hydride only has one hydrogen atom to donate to the alkyne; therefore, the other hydrogen atom either came from water in the air or THF, or the alkyne is reacting with another equivalent of tributyltin hydride, which is incredibly unlikely because only 1.2 equivalents are used in the reaction. However, the mechanism of the reaction can only be identified once the cause of the hydrogenation is discovered.
Computer Science

66. Michael Delfino, Matt Hudgins, Scott Sutherland
Department of Computer Science
Mentor: Jerzy Jaromczyk

Three Video Games -- Three Goals and Technologies

Playing games is entertainment, enjoyment and fun for many, but a waste of time for others. However, developing video games is a highly advanced activity that involves sophisticated technologies, algorithms, ideas and creativity. Three different types of video games and technologies behind them are demonstrated. The first game, Tetrominoes is a multiplayer falling blocks game similar to the classic Tetris. The game is played over a network. Making networked multiplayer games forces the programmer to think about the minimal amount of information to send to another computer so both players are always aware of the state of the game. The second game, Hex Wars, is a strategy-based game played against increasingly more sophisticated Artificial Intelligence algorithms. It is developed for the iPhone. The development requires considerations for limited screen and other limiting factors related to the iPhone. The third game, Ythin, is unconventional. The intended purpose is to surprise the player, encourage exploration and convey story and themes via gameplay mechanics rather than dialogue and intro scenes. All the games are original developments.

67. Matt Hudgins
Department of Computer Science
Mentor: Jerzy Jaromczyk

Ythin

Ythin is a unique exploration platformer game I had developed with intentions to experiment with game design theory. Many games today attempt to convey meaning or tell a story via dialogue, text, or cut scenes, a way to emulate film. Much like film originally attempted to emulate theater before taking advantage of the unique abilities of the medium itself. In Ythin, I attempted to convey meaning via the gameplay mechanics themselves. Also I wanted to surprise the player, and give him environments he/she is used to before shattering what they had believed to have been real.
68. Kyle Kolpek, Matt Field  
Department of Computer Science  
Mentor: Brent Seales  

*Enhanced Digital Unwrapping for Conservation and Exploration (EDUCE)*

The goal of the EDUCE project is to develop a system that will virtually unwrap and visualize ancient scrolls. Funded by the National Science Foundation, the project uses X-ray computed tomography to gather the necessary data from the interior of the scroll and then process it using imaging algorithms. The result is a digital rendering of the document that allows the structure to be analyzed and the text to be read without causing any damage to the document. The eruption of Mt Vesuvius in 79AD buried the towns of Pompeii and Herculaneum under volcanic ash. Excavation in Herculaneum revealed an extensive library of papyrus scrolls, carbonized by the pyroclastic flows of the erupting volcano. The fragile remains of these surviving scrolls are held in collections in Italy and France. Though preserved by volcanic ash, they were not immediately recognized as scrolls, resulting in many being incidentally destroyed. Of those that remained, there was a struggle to analyze the contents of the scrolls. The most common method was physically cutting the scroll to the core and attempting to piece together the layers, a method that yielded limited results and destroyed the scrolls in the process. By bringing the technology of the EDUCE project to the Herculaneum scrolls we have a method to analyze the scrolls that is almost completely non-destructive. The three-dimensional views of CT imaging allow the individual layers inside the scrolls to be seen, and computer simulations can then virtually unroll them. This gives a more complete model of the scroll while at the same time leaving the scrolls in a state where they are able to be worked with in the future.

69. John Rigney  
Department of Computer Science  
Mentor: Jerzy W. Jaromczyk  

*Bots Playing Games Not Always on Your Behalf*

Repetitive computer work can be automated saving time and hundreds of manual clicks. It is done with automation scripts, or bots. This project demonstrates how bots are applied to various areas of tedious computing (automating data entry for legacy software -- or proprietary software). Bots for playing World of Warcraft, a popular online video game, are used as an example to give technical overview of technologies behind automated scripts: hooking the game client, loading a driver, key injection, etc. Since bots can, unfortunately, be used for annoying or malicious tasks, for example spam, ethical and computer security issues are also addressed.
Discovery Seminar Program

70. Taylor Moak, William Baldon, Samuel Forman, Jimmie Welch, Sarah Jones, Brooks Laimbeer, Dean Johnson  
Discovery Seminar Program (DSP)  
Mentor: Buck Ryan

*Citizen Kentucky: Journalism and Democracy*

For the first time in Kentucky’s history, citizens will vote in two contested primary elections for the U.S. Senate. Young voters, who turned out in record numbers for the 2008 presidential election, may decide the fate of Kentucky’s election. A case study of young voters, ages 18 and 19 and enrolled in a Fall 2009 freshman Discovery Seminar at the University of Kentucky, revealed four key factors in their coming to public judgment about which candidate to support in the U.S. Senate race in Kentucky. These factors are: personal contact, perception of a candidate in a public forum, passion about issues pertinent to students, and willingness of a candidate to appear at public events. Curiously, the stated party affiliation of a student was not a key determinant in the young voter’s choice, and while students spoke of the importance of news coverage, they often were found not to be following the news. Young voters could not vote in national elections until ratification of the 26th Amendment in 1971, and the presidential election of 1972 retains the highest percentage of voter turnout for that age group. Now, the fate of the six Republicans and five Democrats running for the U.S. Senate in Kentucky to replace Sen. Jim Bunning (R-Ky.) lies in the hands of voters, including young voters. Whoever wins the primary elections on May 18, 2010, will face off on Nov. 2, 2010, in the general election, which will not only affect the future of Kentucky, but of the nation itself. Currently, the Democrats control the Senate majority, 59-41, and Kentucky is deciding one of the 36 seats being contested in Election 2010. Young voters are expected to be influential in the final election outcomes and researchers studying young voter trends will find the case study findings valuable.

Electrical Engineering

71. Mamoon Khattak, Chen Hanling, Li Qianqian  
Department of Electrical Engineering  
Mentor: Vijay Singh

*Solar Car: Maximum Power Point Tracker*

There seems to be a never ending demand for energy but a limited supply of it which has resulted in the search for other forms of energy. There are other factors such as price and environmental pollution that are also contributing to this search for other forms of energy. Solar energy is one such form of energy that is being looked into. Using solar panels and photovoltaic cells, it is possible to harness energy from the sun to produce electricity. The same technology is being used by the Solar Car Team at the University of Kentucky. The problem faced by the Solar Car Team is that the energy absorbed by the solar panel is not being utilized to its optimum potential.
This means that the solar car battery is not able to obtain the maximum power possible from the solar panels. This is because the panels and the battery operate at different voltages and, when connected, the panel has to operate at a battery voltage, which does not result in maximum power production. One way of solving this problem is to use a Maximum Power Point Tracker that allows the panel to operate at its maximum voltage resulting in maximum power production. A Maximum Power Point Tracker (also known as an MPPT) can be obtained off the shelf. MPPTs purchased off the shelf have an efficiency of up to 96%-97%, but tend to be very heavy and expensive. The price range starts at $1000 and the weight is about 0.7 kg. The purpose of this project is to make an MPPT that is cheaper (up to $500) and lighter compared to those off the shelf MPPT’s. The efficiency of the constructed MPPT made would be slightly lower than the ones purchased (92%-93%), but the decrease in efficiency should not affect the performance significantly. In fact, this project might improve overall efficiency due to the decrease in the weight of the car and the total cost involved.

72. Daniel Legg, Haitao Yang, Shawn Maynor, Jeremy Metcalf  
Department of Electrical Engineering  
Mentor: Regina Hannemann

Robot Soccer Team

In an effort to perform additional research in the areas of robotics and artificial intelligence, the RoboCup Robot Soccer League was created. The Small-Size Robot League is a division of RoboCup that plays soccer using 2 autonomous teams with 5 robots per team. The robots must fit within certain size and performance guidelines to be qualified for the Small Size League. For this project, the team plans to build a strong foundation towards building a full robot soccer team to compete in the Small-Size League by building one robot that can perform the basic tasks required to play soccer. The robot will be built within the guidelines of the Small Size league and the hardware and software used will be built in a way that it can be expanded for additional robots so that future teams will be able to build on the design of this one robot.

73. Tyler Prouty, Richard Jones, Corey Carrico  
Department of Electrical Engineering  
Mentor: Regina Hannemann

Meteor Detection

The Department of Physics and Astronomy at the University of Kentucky would like to acquire an automated radio meteor detector, as well as build a public display. However, there are no commercially available meteor detectors and all of the available prototype designs require an operator to function. To solve this, we will create a forward scatter detector using an existing television broadcast signal. The fundamental principal of forward scatter is quite simple. A receiver that is far enough away from a given transmitter (about 300 mi), and is unable to receive its transmissions, due to the curvature of the earth except when a properly positioned meteor is
present. As a meteor pushes its way through the atmosphere it creates a trail of ionized particles. We will base our hardware design on an example detector made by the Meteoroid Environment Office of NASA. The software needed to automate the data collection, analysis, organization, and storage will be created and thoroughly tested. The system will be designed with future expansion in mind, and will also share the acquired data on various websites. The creation of standardized data sets collected from multiple detectors would allow for that data to be combined, calculating more accurate statistics. These statistics could then be combined and used to calculate other information about meteors like height, size, and speed.

Entomology

74. Mark Adams, Eric Chapman
Department of Entomology
Mentor: James Harwood

Molecular Identification of Interaction Pathways Between Carabid Beetles and Slugs in Alfalfa

Global trade facilitates the intercontinental movement of cargo and thus increases the potential introduction of exotic gastropods to new areas of the world. Hence, there is a growing need to understand ecological interactions of newly introduced species with the native fauna. Furthermore, exotic slugs are of particular concern because yield losses to commodities planted throughout much of the continental United States are high, states such as Kentucky, whose humid climate typically supports a high density of these species, have significant acreage of farmland planted to crops at risk of damage including alfalfa, soybean, wheat and corn. Given these concerns and the high density of endemic natural enemies inhabiting these agro-ecosystems, it is essential to examine the mechanisms of predation, decipher the strength of interaction pathways and evaluate the role of predators in biological control. In 2008, over 1,000 specimens of three species of ground beetles (Carabidae) were collected from alfalfa and screened by a polymerase chain reaction using species-specific primers to identify the presence of DNA of the exotic slug Deroceras reticulatum. Feeding trials indicated that slug DNA was detectable in predator guts for approximately 12 hours and, significantly, during the month of June, 5% of Harpalus pensylvanicus, 25% of Scarites quadriceps and 5% of S. subterraneus specimens screened positive for D. reticulatum DNA. Drought conditions thereafter likely caused slug predation rates to decrease as their availability to epigeal predators declined. This research has enhanced our understanding of complex and emerging slug-carabid interactions in North America and provides a valuable framework for future efforts in conservation biological control.
75. James Baulding  
Department of Entomology  
Mentor: Subba Pali  

*Insulin Signaling Pathways Regulate Male Beetle Reproduction and Behavior*

Insulin signaling pathways play key biological roles in growth and development, reproduction, stress resistance, metabolism, and lifespan in many different organisms. The research findings over previous decades indicate that peptides exist in insects with the same structure and function as insulin in mammals. Research is being conducted to understand insulin-like peptides (ILPs) in the red flour beetle, *Tribolium castaneum*. This beetle is a notorious pest of stored grains and has developed resistance to most insecticides used to manage their population size and is therefore, becoming increasingly difficult to control. It is hypothesized that these insulin signaling pathways regulate male beetle reproduction and behavior. RNA interference (RNAi), a technology used to target-specific silencing of genes, was used to silence the expression of genes coding for insulin pathway genes in male beetles. These RNAi male beetles were then mated with virgin females. The females mated with ILP RNAi injected males produced a significantly lower number of eggs when compared to the eggs laid by control female beetles mated with control male beetles injected with double-stranded RNA produced using the bacterial *malE* gene as a control. This study indicated that insulin pathway genes including ILPs play important roles in regulation of reproduction and development in this organism. Given the diverse and central functions of insulin signaling via ILPs, a deeper understanding of their physiological roles in reproduction of invertebrate (insect) ILPs, and the mechanisms by which they achieve them, will address additional insight on the functioning of this system in mammals.

76. Philip Houtz, Juliane Deacutis  
Department of Entomology  
Mentor: Bruce Webb  

*Persistence of Campoletis sonorensis Ichnovirus in vivo and TAIL PCR Method in Junction Site Determination*

Polydnaviruses (PDVs) are a group of insect viruses that reside within certain parasitoid wasps. When parasitizing, these wasps inject PDV, together with an egg, into caterpillar hosts. The PDV suppresses the caterpillar's immune system thus allowing the wasp egg to develop. PDVs share an intimate relationship with their wasp host; they do not replicate outside of the wasp body and their genome is stably integrated into that of the wasp. The relationship of the PDV with the caterpillar host, however, is supposedly transient, and the genome persists only as circular segments. This view was challenged when certain polydnavirus segments were found to persist in PDV-exposed lepidopteran cells, by stably integrating into their cell genome. To explore this phenomenon in vivo, we injected fourth-instar *Heliothis virescens* moth larvae with the *Campoletis sonorensis* ichnovirus (CsIV), raised them to adulthood and screened for the presence of eleven CsIV segments, using PCR. Ten out of eleven segments were detected in at least one adult. One detected segment, G2, was analyzed for its integration site in the wasp genome.
genome, precursory to integration site analysis in injected lepidopterans. We seek to completely describe the integration patterns of all CsIV segments that persist in whole organisms. The characterization of such integrating DNA molecules can be directly applied to medical and biotechnology fields in areas such as gene therapy and transfer.

Forestry

77. Christina Kuchle
Department of Forestry
Mentor: Mary Arthur

Effect of Bush Honeysuckle, an Invasive Plant Species, on Mycorrhizal Growth in Native Tree Species

Bush honeysuckle (Lonicera maackii) is an exotic invasive plant that inhibits the growth of native plants that have significant ecological, cultural, and economic importance to Kentucky. This project investigates the hypothesis that bush honeysuckle will inhibit the symbiotic relationship between mycorrhizae and native tree species with potentially negative consequences to tree seedling growth. Using three tree species native to the Inner Bluegrass Physiographic Region, mockernut hickory (Carya tomentosa), shellbark hickory (Carya laciniosa), and pawpaw (Asimina triloba) and four soil treatments collected from Central Kentucky, we tested the effect of soil with and without the influence of bush honeysuckle on mycorrhizal infections. Soil was collected underneath honeysuckle plants (bush honeysuckle soil) and in areas with native vegetation (non-bush honeysuckle soil). Tree seeds were planted in ‘bush honeysuckle soil’, ‘non-bush honeysuckle soil’, and the same soils sterilized to minimize soil biota to provide a basis of comparison in the level of mycorrhizae infection. Tree seedlings grew for four months after germination to allow adequate colonization by mycorrhizae. After the growth period, trees were harvested, carbon allocation data from roots, stems, and leaves were taken on each tree, and fine roots were clear stained for mycorrhizal enumeration. Although the project is still in progress, preliminary data indicates a significant difference in total root mass among soil treatments. Root mass of seedlings grown in non-bush honeysuckle soils were significantly greater than the bush honeysuckle soil treatments. Seedlings grown in sterilized bush honeysuckle soils also had a larger average root mass than non-sterilized bush honeysuckle soils, possibly indicating changes in soil biota as a result of bush honeysuckle influence.
History

78. Allison McVey
Department of History
Mentor: Karen Petrone

*Life According to Tolstoy*

Each person lives his or her time on earth, whether knowingly or not, with a belief on what life is. This topic of what life is made of and what is truly important in life is an issue that has been discussed by many prominent and influential people throughout the ages. One such person is Leo Tolstoy. Leo Tolstoy was a nineteenth century Russian author who wrote a variety of novels and essays that garnered considerable acclaim. Tolstoy is considered by many to be one of the most prolific and wide-ranging novelists of modernity; the effects of his life and work can be seen not only in literature but also in the spiritual part of the human psyche. What then did such an influential person believe about life? What did he hold to be the most important and meaningful aspects of human existence? This research attempts to answer these questions through an examination of Leo Tolstoy’s life and writings, as well as critical work done on Tolstoy and his writings. The influence Tolstoy’s life had on the spiritual and political aspects of Russian society in the nineteenth and twentieth centuries will be looked at, as will the effect he had on the writing and artistic community during the same period.

Interior Design

79. Meaghan Boenig
Department of Interior Design
Mentor: Megan Shaw

*The White Road to a Cooperative Community*

This design integrates science with a passion for Guatemala, its history, and its culture. Biomimicry has been defined by scholars as “a new science that studies nature’s models and then imitates or takes inspiration from these designs and processes to solve human problems.” In nature, dissimilar organisms function together in a cooperative manner known as symbiosis and mutualism. The Buffalo coexists with the Oxpecker bird in a mutually beneficial relationship. This concept can be applied in the design process to create functional buildings that improve the human condition in developing nations. The Central American country of Guatemala has an ancient and rich Maya history. Today, 43% of Guatemala’s population are indigenous Maya, who are often under-educated, subsistence farmers. Utilizing the science of biomimicry, this design creates a community development center that brings together resources to create economic independence through farming, educate the population, and provide healthcare in a cooperative community setting. Inspired by Maya hieroglyphs, temple design, and culturally significant colors, the community center is constructed of natural and recycled materials that would normally end up in Guatemala’s overflowing landfills. Using nature’s models to create a
cooperative community space helps provide a link to Guatemala’s past while building and protecting resources for its future.

80. Veronica Polinedrio  
Department of Interior Design  
Mentor: Megan Shaw

*Lympha*

The Italian city of Venice has been considered since Roman times the most serene and dominant Republic of the Mediterranean. Its magnificence is an international treasure and its urban planning a marvel of Biophilia Design. In the past centuries, Venice has been facing catastrophic consequences caused by Global Warming and the consequent phenomenon of Eustasy. During the rising tide, polluted seawater flows into Venice and the surrounding lagoon from the Adriatic Sea, damaging the historical and artistic components as well as the supporting structure of the city itself. The so-called Mo.S.E. Project (Experimental Electromechanical Module) has been instituted to compromise with the problem resulting in a three decade long project that has not yet ended, and that brings up further questions about the effectiveness of the entire system. This new project, named Lympha, investigates a new method and strategy to answer the issue of inundation in the Venetian Lagoon. Lympha is a system based on the emerging discipline of Biomimicry, which intends to study the way organisms naturally function and apply such processes to human living and design. It is an alternative proposal to the Mo.S.E. that approaches a sustainable method to safeguard the city of Venice from the rising tides. Lympha emulates the pumping and cleansing coordination of the cardiovascular system in the human body, while mimicking the motion of deep-sea sponges in propelling water through their body. It works in conjunction with wind and solar energy to filter contaminated seawater through a series of connecting pipes located on the bottom of the lagoon. Once cleaned, the uncontaminated water is pushed to a sequence of fountains that create visual interest and provide way finding to boats. Lympha is an environmentally friendly solution that continues the process of beautification of the city of Venice.

81. Ainsley Wagoner  
Department of Interior Design  
Mentor: Sarah McNabb

*Unfurl: Using Biomimetic Processes in Interior Design*

Unfurl uses the inherent processes of nature and the existing conditions of a boutique hotel to create an unforgettable artistic experience that both inspires and educates. Boutique hotels today strive to both achieve sustainability and to give their guests an unforgettable aesthetic experience. Without using any extra energy or resources, Unfurl taps into the existing grey water usage in a hotel to create a dynamic color-changing entrance wall. Unfurl is a beautiful artistic statement, but it also is thought provoking for guests. It fosters awareness of energy and resource usage by provoking an awareness that water doesn’t just go away, but that
many individuals make up a very large whole. The building’s filtered grey water is channeled to shelves that are attached to the back of gradient-colored cylinders, out of sight from the public. As the shelves fill up with water, the weight of that water pulls the shelf down, and the movement of each shelf rotates its particular cylinder to reveal a different section of color. Tiny holes in the bottom of each shelf allow the water to accumulate and drain out slowly to the next shelf below so the change in color is gradual and never abrupt. Inside each cylinder, there is a weight to ensure a ‘home’ position for the entire wall. If the back shelves are empty, the cylinders will all return to their home position. Once the filtered grey water makes its way down through the shelf network, it can be collected to water hotel plants or support a green roof. The unfurl wall challenges the standard that something can only be used once, and makes post-use resources beautiful and unique.

International Studies
Jenna Brashear
Department of International Studies
Mentor: Karen Petrone

Memorialization in Contemporary Berlin: Lessons from the Neue Wache and the Holocaust Memorial

The city of Berlin’s history is particularly rich and complex, and one physical outcome of that nuanced background is the rich memorial landscape. Walk down the famed Unter den Linden, for example, and you will see the iconic statue of Frederick the Great as well as the Neue Wache, or New Guardhouse, which has served the memorial needs of changing German regimes since World War I. Mere footsteps from the original location of Hitler’s Bunker, stands the Holocaust Memorial. My project details the histories, debates, and controversies of the Neue Wache and the Holocaust Memorial, which both memorialize events of World War II, and uses that background to illustrate the ways in which memorialization is more valuable as a process than strictly an event that manufactures a monument. The flaws of the physical medium are shown in the sharp contrasts between the two memorials, and these lend themselves as well to the emphasis given to the total process of memorialization and the necessity of broader involvement from all corners of society. In the memorialization processes of these two sites, special attention is given to acts of collective remembrance — including protests and vandalism—that enable a diverse cast of social players to invest these structures with rich and disparate meanings.
Linguistics

82. Josh Cason  
Department of Linguistics  
Mentor: Andrew Hippisley

DATR Language Generation in Classical Greek

The DATR programming language was developed for the purpose of describing the morphology of natural languages in a computable and concise way. It incorporates default inheritance. Each lexical root inherits its various morphological forms from a hierarchical theory of classes. This allows a linguist to develop a lexicon where the majority of the entries are quite short. New entries in the lexicon are added almost effortlessly. There are theoretical as well as practical applications to such an implementation. Perhaps, the most relevant application will be to teachers and students of Greek. A morphological theory of Greek, extending my noun theory, could serve as part of a back end to a comprehensive drilling program for students. Furthermore, it could also serve as a basis for software to generate test questions for teachers. Linguists will also find DATR appealing for its elegance in theory development. In the presentation, some of the abstract properties captured in the theory as well as some theoretical conclusions will be shown. The shape of this theory is very different than the standard three declensions. In addition, the presentation will illustrate how the mechanisms of DATR make the task of hypothesis testing and refinement much simpler for field workers modeling undocumented languages. This work was supported by an undergraduate research grant from the University of Kentucky for the summer of 2009.

Mechanical Engineering

83. Anthony Karam, Loretta Kwan, Elijah Brown, Olivia Overall, Jiawei (Derek) Liu, Edison Beh  
Department of Mechanical Engineering  
Mentor: Keith Rouch

Earth Saver: Autonomous Waste Sorter

This year, six University of Kentucky students will enter the 2010 ASME Student Design Completion: Earth Saver: Autonomous Material Sorter. Participants compete to build, and test an autonomous system capable of sorting common recyclable materials, namely tin-coated steel, aluminum, plastics, and glass containers into their respective waste bin. Points are awarded and deducted based on identification, weight, and time. Top placing teams compete in the national level in the following November. All teams create their own Autonomous Waste Sorter (AWS) with the following constraints. Firstly, the system must operate autonomously and be capable of both material identification and waste handling. Secondly, the AWS must be powered by readily-available, over-the-counter, dry-cell, rechargeable batteries. Thirdly, the AWS must have a readily accessible, clearly labeled master shutoff switch. Fourthly, the AWS must be deemed
by the judges to be safe. Any system deemed at the judges’ discretion to be unsafe will be immediately disqualified and not allowed to participate in the competition. Lastly, the AWS must fit within a container measuring, on the inside, 340 x 580 x 400 mm. The AWS must fit within this box fully assembled. Any expansion or extension of the AWS must be done autonomously by the system itself during the competition run. Two noticeable problems when creating AWS are the AWS’s dimensions and the wastes’ variability (unable to test recyclables based on weight or visuals). Fortunately, the four materials each have their own frequency spectrum for acoustic identification. Accuracy increases through additional tests, such as autonomous voting and metal detection. Once identified, a 100mm diameter test tube — holding the waste — will move in one of four different directions to drop the recyclable material into its proper bin.

Microbiology, Immunology, & Molecular Genetics

84. Hannah Bryant, Christina C. Nelson
Department of Microbiology, Immunology, & Molecular Genetics
Mentor: Sarah D’Orazio

Role of M2 in Antigen Presentation to CD8+ T Cells During Listeria monocytogenes Infection

Foodborne infection with the Gram-positive, intracellular bacterium *Listeria monocytogenes* (*Lm*) is of great concern in the human population because of the high mortality rate associated with listeriosis. Specific CD8+ T cell responses are necessary to fully eliminate *Lm* infection, and the CD8+ T cells activated in response to *Lm* infection recognize antigens bound to both MHC-Ia and MHC-Ib proteins. These antigens are peptides derived from the bacterial proteins and are presented by MHC-Ia and MHC-Ib molecules on the surface of dendritic cells and macrophage-like cells. Previous studies using MHC-Ia deficient mice show that the presence of MHC-Ib proteins alone is sufficient for clearance of either primary or secondary *Lm* infections. The goal of this study is to identify novel MHC-Ib molecules that are capable of presenting antigen to memory CD8+ T cells since these antigens would be good candidates for inclusion in a vaccine to protect against *Lm*. In this study, we tested the hypothesis that one such protein, called M2, is capable of presenting *Lm*-derived antigen to CD8+ T cells. Two versions of the murine M2 gene were subcloned into a mammalian expression vector: full length M2 and an M2/Qa-2 (M2Q) fusion protein. The M2Q construct was transfected into the human monocyte-like cell line THP-1. Additional studies to characterize the surface expression of M2Q protein and determine whether *Lm*-specific T cells can recognize this protein will be described.
85. Roaa Jarrar, Maria Bruno
Department of Microbiology, Immunology, & Molecular Genetics
Mentor: Charlotte Kaetzel

*Induction of Pro- and Anti-inflammatory Genes in Intestinal Epithelial Cells by Probiotic and Pathogenic Strains of E. coli*

The human colon is home to 100 trillion bacteria. Intestinal epithelial cells (IECs) prevent inflammation by functioning as a barrier between the bacteria and the underlying immune cells. IECs respond to bacteria in the colon through pattern recognition receptors (PRRs) including the Toll-Like Receptors (TLRs). Each TLR recognizes a different bacterial cell constituent, such as peptidoglycan (TLR2), lipopolysaccharide (TLR4), flagellin (TLR5), and bacterial DNA (TLR9). *E. coli* Nissle (EcN) is a probiotic strain of *E. coli* that has been shown to improve symptoms in patients with inflammatory bowel disease. *E. coli* LF82 (EcLF82) is a pathogenic strain of *E. coli* that exacerbates intestinal inflammation. It was hypothesized that expression of pro-and anti-inflammatory genes are regulated by *E. coli* in IEC through TLR signaling. To test this hypothesis, gene expression was analyzed in different human IEC cell-lines (CaCo-2, HT-29, and LS174T) that differ in their patterns of TLR expression. Cells were cultured for 3 or 24 hours in the presence or absence of EcN or EcLF82, and mRNA levels were analyzed for a pro-inflammatory gene (IL-8) and an anti-inflammatory gene (PIGR). Both strains of *E. coli* induced expression of IL-8 in all three cell-lines, and induced expression of PIGR in 2 of the 3 cell-lines. The extent of gene induction varied with the baseline levels of IL-8 and PIGR expression and the pattern of TLR expression. However, no significant differences were observed between EcN and EcLF82 in their ability to induce gene expression in IEC. In conclusion, *E. coli* appears to be an important regulator of gene expression in IEC, but the differential effects of probiotic and pathogenic strains on intestinal inflammation may be due to other causes, such as the ability to penetrate the epithelial barrier and stimulate immune cells.

Molecular & Biomedical Pharmacology

86. Laura Feder
Department of Molecular & Biomedical Pharmacology
Mentor: Oliver Thibault

*The Neurological Effects of Insulin and Glucose on the Brain Correlating With The Development of Type II Diabetes and Alzheimer's Disease*

Alzheimer’s Disease and type II diabetes are becoming more prevalent in the world today. Countless people’s daily lives change when encountering a diagnosis of either one of these diseases. Even though treatments have been described that can prevent or delay the seriousness and onset of each of these diseases, a cure has yet to be found. Alzheimer’s disease is a form of dementia that affects the brain, weakening learning and memory functions through effects on the hippocampus. Some forms of dementia are caused by the loss of neurons in the brain. It has been hypothesized that there is a link between developing diabetes and experiencing memory
difficulties. This idea could be linked to the fact that the neuron cells depend on glucose for energy and survival, and diabetes is a disease of glucose deregulation. However, if one’s body is insulin resistant, as found in a type II diabetic, then the glucose is not able to enter the neuronal cells, causing them to eventually die without their main source of energy. As the number of dying neurons raises, the loss of memory, difficulty learning, and in extreme cases, dementia increases as well. However, recent reports have indicated that intranasal insulin allows one to retain information for a longer period of time. Research has been conducted locating the insulin-sensitive glucose transporter (GLUT-4) on the membrane of hippocampal neurons in culture. The goal of this study is to monitor the movement of the GLUT-4 when insulin is present, which should allow us to better understand the beneficial mechanisms associated with intranasal insulin. In addition, glucose and insulin tolerance tests were accomplished on aging rats to test their glucose and insulin sensitivity. Future experiments will measure the impact of diet induced type II diabetes on memory function.

Molecular & Cellular Biochemistry

87. Eric Gilland
Department of Molecular & Cellular Biochemistry
Mentor: Young-In Chi

Type Gene Regulation: X-Ray Crystallographic Structure Determination for FoxO 1 Forkhead Protein

FoxO 1 is a forkhead — protein family with multiple heads — protein transcription factor (PTF) that plays a key role in the synthesis of glucose-6-phosphatase (G6Pase). G6Pase operates in the metabolic degradation of glycogen into glucose. Because of its vital role in various metabolic pathways, mutations in the gene that encode the FoxO 1 (PTF) lead to fetal death in animals. This project used X-Ray Crystallography for structure determination of FoxO 1 in complex with — bound to — DNA to better understand the molecular mechanism of its target (G6Pase) gene recognition. Crystal structure determination is a multi step process involving protein/DNA sample preparation, protein/DNA complex crystallization, data collection and analysis. Standard methods of molecular biology and recombinant protein production were employed to obtain large quantities of the FoxO 1 (PTF). These proteins were purified using an affinity tag that utilizes chromatography methods. FoxO 1 was combined with DNA constructs and subjected to multiple crystallization screenings. A vapor diffusion method was applied for complex crystallization to produce diffraction quality crystals of FoxO 1 with one of the DNA constructs. The X-Ray diffraction data was collected at a synchrotron radiation facility and the structure was determined upon analysis. The structure was determined by molecular placement using the already known homologous forkhead structure as a search model. The refined structure of FoxO 1/DNA complex showed that FoxO 1 binds to the G6Pase promoter region as a dimer — two proteins. This structure facilitated the identification of the true binding site for FoxO 1, which had not been previously predicted. The current structure is at a marginal resolution such that the exact positioning of the side chains cannot be determined clearly. Future testing is needed for complete understanding of the molecular mechanism of FoxO 1.
88. Nazeeha Jawahir  
Department of Molecular & Cellular Biochemistry  
Mentor: Rebecca Dutch  

*Role of Membrane Proximal Negatively Charged Residue on the Hendra Virus Fusion Protein*

The Hendra and Nipah viruses are two recently identified members of the Paramyxovirus family. They can be transmitted from animals to humans (zoonotic) and have high fatality rates among humans, with a 1998 Nipah outbreak claiming over 100 lives. In most viruses, including all other Paramyxoviruses, the viral fusion (F) proteins have a positively charged residue on the cytoplasmic tail that interacts with the negatively charged viral membrane to stabilize the protein. Interestingly, however, in Hendra and Nipah it is a negatively charged residue on the cytoplasmic tail that directly interacts with the negatively charged membrane. Normally, the two charges would repel one another. It is thought that the trimeric structure of the Hendra F protein may be involved in the stabilization of the charges. This specific project involved altering the plasmid DNA residue to see if this has an effect on Hendra virus fusion and expression. Using a polymerase chain reaction (PCR) site-directed mutagenesis procedure, the negatively charged amino acid residue, glutamic acid, was transformed into two mutants- the neutral, nonpolar amino acid alanine (E519A), and the neutral, polar amino acid glutamine (E519Q). A series of assays were run to test the effects of these mutations on viral fusion and expression. Qualitative syncytia and quantitative reporter gene assays show minimal effect on viral fusion, but biotinylation gel assays show that both mutants result in decreases of approximately 20% in total viral protein expression, and decreases of nearly 40% or more in surface protein expression. Currently, research is being conducted to create new mutants with multiple adjacent point mutations in the region, to see if mutating more than one residue will affect viral fusion or expression. The overall goal of this research is to learn more about these new, potent viruses, and the role of fusion proteins in viral fusion and expression.

89. Mary Beth Johnson  
Department of Molecular & Cellular Biochemistry  
Mentor: Matthew Gentry  

*Developing a Biomarker to Monitor Pre-clinical and Clinical Treatment of a Fatal Neurodegenerative Epilepsy*

Lafora Disease (LD) is an autosomal recessive epileptic disorder, which causes rapid neurological deterioration and the accumulation of insoluble carbohydrates called Lafora bodies (LBs). LD patients die within 10 years of experiencing an initial epileptic episode during their second decade of life. LD is the result of mutations in the phosphatase laforin. We previously demonstrated that laforin is the founding member of a unique class of phosphatases called glucan phosphatases that remove phosphate from carbohydrates/glucans. In the absence of laforin, glucans become hyperphosphorylated, improperly branched, and insoluble, resulting in a Lafora body. It is thought that Lafora bodies drive the symptoms of LD and eventually the death of the
There is no cure or long-term treatment for the disease; however, our collaborators are currently testing pre-clinical and clinical treatments. An important aspect of any experimental treatment is a means to quantify the biological outcome of the treatment, referred to as a biomarker. Our goal is to develop an assay that quantifies laforin function so that it can be used as a biomarker in pre-clinical and clinical treatments. The specific aim is to develop an in vitro assay to evaluate the two aspects of laforin functionality. These two aspects are and will be evaluated by conducting the following five sections: determine the most efficient transfection agent to transfect Hs-Laforin into Human Embryonic Kidney (HEK) 293 cells, determine if laforin can bind and dephosphorylate glucans while bound to an antibody-resin, establish which α-laforin antibody most efficiently immunoprecipitates mouse and human laforin, optimize the immunoprecipitation procedure, and define the minimal amount of mouse and human cells needed to perform the assay.

90. Deepa Patel  
Department of Molecular & Cellular Biochemistry  
Mentor: David Rodgers

**Linking a Neuropeptidase to a Surface**

Neuropeptides are signaling molecules used in the central nervous system and other tissues. A class of enzymes known as neuropeptidases, which are nearly all zinc metallopeptidases, cleave these bioactive peptides. Neuropeptidases are potential therapeutics for a number of human disorders, including cancer, Alzheimer’s disease, mental illness and drug addiction. We are attempting to develop delivery methods to maximize the utility of these enzymes in treating disease. The enzyme thimet oligopeptidase (TOP) is a typical neuropeptidase, and we are using it as a model for developing delivery systems. The crystal structure of TOP shows that its active site is located at a base of a deep, narrow channel that runs the length of the enzyme. Substrate peptides bind on the channel wall opposite the active site and a hinge motion in the enzyme aligns the substrate and active site for catalysis. To lay the groundwork for therapeutically delivering neuropeptidases we are examining methods of tethering TOP to substrates using various covalent and noncovalent linkers. The activity of the tethered enzyme is determined using a substrate that increases in fluorescence upon cleavage. The best method for linking the enzyme to a substrate as well as the utility of tethering the enzyme will be determined.

91. Megan Schultz  
Department of Molecular & Cellular Biochemistry  
Mentor: Robert Dickson

**Identification of Genes that Protect Saccharomyces cerevisiae from Iron (Fe) Deficiency and Excess**

Iron deficiency is the most common nutritional challenge facing the world’s population. Eukaryotic cells and organisms have evolved many mechanisms to cope with both iron
deficiency and iron excess. The most common manifestation of iron deficiency in humans is anemia, but adverse effects also occur on the immune system as well as on cognitive development. Iron deficiency leads to impairment of iron-requiring enzymes and proteins leading to eventual loss of vital cellular functions. Excess iron creates a different set of problems because iron can participate in the generation of toxic oxygen molecules such as the hydroxal radical that can damage proteins, lipids, and nucleic acids. Studies using model organisms such as the Baker’s yeast *Saccharomyces cerevisiae*, which serves as a model for understanding non-dividing human cells including muscle cells and neurons, have played key roles in determining how cells respond to low and high iron conditions. Our laboratory is using two yeast strains, normal DBY746 and mutant PF101 (cyr1::mTn), to determine how iron deficiency and excess affect chronological lifespan, which is the time cells remain viable in a non-dividing state. A comparison of the lifespan of the two yeast strains in medium containing an iron chelator (Ferrozine) was used to determine if *CYR1* is involved in protecting the cell against iron depletion. Likewise, a comparison using a medium containing ten times the normal concentration of iron (1.23 μM) was used to determine if *CYR1* protects cells against excess iron. In the future, the genetics and signaling pathways that are mapped out in yeast cells will be applied to determine the underlying processes of aging in other eukaryotic cells, such as those of mammals.

92. Fei Xiong
Department of Molecular & Cellular Biochemistry
Mentor: David Rodgers

*Inhibitor or Substrate Induced Conformation Changes in a Neuropeptidase*

Neuropeptides are small bioactive peptides that play a vital role in signaling within the nervous and endocrine systems. The zinc metalloenzyme neurolysin has the ability to modulate the activity of small neuropeptides by selectively cleaving them. Regulation of these peptides plays a role in many human disease states, including Alzheimer’s disease, pain medicines, drug addictions, and psychotic disorders, all of which have been linked to changes in the levels of bioactive peptides. The X-ray crystal structure of neurolysin revealed a deep, narrow channel through which substrates gain access to the active site. Evidence indicates that substrates bind across the channel from the active site and are positioned for catalysis by a hinge-like conformational change of the enzyme. Previous studies shown that a peptide-like inhibitor of neurolysin binding at the active site causes the enzyme to tumble faster, indicating a conformational change that narrows the channel. In contrast, the novel inhibitor C28, which binds far from the active site, causes the enzyme to tumble more slowly, indicating that it locks neurolysin in an open conformation. Site-directed mutagenesis will be used to alter the electric charge on the inner channel walls of neurolysin in order to further investigate the conformational change of neurolysin. Sites on neurolysin will be modified to change the surface charge or fill up the C28 binding site. The conformational state of the enzymes will be determined using fluorescence polarization anisotropy measurements to estimate rotational tumbling times, comparing the mutant neurolysin construct to the wild type enzyme. It is hypothesized that increasing the charge will bias the enzyme toward the open conformation, while decreasing the charge should favor the closed conformation. If C28 acts by inhibiting the hinge motion, filling
up its binding site will alter the enzyme to be biased toward the open conformation, therefore decrease activity.

Nursing

93. **M. Erin Alvey**, Kelly E. Leech, Kristyn L. Mickley  
Department of Nursing  
Mentor: Patricia Burkhart

*Parents’ and Children’s Evaluation of Peak Flow Monitoring as Part of an Asthma Self-Management Program*

Asthma is the most prevalent chronic condition of childhood, currently affecting 7 million U.S. children and causing children to miss 12.8 million school days annually. Daily use of a peak flow meter, which measures the rate of airflow on expiration, is recommended for patients with persistent asthma. The purpose of this descriptive study was to evaluate peak flow meter ease of use and importance of daily monitoring for children participating in a clinical trial. Seventy-seven children, ages 7 through 11 years with persistent asthma, participated in a 16-week randomized, controlled, clinical trial that tested an asthma self-management intervention to promote adherence to peak flow monitoring (PFM). The children and their parents were recruited from primarily pediatric practices. None of the children were using PFM at study enrollment (inclusion criteria). At the completion of the study, a program evaluation was conducted by a personal interview with each parent and child dyad by a nurse interventionist. Parents’ and children’s self-reports were descriptively analyzed. Parents and children, respectively, reported that PFM is easy to perform (79%, 83%). Ninety-five percent of parent/child dyads indicated that PFM was important to do on a daily basis as part of asthma self-management. PFM is an important tool for child asthma self-management, and parents and children report that PFM is easy to perform. Program evaluation from the participant’s perspective is important to future development of acceptable asthma self-management education protocols.

94. **Sarah Cole**, Susan Westneat  
Department of Nursing  
Mentor: Jessica Wilson

*Differences in All-Terrain Vehicle Use on Hobby and Commercial Farms in Kentucky*

This study was to determine if there are differences in all-terrain vehicle (ATV) use and attitudes on hobby and commercial farms, thus requiring different nursing intervention on farms. ATVs are a significant source of death in Kentucky. Their use on farms is increasing because they are less expensive and easier to operate than pickups or tractors. The fastest growing segment of farms is often called hobby farms. A random sample of 4,500 farms was sent a mail survey. Inclusion criteria were 18 years of age and living on a farm in active operation. Descriptive
statistics were conducted in SAS for demographic variables. Chi-square was used for bivariate analyses and Satterthwaite t-test was used to compare mean scores for hobby and commercial farms. The response rate was 53%. Respondents resided on farms in 114 counties. Sixteen percent of the farms represented in the sample were hobby farms and 84% were commercial farms. Fifty-three percent of farms in the study owned an ATV and there were more hobby farms that owned ATVs than commercial farms ($\chi^2=4.87, p = 0.03$). More hobby farmers reported using ATVs on the farm for recreation ($\chi^2=54.53, p < .0001$) while more commercial farmers reported using ATVs to monitor property and livestock ($\chi^2=45.8, p < .0001$). Seventeen percent of hobby farmers reported never wearing a helmet compared to 83% of commercial farmers ($\chi^2=4.13, p = 0.4$). Only 6% of each group had ever attended an ATV safety course. Farmers agreed that children under sixteen are at increased risk on ATVs regardless of farm type ($\chi^2=3.28, p = 0.07$), but proportions of those wearing helmets were low for both groups (hobby 48% and commercial 55%) and not different ($\chi^2=0.39, p = 0.53$). Dangerous risk-taking attitude was significantly higher among hobby farmers than commercial farmers ($t=-3.14, df 1, p=0.0018$). Public health nurses need to educate farmers about the risks of ATVs. This study found that ATV use and associated risks are high on both farm types and most attitudes do not differ significantly. All farm families need training and should be encouraged to wear helmets. Future research should focus on barriers to helmet use and safe riding and testing the effectiveness of safe riding intervention in farm families.

95. Christin Huff, Andrea McCubbin  
Department of Nursing  
Mentor: Kristin Ashford  

Maternal Stress and Birth Outcomes  

Over the past decade the rate of preterm birth has steadily increased from 12.5%-12.7% (CDC, 2006). Present studies debate the relevance of stress on pregnancy outcomes. In recent studies, high levels of C-reactive protein (CRP) obtained from amniotic fluid and serum was significantly higher in women with preterm delivery (Austin & Leader, 2000; Fialova et al, 2006). Conflicting findings report that stress had minimal effect on pregnancy outcomes (Glynn et al, 2004). Furthermore, very little research has determined the most reliable measure of maternal stress during pregnancy. The purpose of this study is to explore perceived maternal stress and its relationship with CRP in maternal serum across three trimesters of pregnancy. Specific aim 1: To examine and compare components of reported stress and CRP across three trimesters in a sample of pregnant women. Specific aim 2: To examine if elevated levels of Everyday Stressor Evaluator (ESS) scores and/or CRP will contribute to adverse birth outcomes (preterm birth, preeclampsia, pregnancy induced hypertension, and stillbirth). This prospective pilot study recruited a multiethnic sample of pregnant women (n= 85) with and without a history of preterm birth. Women were between the ages of 18 and 40 and were recruited from UK Chandler Medical Center. A survey completed in each trimester included the Everyday Stressor Evaluator tool (ESS) to measure perceived maternal stress. CRP in maternal serum was measured with a valid assay. Blood serum and survey were collected at the same time point. Data analysis included descriptive statistics, T-tests, Pearson correlation coefficient, and repeated ANOVA using statistical analysis software which was System Software (SAS) Version 9.1. There was no
significant difference in ESS scores across trimesters however the highest stress scores were reported in the first trimester (12.13; 11.72; 9.89). CRP levels were significantly different across trimesters with the highest level occurring in the second trimester (p=.04). Mean CRP levels ranged from 21793 mg/L to 26699 mg/L. There was no significant correlation between ESS scores and CRP levels in any of the trimesters. Upon medical record review, fifteen women had adverse birth outcomes. In these women CRP levels were not significantly different than women delivering healthy infants. Upon closer examination of women delivering preterm infants, CRP levels in the third trimester were markedly lower compared to other women experiencing adverse outcomes (5020 mg/L vs. 25671 mg/L). In our study higher ESS scores were not associated with adverse birth outcomes; however, lower CRP levels in the third trimester were associated with women experiencing preterm birth. Obstetric practitioners and nurses need to continue to screen for stress throughout pregnancy in order to determine the effect of stress on birth outcomes. Furthermore continued research needs to be done to identify the most valid measurement of maternal stress during pregnancy.

96. Emily McMahan, Lynne Hall, Susan Westneat
Department of Nursing
Mentor: Kristin Ashford

A Secondary Data Analysis of Smoking Status, Everyday Stressors, and Social Support Throughout Pregnancy

Is there a relationship between smoking status, stress, and social support during pregnancy? In 1999, 24.5% of pregnant women in Kentucky smoked during pregnancy, versus 12.6% nationwide. Smoking during pregnancy is linked to poor pregnancy outcomes such as preterm birth and low birth weight. This data analysis examines the relationship between maternal smoking, stress, and social support. The first specific aim is to compare smokers versus nonsmokers on everyday stressors and social support in the 1st and 3rd trimesters of pregnancy. Secondly, the study aims to examine the smoking group in the 1st and 3rd trimesters to determine if smoking status varies by levels of stressors and social support. The CCOST study is a prospective cohort study of pregnant women with repeated measures design. A multiethnic population of 90 pregnant women was recruited using quota sampling. Urine cotinine levels measured smoking status. The Everyday Stressors Index (ESI) and Autonomy and Relatedness Inventory (ARI) were used to measure stress and social support. Data analysis was conducted using Statistical Package for the Social Sciences software. T-tests were performed to determine mean ESI and ARI scores. 51.9% of 1st trimester participants were nonsmokers, and 48.1% were smokers. In the 3rd trimester both smokers and nonsmokers comprised 50% of the sample. The ESI scores in the 1st trimester were 9.7 for nonsmokers and 15 for smokers. The ESI mean difference is statistically significant (p = .007). The 3rd trimester means for ESI were not significant. The ARI mean scores were not statistically significant. The data suggests that higher levels of stress correlate with a positive smoking status. By teaching stress management in smoking cessation programs, clients will gain tools to deal with stress and combat smoking. Further analysis is indicated once the majority of the participants have completed the 3rd trimester surveys.
Compliance with a Tobacco-free Academic Medical Center Policy

The purpose of this study was to (a) develop a protocol to assess compliance with the tobacco-free policy at an academic medical center (AMC); (b) examine patterns of compliance by season, time of day, and type of location; and (c) compare AMC compliance before and after implementation of a university-wide tobacco-free policy. The benefits of a tobacco-free campus include promoting a healthy environment where patients, visitors, students, and employees can live, work, and learn; reducing triggers to use tobacco; lowering cleaning and maintenance costs, and improving productivity. The long-term goal is to inform decision makers about specific challenges in compliance and to improve policy implementation. In this prospective, descriptive study, a protocol was developed for assessing compliance by examining 36 areas where smoking was observed after the implementation of the tobacco-free AMC policy. We assessed the number of cigarette butts, number of people smoking, and whether the location indicated a violation of the policy. Eight observations were conducted per location, four in the fall and four in the winter. Results showed the highest number of butts and incidence of smoking were found in non-policy covered areas (69.75 mean per observation) as opposed to covered locations (12.59 mean per observation). There was no change in the number of butts in the venue that became covered after UK tobacco-free policy implementation (11/09). While there is increased compliance with the policy in covered locations, there is still smoking in locations where it is prohibited. Knowing where tobacco use occurs can help administration tailor efforts to increase education and compliance through signage, enforcement, and marketing tobacco dependence treatment.

Do Fruits and Vegetables Reduce Depressive Symptoms in Pregnant Women?

Increased depressive symptoms during pregnancy have been associated with adverse pregnancy outcomes including preterm birth and low birth weight infants (Orr et al., 2007). Current research indicates that pregnant women with higher depression scores had poor eating habits (Fowles & Murphey, 2009). There is limited research on pregnant women who meet current United States Department of Agriculture (USDA) guidelines for fruit and vegetable intake and whether or not they report less depressive symptoms. The purpose of this descriptive study is to examine the relationship between prenatal depressive symptoms and adequate fruit and vegetable intake across the trimesters. Participants (n=91) were recruited for a larger prospective correlation study examining the relationship between psychosocial factors and inflammatory markers in serum, saliva, and cervicovaginal fluid throughout pregnancy. Participants completed a survey during each trimester of pregnancy. Psychosocial assessment included examining depressive symptoms as measured by the Edinburgh Postnatal Depression Scale (EPDS).
addition, the survey included nutritional variables of daily fruit and vegetable intake. There was no significant difference in depression scores of individual participants across the trimesters. Highest depression scores were reported in the first trimester with nearly 34% of women scoring greater than 10 on the EPDS. The percentage of women with depressive symptoms in the second and third trimesters was 23% and 27% respectively. As pregnancy progressed through each trimester, more women met the USDA fruit and vegetable requirement (74%; 85%; 87%, respectively). Across all three trimesters, participants who ate the recommended amount of fruits and vegetables were less likely to report depressive symptoms. The nursing implications based on the results of this study include assessing the nutritional status of pregnant women, educating the client about the importance of a well-balanced diet including adequate intake of fruits and vegetables, and teaching pregnant clients the signs and symptoms of depression.

Nutrition & Food Science

99. Shira Abernathy
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

Food Choices Made by Elementary Students in a Kentucky School During Breakfast and Lunch Compared to their Socioeconomic Status

In the United States, 32% of children 2 to 19 years of age are overweight or obese, with those from lower socioeconomic families at the greatest risk. Harmful changes, including overconsumption of unhealthy food and lack of physical activity, have contributed to this sudden pandemic of obesity in the past 20 years. One of the most influential food service establishments for children is the United States public school system. Over 25 million students use the National School Lunch Program and National School Breakfast program daily. These meals account for half the daily caloric intake for children that receive them. The types of food the children choose during breakfast and lunch can greatly influence their health. The objective of this study was to determine if children from lower-socioeconomic backgrounds choose foods that contain more calories and are less nutrient dense during breakfast and lunch at school compared to their peers from families of a higher socioeconomic background. The design of the study was a survey. The setting was Dr. Martin Luther King Jr. Elementary School in Hopkinsville, Kentucky, where the subjects were 238 3rd, 4th, and 5th grade students, of which 73 were 3rd grade students, 86 were 4th grade students, and 79 were 5th grade students. Participants included 134 males and 104 females. The surveys were distributed to 3rd, 4th, and 5th grade students at Dr. Martin Luther King Jr. Elementary School during homeroom. The survey contained questions that asked about the types of specific foods the students would choose on a typical school day during breakfast and lunch. The student was also asked how much they paid for lunch to determine their socioeconomic status. Most of the students were free lunch recipients and chose the higher calorie food items. The students who paid full price for lunch chose more fruits and vegetables during lunch and less sugar-containing items during breakfast. The students who paid a reduced fee for breakfast and lunch chose items that were lower calorie and also picked more fruits and vegetables during lunch. In conclusion, students from lower socioeconomic backgrounds chose
items that were higher in calories and fat compared to their higher socioeconomic peers. More education at school on how to make healthier food choices could benefit children and have an impact on their overall health.

100. Autumn Abraham
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

The Effects of Spring Break on Physical Activity Levels Among College Students: A Comparative Analysis between Self-Reported Pre-Spring Break and Post-Spring Break Physical Activity Levels

Many studies have attempted to delve into the motivational factors directly affecting the physical activity levels of college students, a generally latent population of approximately 17 million in the U.S. at risk for adopting adverse health behaviors. Few studies, however, have analyzed the physical activity levels of college students and how they may be affected by a rather unique and highly anticipated institutionalized week known as Spring Break. Several established motivational factors for physical activity surround this occasion including those both extrinsic and intrinsic. Understanding the reasons individuals do or do not participate in physical activity is important for health and fitness professionals as they encourage full participation in a balanced exercise program. The experiment was conducted to determine the effects of Spring Break on physical activity levels among college students through a comparative analysis between self-reported pre-Spring Break and post-Spring Break physical activity levels. A sample of 135 undergraduate University of Kentucky students enrolled in a sophomore-level class during the Spring 2010 semester were used as subjects. Pre-Spring Break surveys were distributed to subjects two weeks prior to Spring Break. Post-Spring Break surveys were then distributed two weeks following Spring Break to the same subjects. Surveys in both cases acquired demographic information of the sample such as gender, undergraduate status, age, height, and weight. Data concerning the frequency, intensity, and types of physical activity were collected along with information revealing Spring Break plans in both surveys. This data allowed for comparative analysis of self-reported pre-Spring Break physical activity levels with post-Spring Break physical activity levels, thus, determining if there were any alterations and if so, to what degree. Complete data analysis will be conducted and specific results will be provided following the collection of post-Spring Break surveys.
101. Aaron Barnes  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*A Study Examining Whether Lack of Nutritional Knowledge Is a Contributing Factor to Obesity and Comparing the Nutritional Knowledge of College Students of Different Weights*

In the United States, 58 million people are overweight and 40 million are obese. Since 1982, the number of overweight children has tripled to 30% in the United States. Along with the rise in obesity, obesity related diseases including Type II Diabetes, cardiovascular disease, and breast and colon cancer are also becoming more prevalent. Weight loss pills, surgery, and diet and exercise programs have been deployed to combat this epidemic. However, research has yet to present a consistent treatment method for those struggling with their weight. The goal of this research was to identify risk factors related to collegiate obesity. A sample of 154 college undergraduate students at the University of Kentucky completed a survey with questions related to age, gender, height, weight, food consumption, and a nutrition quiz. There were an equal number of males and females with an average age of 19.4 years. Average BMI was 23.4 kg/m² (range of 17.4 – 37.0). 19.5% of the participants were considered overweight, 4% of the participants were considered obese, and 1.9% was considered underweight. The participants who ate fast food 0 – 1.5 times per week had a significantly lower BMI than those who ate fast food 2-10+ times per week (P = .0088). Participants who ate 6-10+ servings of grain per day had significantly lower BMI than those who ate 0-3.5 servings per day (P = .039). All the participants scored low on the nutritional quiz section of the survey. Females had an average score of 38%, and males had an average score of 36%. No significant relationships were found between BMI and the overall score on the nutritional quiz. More research is needed to determine if people suffering from weight management problems lack the nutritional knowledge to manage their weight.

102. Katelyn Brough  
Department of Nutrition & Food Science  
Mentor: Tammy Stephenson

*Correlation between Increased Stress Levels and Unhealthy Food Choices in College Females*

Two-thirds of American adults and one-third of American children and adolescents are overweight or obese and these numbers continue to increase. The types of foods Americans consume contribute a great deal to this trend, particularly in college students. To better understand poor food selection in college students a study was conducted evaluating stress levels and unhealthy food choices in college females. The students completed a survey that inquired information about their body mass index (BMI), stress levels, cause of stress, and the types of food they consume when they are stressed versus unstressed. Two hundred and nine female
college students at the University of Kentucky took part in this study (average age 20.3 years +/- 2.76 years and average BMI 22.2 +/- 3.4 kg/m²). Eighty-six percent of the participants reported eating unhealthy foods when stressed; these foods consisted of ice cream/candy, fried food, fast food, and chips. In comparison, 88.5% of the participants reported that when they were unstressed they chose healthy foods such as fruits, vegetables, sandwiches, or granola bars. Also, 65% of the participants that claimed to be healthy eaters consumed fast food an average of 1.9 +/- 0.6 times a week. The results of this study show the impact of stress levels of college females on their choices of food, which could be a factor in the increasing obesity trend. The students need to be better educated about the damage they are doing to their bodies by eating unhealthy foods during stressful periods and informed how to correct these detrimental habits.

103. Courtney Butler  
Department of Nutrition & Food Science  
Mentor: Tammy Stephenson  

*Effects of Regular Physical Activity on College GPA*

Research has found that there is a positive correlation between regular physical activity and improved cognitive function, improved mental health, reduced risk-taking behaviors and improved overall health. The relationship between regular physical activity, type of physical activity, study habits and GPA was investigated in 200 undergraduate students at the University of Kentucky. Participants included 89% females (age 21± years) and 11% males (age 22±) who completed surveys regarding their study habits, GPA for the past semester and overall GPA, type(s) of physical activity, frequency of physical activity, average overall energy level and stress levels after performing physical activity. The average body mass index for females was 22.2 kg/m² and for males was 26.1 kg/m², both averages falling in the normal range for healthy young adults. 88% percent of students reported doing some form of physical activity on a regular basis. The most common types of physical activity students engaged in regularly were walking, elliptical and aerobics. It was found that students who engaged in regular physical activity had higher average GPA for the Fall 2009 semester and overall than those who did not engage in any type of regular physical activity. Although engaging in regular physical activity was shown to have a positive effect on the study habits/GPAs of college students, students still need to be further educated on the importance of engaging in regular physical activity for their mental, physical and emotional well-beings.

104. Rachel Clark  
Department of Nutrition & Food Science  
Mentor: Tammy Stephenson  

*College Students’ Sleeping Habits Related to Health*

An inadequate amount of nightly sleep is most common among adolescents and young adults, including college students. Whether students are up late cramming for an exam, finishing
homework, working or choosing to stay out late partying, a good night’s rest is often hard to come by. The relationship between sleeping habits and overall health was examined in 194 undergraduate students at the University of Kentucky. The participants included 121 female students (age 20.9 +/-2.53 years) and 73 male students (age 21.4 +/-2.19 years). There was significant variability in body mass index (BMI) ranging from 17 to 42 kg/m². It was found that the students averaged 6.83 hours of sleep on school nights and 7.77 hours of sleep on weekend nights. An overwhelming majority of the students surveyed (80.4%) indicated that they noticed having lower energy when sleeping for less than 6 hours the night before. About half of the students (52.6%) indicated that it was more difficult to eat healthy when they slept for less than 6 hours. Sleep is necessary for proper mental and physical functioning, and it is imperative that college students understand the importance of adequate sleep because they need extra energy to compensate for their demanding daily routines.

105. Cynthia Cockerham
Department of Nutrition & Food Science
Mentor: Tammy Stephenson

Spending Habits of College Students at Supermarkets and Restaurants

The objective of this project was to examine if there were significant differences between the Body Mass Index of students who eat at restaurants more frequently than those who eat from groceries, if there is a correlation between place of residence and BMI, and if there is a correlation between amount of money spent at grocery stores per week and BMI. A survey was administered to 202 undergraduate college students (50% males, 50% females) at the University of Kentucky. The students completed surveys regarding their spending habits on food at groceries and restaurants, dining habits (whether they eat out frequently or eat home-cooked meals), place of living, exercising habits, current weight and height, and what restaurants they tend to frequent most. The average age of all participants was 20.45 +/- 1.62 years. Those students living and eating on campus had a significantly higher body mass index (BMI) than those off campus (24.18 +/- 4.15 kg/m² vs 22.21 +/- 7.03 kg/m²). There was no significant difference in how many times a student ate at restaurants or cafeterias per week and their BMI. Those students who spent $0-$15 per week on groceries had a significantly lower BMI those who spent over $45 per week (23.92 +/- 4.09 kg/m² vs 26.02 +/- 4.19 kg/m²). Factors including place of residence, money spent on groceries, and restaurant eating all appear to be related to BMI. Students at the University of Kentucky need to be better educated to make health-promoting food choices both at the supermarket and when eating out.
**106. Erika Contasti**  
Department of Nutrition & Food Science  
Mentor: Tammy Stephenson

*Correlation between Beverage Intake and BMI*

Two-thirds of American adults are overweight or obese. Lifestyle choices including diet and physical activity are prime contributors. Preliminary research has shown that beverage choice is one factor contributing to obesity, particularly consumption of sugar-sweetened, high-fructose corn syrup containing drinks. To investigate the correlation between beverage intake and body mass index (BMI) a study was conducted of 190 undergraduate students at the University of Kentucky (average age 19.84 ± 1.68 years).

79 males (average BMI 24.61 ± 3.14 kg/m²) and 111 females (average BMI 22.38 ± 3.28 kg/m²) completed the survey. The males who answered that they drank regular soda daily had an average BMI of 24.02 ± 3.18 kg/m² while those who did not had an average BMI of 25.04 ± 3.08 kg/m². The females who answered that they drank regular soda daily had an average BMI of 22.55 ± 3.93 kg/m² while those who did not had an average BMI of 22.35 ± 3.08 kg/m². The males who answered that they drank diet soda daily had an average BMI of 27.02 ± 3.67 kg/m² while the males who did not had an average BMI of 24.05 ± 2.74 kg/m² (p<0.05). The females who answered that they drank diet soda daily reported an average BMI of 22.58 ± 2.76 kg/m² while those who did not had an average BMI of 22.26 ± 3.58 kg/m². Females that consumed milk daily had an average BMI of 22.23 ± 4.58 kg/m² while those who did not had an average BMI of 21.74 ± 4.29 kg/m². Males and females that recorded consuming 1 cup of water had an average BMI of 23.03 ± 3.89 kg/m², those consuming greater than 1 cup but 2 cups had an average BMI of 23.86 ± 3.88 kg/m², those consuming greater than 2 cups but 3 cups had an average BMI of 24.02 ± 3.89 kg/m², and those consuming 3 cups had an average BMI of 23.06 ± 3.17 kg/m². Most of this data found no significant differences between beverage intake and BMI. The only correlation found (p<0.05) was between males that consume diet soda and males that do not consume diet soda. However, further research needs to be completed on this topic to better educate college students on beverage choices.

**107. Sarah Drake**  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*Fruit and Vegetable Consumption in College Females*

Going to college often makes it difficult for female students to consume an adequate amount of fruits and vegetables. Depending on their ability to prepare, purchase or store the food, research has shown most college females are not consuming enough fruits and vegetables daily. The average minimum recommendation, according to the United States Department of Agriculture, for women ages 19-30 years who perform less than 30 minutes of physical activity daily is 2 ½ cups of vegetables and 2 cups of fruit per day. The purpose of this study was to determine whether college females are consuming the recommended amount of fruits and vegetables, what factors are preventing them from achieving the recommendations, and what fruits and vegetables
are consumed most often. An analytical survey was given to 144 female undergraduate college students (age 19.8 +/- 1.51 yrs) at the University of Kentucky. The average body mass index (BMI) was 21.72 +/- 3.05 kg/m², within the “normal” category. The majority of the 144 females, 24%, reported consuming 1 cup of fruit per day. Only 38% reported consuming the recommended 2 cups of fruit per day or higher. For vegetable consumption, 85% of females that participated consumed less than the 2 ½ cups of vegetables recommended per day. It is startling that so many women are not consuming near the amount that they need for continuous growth and maintenance in their bodies. Many of the reasons given in the open ended question concerning what prevents participants from consuming fruits and vegetables dealt with the expense, preparation time, and availability of the products. It would be beneficial for companies to create products with a longer shelf and at a price targeted for economically challenged students. Increasing consumption of fruits and vegetables in college women could help to prevent future diseases and disorders.

108. Holli Dunn
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

The Use of Weight Loss Supplements: What are the Perceptions of Supplement Use and How Does It Affect Weight Loss in Relation to Physical Activity?

There are many college women currently taking a weight loss supplement. Some of these women are taking both the weight loss supplement and participating in every day physical activity. Many people who choose to take a supplement are unaware that the most common ingredient in weight loss drugs is caffeine. The side effects of caffeine are that it increases heart rate, blood pressure, and basal metabolic rate. Since this is the case, college females are often using weight loss supplements as an energy booster for physical activity. In order to determine the effects of taking a weight loss supplement while exercising surveys were distributed to 250 undergraduate female students on the University of Kentucky campus. Results showed that most undergraduate females overall do not use a dietary supplement. Female participants between 19 and 20 years of age showed to have a particular diet, consume small amounts of other caffeinated beverages, and exercise between three and four days a week. However, out of the 250 subjects 26.8% of the female subjects indicated that they do take a supplement. Ironically, every one of those subjects filled out a survey at the Johnson Center. An assortment of factors such as supplementary caffeine intake, serious illnesses, and diet plans can contribute to metabolism and energy needs in the body while exercising. Since dietary supplements do increase heart rate and metabolic rate, college students need to be more aware of side effects and be better educated on the importance of physical activity and diet on health.
Prevalence of Exergaming (Exercise Gaming) as Primary Means of Physical Activity in College Students

Weight gain among college students, often perceived as the “Freshman Fifteen”, is a common occurrence. Lack of exercise, poor diet habits, and an increase in sedentary activity, such as “screen time”, are frequently cited reasons for weight gain. In the past couple of years studies have been conducted investigating the effects of exergaming (exercise gaming) on sedentary children, most finding positive results. The objectives of this study were to examine exergaming as a form of physical activity for college students, whether males or females are more likely to exergame, and if exergaming leads to a decrease in traditional physical activity. Exergaming in college students was evaluated in 154 undergraduate students, 71 males and 83 females, at the University of Kentucky (age 20.99 ± 2.10 yrs). A brief survey was completed asking students about their knowledge of exergaming, if they use exergaming as a form of physical activity, if they would consider using exergaming as a form of physical activity, and the amount of traditional physical activity performed. Of the 154 students surveyed only 12.9% had used exergaming as a form of physical activity. This is compared with 78.5% of students who reported participating in some form of traditional physical activity. Only 10.3% of students used both exergaming and traditional exercise as forms of physical activity. The average body mass index (BMI) of students was 24.2 ± 3.4 kg/m². The BMI of students who exergamed 1-2 times per week was 22.8 ± 2.9 kg/m² while the BMI of students who used traditional physical activity was 24.9 ± 3.8 kg/m². Even though exergaming usage is relatively low among college students, 70.1% surveyed said they would consider using exergaming as a form of physical activity. The data does not support the fact that exergaming is a primary means of exercise among college students. It is interesting to note, however, that those who exergamed did have a lower BMI than those who choose traditional physical activity. While exergaming is used as a form of physical activity among few students, many indicated that they would be interested in using exergaming as a form of physical activity.

College Lifestyle and the Effects on Dental Health

Poor dental hygiene, late nights studying and participating in social activities, and increased consumption of sugary beverages, bottled water, coffee, energy drinks and alcohol, often lead to an increase in dental caries and other oral problems, such as gingivitis, during the college years. Poor dental health in the young adult stage can cause serious systemic diseases and future health problems, such as diabetes, miscarriages during pregnancy, heart disease and cancers. Anonymous surveys were distributed to students asking questions about their dental health
history, how frequently they have visited their dentists, whether they consume certain beverages and if so, how much, and general questions on dental health behaviors. 200 total participants, 70 males and 130 females, completed the survey (average age 20.55 +/- 1.42 years). 76% of the sample consumed alcohol with an average consumption is 3.15 days a week. Of those consuming alcohol 68% reported neglecting to brush their teeth after drinking. The average number of times college students see a dentist is very low and those who do average around once a year. Most students say that they brush their teeth around 2 times a day, except some nights when they drink or stay up late and then “crash.” The majority of the sample fell between 1-5 cavities, but a small percentage reported having over 9 cavities, with many occurring since they began college. There are many factors contributing to the growing number of cavities and dental problems seen in college students. College students need to be better educated on the importance of regular visits to the dentist and proper dental hygiene as it is a major factor to an overall healthy body.

111. Amy Gonnella
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

The Relationship between Caffeine Consumption and a Student’s GPA

Caffeine is the most widely used stimulant among Americans. It can be found in products such as coffee, tea, soft drinks, energy drinks, and some medications. Research has shown that caffeine consumption stimulates the central nervous system by blocking adenosine receptors in the brain. The pituitary gland is then stimulated to release epinephrine, also known as the “fight or flight” hormone, which can improve concentration and promote alertness. Increased alertness and concentration allows for easier retention and understanding of material and can ultimately affect a college student’s academic success. The relationship between caffeine consumption and grade point average (GPA) was examined in 209 undergraduate students at the University of Kentucky. Participants included 40 males (average age 21.57 ± 3.15 years) and 169 females (average age 20.04 ± 2.77 years). Subjects completed surveys regarding their caffeine consumption and frequency, study habits and grade point averages. The average overall grade point for female students was 3.36 ± 0.44, with an average grade point average of 3.38 ± 0.49 for the 2009 fall semester. The overall grade point for male students was 3.12 ± 0.45, with an average grade point average of 3.15 ± 0.44 for the 2009 fall semester. 88% of the students reported consuming caffeine on a regular basis and 48.3% reported consuming at least five to seven caffeine beverages per week. The most common sources of caffeine were coffee and caffeinated soda. Only 28.7% of students reported using energy drinks as their main source of caffeine. Students who consume caffeine while studying reported having an easier time concentrating and retaining more information than students who do not consume caffeine. It was also found that students who did consume caffeine had a higher grade point average than those students who did not. However, many students reported that there was no correlation between their caffeine intake and their performance on an exam. While caffeine was shown in this sample to have a positive effect on a student’s overall GPA, college students would benefit from being more informed about caffeine’s effects on the human body and potential side effects to its over-use.
112. Emily Hayman  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*Correlation between Caffeine Consumption and Symptoms of Acid Reflux Disease*

Acid reflux disease, or gastro-esophageal reflux disease (GERD), is increasing in the U.S. Despite unknown causes, dietary intake is a major suspected contributor. If symptoms are not controlled, greater complications may result. Previous studies exhibit contradictory results on the effects of particular foods on GERD. The study evaluated caffeine intake in college students to determine relationships between intake and acid reflux. It was hypothesized that 1.) Coffee, espresso, soda, tea, chocolate, and pills produce temporary GERD, 2.) Genders differences are insignificant, and 3.) Caffeine pills and decaffeinated items are low risk, while espresso and sodas are high risk. A 22-question survey collected data from 203 undergraduate students at the University of Kentucky (20.0±1.3yrs). 94.09% of all subjects reported consuming at least one form of caffeine once or more a week. Men experienced significantly more GERD symptoms than women (P=0.0091), with 42.57% of all subjects experiencing GERD. There was no significant difference in caffeine intake (P=0.191) or symptom frequency (P=0.533) between men and women. Short-term GERD was significantly worse than long-term symptoms (P=2.25e-4). There was no significant difference in GERD presence due to coffee (P=0.544), decaf coffee (P=0.906), soda (P=0.210), decaf soda (P=0.107), tea (P=0.100), or chocolate (P=0.435). However, GERD symptoms increased in those consuming espresso (P=0.025), caffeine pills (P=5.598e-40), or energy drinks (P=0.0067). Caffeinated soda contributed most to acid reflux, with 50% of symptom-experiencing subjects indicating soda as a source, followed by 25.53% indicating coffee. Heartburn/indigestion was most prevalent, followed by burping. According to the study, men suffer more from GERD, especially heartburn/indigestion. Short-term symptoms are most severe. Espresso, energy drinks, and caffeine pills contribute to GERD significantly more than regular/decaf coffee, regular/decaf soda, tea, and chocolate. Based on results, individuals with GERD should avoid high-caffeine items until their effects are fully understood.

113. Lindsay Hubbard  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*Prescription Drug Adderall Abuse Among College Students and Cognitive and Nutritional Side Effects*

College students across the country are overwhelmingly familiar with their peers taking illegal-stimulant drugs, such as Adderall, to increase focus, concentration and academic performance. The prevalence of students abusing Schedule-II substances has shown continual growth over the past decade as these medications have become more readily available with increasing diagnoses of ADHD and, thus, prescriptions written in the United States. Students are thought to use these substances as a means of increasing alertness, to help study and concentrate, to stay awake longer, to increase energy levels, and to some pure experimentation. To examine the nutritional
and cognitive side effects of prescription drug Adderall abuse and the relationship between private and public university student usage, 75 undergraduate students were surveyed both at the University of Kentucky and Saint Louis University. The participants included 76 males and 74 females (age 20.45 +/- 2.17 years). Nonprescription Adderall use percentages were nearly the same between both universities, with 31.8% of students at the University of Kentucky and 31.4% of students at Saint Louis University reporting nonprescription Adderall use. Over ¾ of the students who reported taking Adderall believed the drug allowed them to study and function better, the drug was to help them study and focus. While 61% of those who have taken nonprescription Adderall experienced a loss of appetite, only 20% believed it had a negative effect on their overall nutritional health. Considering all students reporting use admitted the drug could be easily obtained on both college campuses, this proves that there is an increasing prevalence of Adderall availability and usage on both campuses. Although the majority of students represented in this study reported not having experimented with the prescription drug Adderall, all college students should be better educated on this growing problem that could have negative effects on one's nutritional and health status.

114. Aaron Jones
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

The Affect Fruit and Vegetable Intake on BMI and Feeling of Well Being

It is widely known that there are many health benefits to consuming ample amounts of fruits and vegetables; many studies have supported the positive affects they can have on risk factors for chronic diseases such as cardiovascular disease, diabetes, and cancer. There are also studies showing that individuals consuming relatively high amounts of fruits are more likely to be at a healthy Body Mass Index (BMI). However, there is limited information showing the effect various fruits and vegetables have on BMI, and the way a person perceives their mental and physical well-being. To evaluate a possible relationship, surveys were distributed to 203 volunteer participants, 114 female and 89 male. Participants were University of Kentucky students and members of the Lexington, KY community. The average of age of participants was 22.04 +/- 4.44 years old. Participants answered questions regarding their age, gender, height, weight, activity level, and specific vegetable and fruit intake. They also rated their own well-being through questions pertaining to energy levels, alertness, mood, and feeling of overall health. Results show that those who rated themselves as being in good/great overall health, 8/10 or higher, had a lower average BMI (22.8 +/- 3.35) than those who rated themselves as being in fair or poor health (24.5 +/- 4.95). It was also determined that, while those who consumed higher amounts of leafy greens and broccoli are at a healthier BMI and slightly more physically active than those who consumed more potatoes and corn, they do not rate themselves any higher in subjective well-being. It was seen, however, that consumption of certain foods, such as apples, may have positive effects on both BMI and all aspects of self-perceived well-being. These findings may have important implications, as they reveal the significant discrepancies in the benefits of various fruits and vegetables.
115. Joanna Kasper  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*The Effects of High Fructose Corn Syrup on Body Weight in College Students*

High Fructose Corn Syrup (HFCS) is becoming one of the most commonly consumed sweeteners in the United States. It can be found in soft drinks, fast food, processed goods, and more. While a controversial topic, research has shown that HFCS consumption can contribute to weight gain. The relationship between weight gain and HFCS consumption was investigated in 249 undergraduate students at the University of Kentucky. The participants included 171 females (average age 20.5 ± 3.2 yrs) and 77 males (average age 20.8 ± 2.0 yrs) who each completed a survey regarding their soft drink and fast food consumption, exercise routines, height, weight, and age. The average current body mass index for females was 22.7 ± 3.6 kg/m², which is within the “normal” range for healthy adults. The average current BMI for males was 25.5 ± 4.7 kg/m², which is within the “overweight” range for healthy adults. 26.6% of students reported consuming regular soda, and 82.3% of students reported consuming fast food on a regular basis. It was found that female students who regularly consumed regular soda and fast food had significantly higher BMI’s. This relationship for fast food was approaching statistical significance in males (p = 0.06). While HFCS consumption was shown in this sample to have positive effects on weight gain, other lifestyle factors could also have contributed and were not specifically evaluated in this study. Overall, college students need to be better educated on what HFCS is and possible negative effects of consuming soft drinks and fast food on a regular basis.

116. Emily Lippard  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*Correlation between Soda Consumption, BMI and Knowledge of the Effects of High-Fructose Corn Syrup in College Students*

The American population that is overweight and obese has steadily increased in the past 20 years. Along with this decline of health, there has been an incline of consumption of high-fructose corn syrup (HFCS). HFCS is prevalent in the majority of processed foods Americans consume, particularly because it is cost efficient while still providing the level of sweetness Americans crave. Regular soft drinks are a significant contributor to overall HFCS intake. This study evaluates the correlation between unhealthy Body Mass Index (BMI) and soft drink consumption among college students. It also explores the knowledge that level college students have about HFCS. Finally, this study gages whether or not college students would change their eating habits if it was shown that HFCS has a negative effect on health. In order to determine the BMI, regular soft drink consumption, knowledge about health issues related to being overweight, and attitudes about behavioral change, a paper survey was distributed to 170 undergraduate students in Kentucky, 123 females and 48 males. 52.9% of students who consumed regular soft
drinks frequently (4-5 times a week, daily, or more than once a day) were either unsure or not willing to change their consumption if a correlation was shown between HFCS consumption and weight gain or the risk for Type 2 diabetes. Conversely, 31% of those who did not consume frequently said they were unsure or not willing to change their consumption. There was no significant correlation between BMI and regular soft drink consumption between participants. Those students who obtained their nutritional information from college classes were more knowledgeable about HFCS than those who gained their knowledge from the media. These findings have important implications about HFCS consumption and its possible relationship to knowledge and attitudes about altering eating habits to improve health.

117. Abbas Malik  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Effect of Smoking on BMI in College Students

Nicotine, a stimulant found in cigarettes, has been shown to reduce appetite and raise metabolism, potentially leading to weight loss. Recently there has been an increase in smoking by teenagers for the sole purpose of trying to curb appetites and lose weight. To examine the relationship between smoking and body mass index (BMI), a study was conducted using 500 undergraduate students at the University of Kentucky. The subjects in the study varied in age between 19-22 years old with 120 male and 80 female smokers. Participants completed a survey which included questions such as: when the participant began smoking, frequency of their smoking, do they smoke in combination with other drugs or alcohol, and do they feel smoking made an impact on their BMI. Analysis of the data showed that 89% of females and 88% of males who smoke do so in combination with other drugs or alcohol. 8% of females and 5% of males confirmed that they felt smoking had impacted their BMI. Based on this information, it can be concluded that smoking has a relatively small impact on the BMI of college students. This appears to be due to the fact that many of these students smoke while drinking or using other drugs that counteract the appetite-reducing power of nicotine.

118. Kirby Mayer  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

The Effects of Breakfast in College and High School Students

As young adults move from home to attend college, they embark on new experiences and memories, but they are also faced with many challenges and obstacles. One of those obstacles includes choosing the right foods to eat, as they are no longer planned by the high school cafeteria system and parents. One choice that may have a profound effect on health is deciding whether or not to eat breakfast, a meal that is often skipped on college campuses. This is a concern, as eating a nutritious meal in the morning will not only generate energy, but will also break the overnight fast, rejuvenate the metabolism, and provide essential nutrients including
vitamins, minerals, and fiber. To evaluate breakfast choices in teenagers and young adults, an anonymous survey was distributed to 120 college students at the University of Kentucky and 120 high school students at Southwestern High School. The surveys were identical self-administered questionnaires that asked demographic questions about lifestyle choices and specifics related to breakfast intake. On average, college students ate breakfast 4.46 +/- 2.39 days a week compared to 4.11 +/- days a week that high school students ate breakfast. When comparing body mass index (BMI) and GPA to the number of days college students eat breakfast versus high school students, there were no statistical significance. Although BMI was lower for college students, GPA and number of days exercising per week were higher. When factoring in certain lifestyle choices such as alcohol, there were trends. For example, more consumption of alcohol (78% of college students admitted to drinking one alcoholic drink per week compared to only 25% of high school students) leads to decreased breakfast intake. The primary reason for skipping breakfast was lack of time, followed by sleeping late and no money. This research provided surprising results that students are eating more breakfast in college then they did in high school, but shows that all these teenagers and young adults need to be made more aware of the importance of breakfast in promoting health, wellness, and academic success.

119. Lindsey Mayes
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

Correlation between a College Student's Amount of Exercise and Utilization of Group Fitness at the University of Kentucky

The prevalence of obesity in America and other developed countries has increased significantly in recent years as a result of many factors. While excessive consumption of calories, fat, and simple sugars contribute immensely to the obesity epidemic, lack of physical activity is also a major contributor. Research has found that weight gain in college is, at least in part, caused by insufficient exercise. This research evaluated levels of physical activity in college students and how participation in group classes affected overall activity. Participants in the study included 201 undergraduate students at the University of Kentucky. The average age of the participants was 20.0 +/- 1.4 years and the average BMI was 23.0 +/- 4.4 kg/m². The students completed surveys inquiring about how often they exercised in an average week, whether they exercised alone or with others, and reasons for exercising. 18% of participants reported that they only exercise alone, while 16% only exercised with others. The majority of the participants, 65%, said they sometimes exercise with others and sometimes exercise alone. When the college students were asked why they exercise, most said for weight management, followed by to improve overall health. The most common reason why college students reported exercising with others is because it motivated them to exercise. This research has important implications because, as of right now, the majority of college students do not engage in regular physical activity. The results of this research indicate that physical activity opportunities on college campuses need to vary, with both individual and group options available.
120. Courtney McDonald  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Skipping Meals in College  

Everyone has wished for a longer day in order to complete all of the overwhelming tasks that are assigned or felt the pressure of an ever-looming deadline. College students in particular feel the stresses of classes, exams, projects, extracurricular activities, and work schedules. During times of stress and completing deadlines, people often do not take the time to care for themselves whether it be showering, changing clothes, or even eating. Skipping meals and not obtaining proper nutrients is a significant problem amongst college students. While some people do not eat meals in order to lose weight, others simply feel they do not have time. Skipping meals can actually cause cravings and bingeing to occur, eventually leading to high consumption of triglycerides and fat-storage. The relationship between skipping meals and its subsequent effects on weight gain was investigated by surveying 200 University of Kentucky undergraduate students. The study included 151 females and 49 males who answered questions concerning the frequency of skipped meals, reasons for skipping meals, types of foods normally eaten, and if they had noticeable weight change within the last year. Data analysis is still in progress. However, preliminary results show that the majority of college students skip meals because they do not have time. As a result, the students often develop cravings for foods and are more likely to consume foods that are not considered healthy. A range of factors including snack choices, meal frequency, and exercise can all play a role in the energy balance and metabolic needs of individuals and thus can affect their overall weight.

121. Eric Oberst  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Correlation between the Consumption of Alcohol and Late Night Food Intake  

While weight gain during college is a well-established phenomenon of young adulthood, the reason(s) behind the weight gain remain unclear. A decrease in physical activity along with increase consumption of alcohol has become an accepted culprit. However, what affect does alcohol really play on weight gain in college students? Research has documented similar body mass indexes (BMIs) for drinkers and nondrinkers despite the extra calories from alcohol the drinkers are consuming. The relationship between alcohol consumption and body weight was evaluated in 236 University of Kentucky undergraduate students. Included in this study were 120 male participants (aged 21.31 ± 2.881 years) and 116 female participants (aged 20.60 ± 3.076 years). The participants filled out a survey providing answers about their drinking habits and food eating trends following alcohol consumption. The average participant reported drinking between every and most weekends. Males reported consuming on average between six to eight drinks in a night while female participants reported drinking three to five drinks in a night. The average BMI of nondrinkers was greater than that of drinkers. Males and females who reported drinking the most frequently had the lowest BMI(23.18 ± 3.54 kg/m² and 25.45 ± 5.93 kg/m².
respectively) Not surprisingly, the average student reported eating sometimes after alcohol consumption; with average males and females eating at about the same frequency. However, when broken down, those reporting eating every time after alcohol consumption have a higher BMI than those reporting less frequent eating following alcohol consumption. Those reporting eating every time after consuming alcohol averaged a BMI of 24.61 ± 6.77 kg/m²; while those reporting never eating averaged 23.84 ± 3.85 kg/m². The most frequent places students reported eating at were home, Qdoba, McDonalds, and Taco Bell. This research indicates that college students are making unhealthy food choices after alcohol consumption, something that could be contributing to unwanted weight gain in college.

122. Katie Oster
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

_Marijuana and the Associated Effects on BMI and Physical Activity in College Students_

Marijuana is one of the most highly used drugs with an estimated over 8% of habitual users in the United States alone. Though marijuana has continued to gain some popularity, it remains shrouded in a cloud of confusion. There have been increasing debates on the positive and negative effects this substance can have on the body and it is now used as medicine for several ailments. During college many students are exposed to marijuana and it is important to determine what effects it may have. It is believed that marijuana increases appetite and, therefore, may increase body mass index (BMI). The relationship between marijuana use and BMI and physical activity levels was investigated in 202 undergraduate and graduate students at the University of Kentucky. The participants included 104 female students and 98 male students from various majors and academic backgrounds. The students completed surveys to gather information on frequency of marijuana use, BMI, physical activity, and other drug use. The average BMI for non-users was 23.91 +/- 4.42 kg/m² and the average BMI for daily users was 24.90 +/- 4.78 kg/m². Additionally, 25.9% of the non-smokers surveyed and 24% of daily smokers did not participate in regular physical activity. Out of those who responded to having used marijuana at least once, 75% reported increased appetite after smoking marijuana. Although, the study did not find a significant difference in BMI in marijuana users versus nonusers the results did show that users experience an increase in appetite. It is important that college students, who experience increased pressure to use drugs, know the effects marijuana can have on their health so that they may make the best informed decisions possible.
The Correlation between Carbonated Beverages Consumption, Dietary Selections and Weight Gain

One can of Coca-Cola (12 fl.oz.) provides 39 grams, or 9.2 teaspoons, of sugar. According to MyPyramid.gov, sugar provides “discretionary calories,” which are extra calories that a body does not require for energy production. These carbonated beverages are heavily marketed in the fast food industry as part of their value meals, but what affect is this having on health? In this analytical survey study, 200 participants were randomly chosen from the University of Kentucky and the Army Depot. Subjects consisted of 125 females and 75 males. The females were 22 ± 6.19 yrs with an average weight of 138 ± 29.7 lbs and BMI of 23 ±5.6 kg/m². The males were 24 ± 7.05 yrs with an average weight of 184 ± 39.9 lbs and BMI of 25.5 ± 6.1 kg/m². 37.5% of the participants consumed regular carbonated beverages, 26.5% consumed calorie-free carbonated beverages, 31% did not consume carbonated beverages, and 5% consumed both regular and diet carbonated beverages. Carbonated beverage consumers drank an average of 1.5 cans a day, ate out 3 times weekly, snacked between meals 1 to 3 times weekly, and 2.4 servings of fruits and vegetables per day. Those who did not consume carbonated beverages reported eating out 2.4 times weekly, snacking between meals 1 to 3 times weekly, and consumed 3.6 servings of fruits and vegetables a day. Carbonated beverage consumers exercised 1 to 2 times a week while non-carbonated beverages drinkers exercised 3 to 4 times weekly. Moreover, regular carbonated beverage consumers gained an average weight of 1.6 lbs in a year, while those who consumed calorie-free carbonated beverages lost on average 1.3 lbs. Those who consumed carbonated beverages eat out at fast food restaurants, dine-in restaurants, and/or at cafeterias more often than those who do not consume carbonated beverages. They also choose to consume fewer servings of fruits and vegetables than those who do not drink carbonated beverages.

Nutritional Status of College-Age Alcohol Drinkers as Assessed by Dietary Intake

For many young adults the college years are often associated with increased alcohol consumption and poor dietary intake. Both factors individually decrease nutritional status via an increase in an individual’s risk of developing vitamin deficiencies, GI diseases, and other bodily disorders. A combination of these two factors further exacerbates such risks. The relationship between alcohol consumption and quality of dietary intake was investigated in 99 undergraduate students at the University of Kentucky (age 20.50 ±1.84 yrs). In an effort to quantify the subjective nature of the quality of an individual’s dietary intake, a unique survey was developed. The answers to various closed and open-ended questions were scored, and the scores for each question were added to provide a final number, called the dietary analysis number (DAN), that
was a quantitative representation of an individual’s diet. No correlations were found between DAN scores and alcohol consumption (p=0.849). Those individuals who participated in regular binge drinking had statistically significant higher DAN scores (13.41 ± 10.68) compared to those individuals who did not participate in regular binge drinking (9.53 ± 8.70, p=0.05). The higher DAN scores for binge drinkers could be attributed to gross overestimations of food intake. Of those individuals who consumed alcohol, males consumed a statistically significantly higher average number of drinks per drinking session (6.34 ± 3.00) compared to females (4.36 ± 2.13, p=0.003). Fifty-two percent of males and forty-eight percent of females surveyed binged at least once a month, and both genders’ average alcohol consumptions were above levels considered binge drinking (5 drinks per sitting for males and 4 drinks for females). Despite the lack of a correlation between alcohol consumption and dietary intake, this research could spur the generation of interventions that encourage students to drink more responsibly.

125. Emily Reeves
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*The Effects of Late Night Eating on Weight Gain in College Students*

With today’s society so fast-paced and work-focused there has been an increase in late night consumption of food. This is especially true in college students who often study, socialize, and work late into the night. It is not uncommon for the typical college student to have to go to school all day, then go to work, and then go home and write papers or study for a big exam. The relationship between late-night food consumption and weight gain was investigated in 205 undergraduate and graduate students at the University of Kentucky. The subjects included 115 females (average age 23 ± 1.98 years) and 90 males (average age 23.9 ± 2.51 years), the majority of whom were either seniors or graduates. All of the students completed surveys regarding weight and eating habits after 10 pm. As suspected, 83% of the students reported regularly eating after 10 pm. Reasons that were reported for late night eating included not getting off work until late, being up late studying, being up late watching television or movies, and alcohol induced hunger. The most common meals consumed by the females were Taco Bell, turkey sandwiches, and ramen noodles. The most common meals consumed amongst the males were Mad Mushroom pizza, McDonalds, pizza rolls, ramen noodles, and spaghetti. Females reported consuming mainly fruit/vegetables, yogurt, cheese, and cookies as late night snacks, whereas male students primarily ate chips, cookies, and cheese. Both groups reported having the highest craving for something sweet or fatty. Due to the rising prevalence of obesity across the country today, it is important that students become more aware of which factors are environmental and can be controlled, perhaps helping combat this epidemic.
126. Angela Siriphokha  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

The Correlation between Multivitamin Consumption and Servings of Fruit and Vegetable Intake  

Fruits and vegetables are significant sources of essential vitamins, minerals, and fiber that may help protect the body from chronic diseases including cardiovascular and certain cancers. Many Americans struggle in maintaining adequate fruit and vegetable intake and therefore, often chose multivitamins to make up for lack of nutrients. The relationship between multivitamin consumption and fruit and vegetable intake was examined in 75 undergraduate and graduate students at the University of Kentucky. The participants included 40 females (age 20.18 +/- 1.65 years) and 35 males (age 20.91 +/- 1.43 years). The students completed surveys asking about their multivitamin use, the frequency of it, the reason for taking, and the amount of fruit and vegetable servings consumed in their daily diet. Sixty-five percent of students reported using multivitamins. Surprisingly, the main reasons for multivitamin use included students wanting to be healthier and to improve their immune systems. Also, students stated that their parents told them to take multivitamins or purchased them for the students. Compared to those who did not take multivitamins, students who took them consumed 1.19 times more servings of fruits and 1.26 times more servings of vegetables. Although students may recognize the benefits and importance of taking multivitamins, they need to be more informed on the types available and how they affect the body. Many students may use multivitamins as a replacement for fruits and vegetables in their diets and their nutritional needs may still not be met.

127. Nikita Tailor  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

The Relationship between Pets and Physical Activity  

Research has shown positive correlation between pet ownership and physical activity, mood, and a reduction in feelings of stress and depression. To further evaluate this relationship, a study conducted with 200 University of Kentucky students, faculty, and staff who completed an anonymous survey. Out of these participants 105 were pet owners, 83 people owned a dog (some had a variety of pets), 35 owned cats (some with a variety), and the rest owned some other kind of animal, including horses, birds, and fish. 88% of pet owners and 72% of non-pet owners said that they exercised at least 2 days a week for 30 minutes. Further, dog owners were more likely to participate in aerobic exercises, such as walking their pet, than non-owners or other pet owners. Another comparison that was analyzed was that pet owners are less likely to have feeling of depression or sadness; only 5 pet owners said that they were often or always sad, while 20 non-owners had these feelings. A larger number of non-owners also answered yes to having been diagnosed with clinical depression (15.8%) compared to pet owners (3.8%). The pet owners who participated in this survey also had a lower average stress level, 5.56±2.2; compared
to non-pet owners experienced and average stress level that was slightly higher, 6.06±2.2. The data collected for this study shows that owning a pet can have a positive effect on a person’s life. Pets can also increase feelings of self worth and give individuals a sense of comfort and an undying love. This study shows that it can be a good idea to own a pet to improve exercise habits and to decrease stress in one’s life.

128. Susan Wofford  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

_Correlation between Stimulant Use and Its Effects on Food Intake and GPA on a College Campus_

Over the past several years, there has been an increase in stimulant use on college campuses. Stimulants are used as a study aid, for weight loss, and just as something to help people get through the day. There are various forms of stimulants which students are using including prescription medicines such as Vyvanse, Concerta and Adderall and non-prescription supplements such as No Doz. The effect of stimulant drug usage (prescription and non-prescription) on test scores and overall GPA and food intake was studied in 150 undergraduate and graduate students at the University of Kentucky: 64 males (age 20.39 +/- 1.44 yrs) and 88 females (age 20.72 +/- 3.06 yrs). The students completed surveys that asked about their stimulant usage (both prescription and over the counter), GPA, average caloric intake, whether or not stimulant usage increased their ability to study, and various other questions pertaining to this topic. Approximately 52% of males and 51% of female students have used either prescription or OTC stimulant medicines during their college career. The average GPA of students that used stimulant medicines was 3.29, compared to 3.51 for non-users. Most students reported that they felt that the usage of these medicines allowed them to have a better GPA, despite the fact that the non-users actually have a higher GPA. The impact of stimulant drug use on GPA, concentration, and food intake need to be more thoroughly studied so that students can be better informed before making the decision of whether or not to use these medicines.

_Ophthalmology_

129. Aaema Athar  
Department of Ophthalmology  
Mentor: Michael Fannon

_Heparan Sulfate Proteoglycans Found in the Aqueous and Vitreous Humors Can Potentially Regulate Angiogenesis_

Macular degeneration is the leading cause of vision loss in adults over 60. This eye disease results from irregular blood vessel growth and leakage under the retina. Vascular endothelial growth factor (VEGF) has been implicated in this abnormal vessel growth and is therefore the
target for corresponding drugs. VEGF is known to interact with heparan sulfate proteoglycans. The main goal of this project is to determine proteoglycan presence in vitreous and aqueous humors of the eye. Doing so will not only lead to a better understanding of the humors, but can potentially foster development of effective treatments for some eye diseases. A goal of this study was to find heparan sulfate proteoglycans in the vitreous and aqueous humors. The study was performed using protein quantification assays such as Bradford assays, dimethylene blue (DMB) assays to identify proteoglycan chains, immunoblotting and low-density lipoprotein (LDL) cell binding assays. LDL, although not present in aqueous or vitreous humor, binds to heparan sulfate, so it was used as a surrogate. The results from the Bradford and DMB assays showed that both humors have significant levels of protein and glycosaminoglycans, respectively, which suggest the presence of proteoglycans in both humors. The immunoblotting results confirmed the presence of heparan sulfate proteoglycans. Finally, the LDL binding assays yielded surprising results. LDL binding to endothelial cells in the presence of vitreous humor bound at significantly higher levels than that of controls in the absence of vitreous humor. The results are interesting because heparan sulfate proteoglycans in the fluid phase have been shown to interfere with LDL binding, suggesting the presence of a molecule that neutralizes the proteoglycan presence and promotes LDL binding. These data suggest that both aqueous and vitreous humor contain proteoglycans that can potentially influence VEGF interactions in the eye.

Pharmaceutical Sciences

130. John Andrew Brown, Jingjing Liu, Nadezhda Sabeva, Eric Rouse, Karyn Esser
Department of Pharmaceutical Sciences
Mentor: Gregory Graf

The Absence of ABCD2 Increases Voluntary Running Wheel Activity and Facilitates Weight Loss in Obese Mice

ABCD2 (D2) is an ABC transporter that promotes the metabolism of very long chain fatty acids (saturated and unsaturated) in peroxisomes. D2 expression is greatest in fat, but it is also expressed in liver and skeletal muscle. In obesity, D2 protein decreases in adipose tissue and increases in liver and skeletal muscle. We hypothesized that the absence of D2 would alter metabolic phenotypes in models of diet-induced obesity and weight loss. Wild-type and D2 deficient (D2−/−) mice were challenged with a high fat diet (n=4, 45% kCal fat) for 16 weeks. Among the high-fat fed mice, differences between genotypes for weight gain, adiposity, fasting glucose, and blood lipids were not appreciated. To induce weight loss, mice were returned to a low fat diet (8% kCal fat) and housed in cages equipped with running wheels. The absence of D2 resulted in a 1.8 fold increase in running speed (0.44 ± 0.15 vs. 0.76 ± 0.05 km/hr) and a 2.1 fold increase in running distance (2.88 ± 1.15 vs. 6.04 ± 0.56 km/day). While the absence of D2 does not prevent adipose tissue expansion, our results indicate that the absence of D2 facilitates reductions in body weight and adipose tissue mass in a model of behavior modification weight loss. To determine whether the increased activity was due to a physical fitness advantage, a
treadmill was implemented before and after high fat feeding. Mice were run at 25 meters/minute at a 5% incline until volitional exhaustion was reached. At 8 weeks of age and 20 weeks of age, D2 deficient mice showed greater run to exhaustion times than their wild-type counterparts regardless of diet. We conclude that the absence of D2 results in greater physical fitness despite the development of obesity, thereby allowing for greater levels of physical activity and weight loss.

Physics & Astronomy

131. Paul Alphonse, Michael J. Detisch
Department of Physics & Astronomy
Mentor: Gary Ferland

Testing the Big Bang I – The Theoretical Challenge

The Big Bang Theory has been a part of cosmological theory since it earned that moniker in 1949. Since then much time and effort has gone into expanding and testing the theory. However, recreating and observing the conditions of the original explosion have proven to be quite difficult to accomplish because the oldest light observable in our universe is about 500 million years shy of the incident. Astronomers can bypass this restriction through careful observation of the universe. For instance, the ratio of helium to hydrogen created after the Big Bang can be used to find the neutron to proton ratio in the very early universe. From both observed and simulated data, we have constructed a timeline varying from nanoseconds after this massive explosion to billions of years later where our world now exists. The pressures and temperatures seconds to minutes after the incident are too excessive to create in a laboratory with current technology as well. In my poster I will outline what happened during the first five minutes of the Big Bang, describe which elements were produced during the creation of the Universe, and explain what careful measurements of the amount of these elements will tell us about these events.

132. Michael Detisch
Department of Physics and Astronomy
Mentor: Gary Ferland

Testing the Big Bang II – The Observational Approach

While it may sound like an impossible task to find the helium to hydrogen ratio created in the minutes after the big bang, there are actually regions of the universe, far away from stars and other sources of fusion, that are believed to contain the same levels of helium and hydrogen as just after the Big Bang. Ionized helium and hydrogen emit light as they are pummeled with energy emitted from nearby sources. This light can be analyzed to determine the nature of its source, whether it was helium or hydrogen. There is a problem with this technique however. Atomic hydrogen and helium do not emit light; because of this, they are not detectable by spectroscopic techniques. This leads to a difficulty in measuring the total amount of helium and
hydrogen in the universe since only ionized forms of the elements can be measured. Our focus is to understand the methods currently used to directly measure the helium and hydrogen in the universe, various modeling techniques that predict total helium and hydrogen abundances, and to analyze the errors created by the inability to directly observe atomic hydrogen and helium.

133. Aaron Meacham, Joseph Stieha, Stephen Johnson
Department of Physics & Astronomy
Mentor: Doug Strachan

*Graphene Nanoribbon Formation, Isolation and Measurement*

Graphene is a hexagonal sheet of sp²-bonded carbon atoms. This 2D material, with its unique structure, is a promising endeavor for nanoscale devices requiring great precision. Research in the field, therefore, is progressing at a rapid pace, including recent work on graphene nanoribbon formation. The objective of this research is to explain the processes and methods behind graphene production and nanoribbon formation from metallic catalyst particle etching. In addition, it explores methods of isolation, measurement, and analysis using atomic force microscopy (AFM).

134. Joseph Stieha, Aaron Meacham, Stephen Johnson
Department of Physics & Astronomy
Mentor: Doug Strachan

*Growth and Evolution of Catalysts on Graphene*

We investigated how time and the concentration of metallic particles affect the outcome of the graphene when placed in a furnace. This technique showed that the metallic particles clustered at the edge of the layer before the iron etched the graphene to make nanoribbons. We also utilized atomic force microscopy (AFM) and the scanning electron microscopy (SEM) to observe how the concentration influenced graphene on the nanometer scale. At this time, graphene is a popular research material because of its honeycomb lattice structure which causes it to be one of a few stable two-dimensional structures under ambient conditions, and its electronic properties which are desirable for use in electronic devices. Recent studies have shown that when metallic particles are placed on the graphene, with the correct reaction and high temperatures, crystallographic etching of the graphene lattice can occur. This etching can create nanoribbons which in turn can potentially be fabricated into field-effect transistors. Using the mechanical exfoliation technique, we placed different heights of graphite on silicon substrate. When looking at the graphite under an optical microscope, there are pieces that are few layer or even single layer, these layers are called graphene. After making these samples, we would place the sample into a furnace varying the temperature, the stall time, or the concentration of the metallic particles. We then looked at the samples using SEM and AFM to find the height and to look at the growth and evolution of the catalysts on the graphene samples.
135. Daniel Woods, Susan Malkowski  
Department of Physics & Astronomy  
Mentor: Bradley Plaster  

*Magnetic Field Stabilization for the Neutron Electric Dipole Moment Experiment*

The neutron electric dipole moment experiment will require an environment with a very small and highly stable magnetic field. One facet of this study investigates shielding factors of high-permeability materials (Mu-metal, Metglas, etc.), including magnetic hysteresis and degaussing effects. Particular attention is given to the effects of the geometry of the shielding materials. This investigation also focuses on the conception and implementation of a magnetic field stabilization program, designed to operate with external coils. Prototype square Helmholtz coils are constructed, and extensive tests of the stabilization system are executed to implement the cancellation of time-varying magnetic fields in low-field environments within magnetic shields. Stabilization performance is thoroughly assessed using several metrics, including the Allan deviation function. Displaced field referencing for stabilization is also investigated, including first-order stabilization corrections.

**Physiology**

136. Braxton Branham, Laura A. Gilliam, Jennifer S. Moylan  
Department of Physiology  
Mentor: Michael Reid  

*Characterization of Neutral Sphingomyelinase 2, 3 in Skeletal Muscle*

Sphingomyelinase is a hydrolase enzyme that is involved in sphingolipid metabolism reactions and is responsible for breaking down sphingomyelin into phosphocholine and ceramide. The activation of SMase has been suggested as a major route for the production of ceramide in response to cellular stress. There are five known isoforms of SMase which are unique to one another based on their optimal pH and cation dependence. Out of the five isoforms, lysosomal acidic SMase and magnesium-dependent neutral SMase are considered to be the largest contributors to the production of ceramide. Ceramide is a lipid molecule found in high concentrations within the cell membrane. It acts as a signaling molecule which can allow it to regulate cell differentiation, proliferation and apoptosis. It also acts as a second messenger that is activated by the binding of tumor necrosis factor to either tumor necrosis factor receptor 1 or 2. This can lead to cell death and dysfunction or cell growth. Messenger RNA and protein levels of nSMase 3 were measured in various mouse muscles using PCR and western blotting lab techniques. nSMase 3 mRNA and protein levels were also measured in response to tumor necrosis factor and the chemotherapy drug doxorubicin in various mouse muscles.
137. Natalie Snider, Mary L. Garcia-Cazarin, Chris White  
Department of Physiology  
Mentor: Francisco Andrade

*Substrate Preference in Mitochondria from Different Muscles*

Previous studies have demonstrated that lactate is not a metabolic waste product in glycolysis. Instead, it has been shown that it is a source of energy in muscles that are constantly active. The objective of this experiment is to compare the substrate preference by measuring mitochondria respiration in diaphragm, triceps surae (TS, a limb muscle recruited during ambulation only), and extraocular muscles (EOMs) from male Sprague Dawley rats. Mitochondrial respiration will be measured using a Clark-type electrode. State 2 respiration will be started with addition of glutamate (5mM) and malate (2.5 mM) or lactate (500mM). Then, we will add adenosine diphosphate (ADP) (150 μM) to start state 3 respiration. Oligomycin (1 μM), an ATPase synthase blocker, will be used to estimate state 4 respiration. Lastly, we will add carbonyl cyanide p-[trifluoromethoxy]-phenyl-hydrazone (FCCP, 0.5 μM) to measure state 5, or uncoupled respiration. We will calculate the respiratory control ratio (RCR): the ratio of state 3 (ADP-induced) by state 4 respiration (addition of oligomycin) for each experiment. RCR ≥4 will be considered as evidence of a viable mitochondria preparation. We anticipate that diaphragm and EOM will use lactate for aerobic respiration to meet their high energy demand.

Plant & Soil Sciences

138. Consolee Karangwa  
Department of Plant & Soil Sciences  
Mentor: Jan Smalle

*Arabidopsis Sensitivity to Protein Synthesis Inhibitors Depends on 26S Proteasome Activity*

The 26S proteasome, the central protease of the ubiquitin dependent proteolysis pathway, is essential for eukaryotic cell viability. To investigate the effects of proteasome defects on plant protein metabolism, we tested the response of Arabidopsis 26S proteasome mutants to protein synthesis inhibitors. Studies in yeast showed that loss of proteasome function leads to increased tolerance to the translation inhibitor cycloheximide and to increased sensitivity to hygromycin B, an antibiotic that both inhibits protein synthesis and increases translational misreading. By using dose-response assays, we show that Arabidopsis 26S proteasome mutants are also more tolerant to cycloheximide and are hypersensitive to hygromycin B. Arabidopsis 26S proteasome mutants also have increased tolerance to L-phosphinothricin, which is widely used as a non-selective herbicide and it inhibits cytosolic glutamine synthase. Immunobloting analyses showed that contrary to cycloheximide, L-phosphinothricin does not cause ubiquitin depletion indicating that the tolerance increase in 26S proteasome mutants is not based on reduced ubiquitin turnover. In addition to the novel mechanism for herbicide tolerance, our data suggests that the combination of hygromycin B, cycloheximide and L-phosphinothricin growth-response assays could be used...
as a facile diagnostic tool to detect altered 26S proteasome function in plant mutants and transgenic lines.

**Psychology**

**139. Amanda Barnes**  
Department of Psychology  
Mentor: Chana Akins

*The Interaction Between Adderall and Nicotine: The Potential for Addiction and Implications*

The use of Adderall by college students has become an epidemic on campuses across the country. This stimulant, made up of the d- and l-isomer of amphetamine, is used by students to improve focus and concentration during times such as mid-term tests or final exams when long stints of studying may be necessary. Adderall is often used in combination with nicotine, and has been shown to increase smoking behavior in smokers. The present research focuses on a question that is very important in the aforementioned context: can an Adderall/nicotine combination be rewarding or even addicting? In particular, could low “subthreshold” doses of Adderall and nicotine, by themselves unrewarding, be addicting in combination? Forty-eight male Japanese quail were examined in a Conditioned Place Preference paradigm. The animals were divided equally and randomly into six groups: a saline control group, one of two Adderall dose groups (3mg/kg or 1 mg/kg), one of two nicotine dose groups (1 mg/kg or .25 mg/kg) and a mixture group, combining the subthreshold doses of Adderall and nicotine (1.25 mg/kg). Results replicate previous unpublished research in the Akins lab indicating that the high dose of nicotine (1 mg/kg) produces a conditioned place preference in male quail. Also, this study shows a significant conditioned place preference produced by the 3 mg/kg dose of Adderall, indicating that clinically relevant doses of this drug could be rewarding. Finally, the combination of subthreshold doses of Adderall and nicotine produced a conditioned place preference, suggesting that very low amounts of these substances (i.e. a single use of each) could alter an individual’s functioning enough to be called addicting.

**140. Joseph Brey**  
Department of Psychology  
Mentor: C. Nathan DeWall

*Nostalgia and Personal Well-Being: Using an Idealized Past to Create a More Promising Future*

Biological cell membranes are vital to cellular physiology in that they play key roles in many of the processes studied. Cell membranes maintain a transmembrane voltage difference called the membrane potential. This basic electrical gradient is the driving force behind many cellular mechanisms, one of which is neuronal signal transmission. Neurons are specialized cells that
conduct signals along their lengths to innervate specific target cells. They are composed of a cell body, axon, and dendrites. These structural components can be modeled by altering equivalent electrical properties within a breadboard circuit. Like wires carrying charge, axons conduct electrical differences between two sites. In signal transduction, ion channels act to carry the charge; they enable extracellular ions to enter the axon, creating a charge difference that activates adjacent channels along the axon in a chain reaction. For modeling purposes, these ions correspond to electrons carried by a wire in an electrical circuit. However, when molecules are carried through an axon, the overall voltage drops due to the nature of the cell and its inherent resistance. To model this, resistors are used in series and in parallel to obtain a voltage drop as a function of distance from the source. Capacitors are used to illustrate membrane capacitance and alteration of signal for a given source current. Therefore, in an undergraduate classroom setting, cell membrane processes can be effectively modeled using breadboard circuits. This approach will be used at the University of Kentucky as a foundational exercise upon which other experiments with live tissue will build.

141. Heather Cornett  
Department of Psychology  
Mentor: Chana Akins

*Conditioned Place Preference in a Highly Visual Species: Do Visual Cues Trigger Nicotine Cravings?*

The harmful effects of nicotine have become increasingly worrisome in the United States, with many cities and workplaces banning the practice of smoking all together. Numerous studies have been published showing a link between tobacco use and cancer. Recent statistics released from the Centers for Disease Control and Prevention report that a person who makes a serious attempt to quit smoking only has a 5% success rate after one year, with more than half of persons undergoing surgery for lung cancer continuing to smoke afterwards. Research has shown that individuals may relapse because they experience craving in the presence of environmental cues where they previously smoked. For example, individuals often smoke in a particular place and returning to that place during abstinence may cause craving and lead to relapse. Controlled studies with animals have helped us to better understand how environmental cues become associated with nicotine. However, these studies have relied on animal models that depend primarily on olfactory cues or odor cues. Thus, the degree to which these findings can be generalized to humans is not clear, as humans are highly visual and environmental cues are very salient in humans. Therefore, the current study utilized a visual species (Japanese quail) to assess how visual cues become associated with nicotine and may cause craving or nicotine seeking behavior.
142. Elizabeth Dunn
Department of Psychology
Mentor: Jonathan Golding

*The Effect of Defendant's Demeanor on Mock Jurors' Decisions in Child Sexual Abuse Cases*

This research project seeks to understand the effect of a defendant’s demeanor on the verdict returned by the jury. Specifically, the research is tailored to study defendants accused of child sexual abuse and the effect on juries when a defendant tilts his or her head downward as opposed to keeping his or her head up during the victim’s testimony. This study includes analysis on how the judge’s instructions effect jury decisions, either when judges instruct juries to use demeanor of the witnesses and the defendant in determining a verdict, or to exclude all demeanor from the evidence. The hypothesis states that participants will return more guilty verdicts when the defendant’s head is turned down as opposed to turned forward, and more guilty verdicts will be returned when the participants are instructed to consider demeanor as opposed to eliminating demeanor. To perform this experiment, four versions of one survey were posted online; each used a different combination of the independent variables (head up/head down with instructions/no instructions). Volunteer Psychology 100 students were randomly assigned to complete one version of the survey. The survey presented the narrative of a trial concerning a child sexual abuse case. The narrative was accompanied by photographs of the victim, the defendant, the defendant’s friend, the defendant’s co-worker, and a police detective. Participants were asked to determine a verdict after reading the trial. Participants also rated the guilt of the defendant and the witness credibility on a Likert scale, and responded to open-ended questions by describing the appearance of the witnesses and the defendant. The results of this study could highlight previously unknown factors that affect the jury’s verdict in child sexual abuse cases.

143. Lisa Fioretti
Department of Psychology
Mentor: Peggy Keller

*Parental Problem Drinking and its Effects on Child Hypothalamic-Pituitary-Adrenal Axis Activity*

Parental problem drinking (PPD) has serious implications for children’s health. Exposure to PPD is a chronic stressor that could possibly alter the operation and functioning of the hypothalamic-pituitary-adrenal (HPA) axis. The HPA axis is one of the body’s primary stress response systems, and helps mobilize resources to cope with environmental challenges. Efficient operation of the HPA axis involves a rapid response to a threat that is appropriate in magnitude, followed by a rapid return to baseline once the threat has ended. Maladaptive patterns of HPA activity include hyper-reactivity (the HPA axis is over-reactive and maintains high levels for a prolonged period) and hypo-reactivity (the HPA axis is under-reactive and fails to mobilize the necessary resources for effective coping with the environment). Activity of the HPA axis is measured by cortisol, a stress hormone found in saliva. Evidence suggests that exposure to
chronic stressors is associated with hypo- and hyper-reactivity. However, no known research has examined the effects of PPD on the HPA axis, and there is little understanding of why some individuals develop hypo-reactivity while others develop hyper-reactivity. This project examines the relationships between PPD and children’s HPA activity in an effort to address these important research gaps. Families with a child between the ages of 6 and 12 will be included (N = 100). Parents will be classified as light, moderate, or heavy drinkers and will complete self and partner-report measures of their problem drinking and family relationship functioning. Children’s HPA axis activity will be measured before and three times after the TRIER social stress test modified for use with children. The psychological and physiological data collected should indicate a relation between PPD and HPA activity that supports the hypothesis that a child exposed to PPD has greater difficulty in controlling his or her stress response, which could lead to an increased risk for physical and mental illness.

144. Benjamin Jones
Department of Psychology
Mentor: Troy Bitson

"Choking" While in Direct Competition

In a competitive situation, one influence on performance involves the concept of “choking,” in which an individual performs less effectively due to situational sources of pressure. In this study, the concept of “choking” was examined in relation to performance on a laboratory miniature basketball task. Induced pressure of “choking” was attempted by displaying a shot clock, which counted down the amount of time in the session; and by having participants compete either alone or directly with another individual. Sixty-three undergraduate male participants shot a mini basketball through a basketball hoop alone or in direct competition. To induce competitiveness, participants were informed that a $40 prize would be awarded to the overall high scorer in the study. In the Individual Condition, one participant performed four timed experimental sessions of 30-seconds each. In the Direct Competition Condition one participant observed, while a second participant performed. Throughout four 30-sec sessions, the participants alternated their positions. Participants in the Individual condition (M = 7.86, SD = 3.90) did not perform significantly better than participants in the Direct Competition condition (M = 7.60, SD = 3.95). The results of the present study indicate that male college students were not induced to “choke” in their performance at a miniature basketball task when competing directly with another individual. Further studies will use the present procedure to examine whether performance is influenced by the level of accuracy displayed by their direct competitor, or whether verbal “choking” statements may be influential when in direct competition.
145. Rebecca Jude
Department of Psychology
Mentor: Mark Fillmore

*How Much is Too Much? Comparing Two Definitions of Binge Drinking as Indicators of Alcohol-related Problems in College Students*

The current study examined the validity of the 5/4 drink and the 0.08% blood alcohol concentration (BAC) criteria of binge drinking as valid indictors of alcohol-related problems. The 5/4 drink criterion defines a binge as any per-occasion consumption of 5 or more drinks (4 or more drinks for women). The 0.08% criterion defines binge drinking as any consumption sufficient to raise the drinker’s BAC to 0.08%, the legal limit for DUI offense. The project compared the validity of the two binge drinking criteria in terms of their sensitivity and specificity in detecting problem drinkers based on their responses to the Alcohol Use Disorders Identification Test (AUDIT). 251 adults completed self reports of their drinking habits and the AUDIT. Analysis showed that the 5/4 definition of binge drinking was more sensitive in detecting problem drinkers and correctly identified 57% of the problem drinkers. By contrast, the 0.08% BAC definition failed to correctly identify problem drinkers nearly half (49%) of the time. In conclusion, the 5/4 binge criteria is sensitive enough to capture most problem drinkers, but may have trouble eliminating non-problem drinkers. Further in-depth comparison of the two criteria, including influential factors such as frequency and duration, is advised.

146. Rachael Looney
Department of Psychology
Mentor: Troy Bitson

*Parent Adjective Trait Characteristics Recalled by College Students*

In the determination of a child’s perceptions of their parents, one useful technique involves adjective ratings, which have been shown to be effective for various purposes involving the perceptions of others. Ratings of the perceptions of parents have been used to examine perceptions of stepparents, post-divorce perceptions of both parents, and to compare self-ratings to ratings given to the mother and father. Although simple and useful, questionnaires and adjective checklists present the possibility that participants can be biased or lead to the reconstruction of childhood events. Blatt, Wein, Chevron, and Quinlan assessed open-ended mental representations of parents using a nonclinical sample. Results indicated that college students who reported perceptions of their parents as lacking in qualities such as nurturance and affection were more likely to reveal high scores on measures of depressive experiences. The present study focuses on adjectives college students would use most frequently to describe their parents. The objective was to utilize the unbiased aspects of a free recall question to determine the most frequently recalled adjectives. College students (N = 1248) were asked to think about the four most positive and four most negative characteristics they recalled about both their mother and their father during childhood. An examination was conducted by three raters to determine which words were given very rarely and which infrequent words could be combined.
with more commonly given words. In comparing the adjectives given for each parent, much overlap was shown between the characteristics of the mother and the father. The ten most frequent positive words were loving, caring, hardworking, fun, kind, understanding, supportive, funny, helpful, and strong. The ten most frequent negative words were strict, mean, busy, angry, uncaring, stubborn, short-tempered, selfish, overprotective, and controlling.

147. Jamie Testa
Department of Psychology
Mentor: Suzanne Segerstrom

Repetitive Thought and Depression in Older Adulthood: A Longitudinal Study

Repetitive thought (RT) can have constructive or deconstructive consequences on mental health. For instance, negatively valenced RT is connected with higher rates of depressive symptoms. This study examined the relationship between RT qualities of valence (i.e. positive vs. negative) and topic (i.e. self- focused vs. other- focused) and depression in individuals over 60. Whether self, or other, focus affects depression more for older adults is unknown. On one hand, depressed people give more self-focused responses than control groups, suggesting that RT about the self may be more important. On the other hand, socioemotional selectivity theory states that with aging, individuals will place a high priority on well-known social partners suggesting that RT about others, especially in older adulthood, may be more important. It was hypothesized that negative valence would correlate with higher depression within and between subjects. We also tested the interaction between valence and topic within and between subjects. RT ratings and Geriatric Depression Scale scores were collected from 167 participants over up to 6 years (total=582) and subjected to multi-level modeling. More negative valence across waves associated with higher depression scores (gamma= 1.24, t(163)= 4.50, p< 0.0001). This effect was moderated by topic, such that valence had a stronger relationship with depression when the topic was about the self than when it was about others (gamma= -0.82, t(163)= -2.75, p< 0.007). When thoughts are self-focused, it may indicate a deficit in the individual in terms of attention to social relations or a small social network.

Robinson Scholars Program

148. Whitney Bowling, Camille Hooker
Robinson Scholars Program
Mentor: Pamela McFarland

Blankets of Love: Providing the Elderly and Hospitalized Children with Homemade Blankets

Throughout hospitals and nursing homes, individuals can become very lonely. Some patients have families that visit often while others may not have this privilege. Thus, the goal of our project is to brighten their day, and to let them know that someone cares enough to take time out
of their day to make them something personal, but simple. We have chosen to make blankets out of fleece fabric. We will do so by cutting the ends of two pieces of fabric and tying them together. We chose blankets because it’s something simple that can be given to the patients, but it is also something that is handmade. This shows that people can take time out of their day to make something that will later be special to someone else. We purchased fabric to create blankets to deliver to the facilities, which include: UK Children’s Hospital and Shriner’s Children’s Hospital. We are also taking the project back to our hometowns by delivering the blankets to the Beattyville and Manchester Nursing Homes. Our expected results are to create a more “at home” feeling for the patients. The overall goal of this project is to let the patients know that they are not forgotten and that people still care.

149. Andrea Corkran
Robinson Scholars Program
Mentor: Pamela McFarland

Young Appalachian Writers, Readers and Artist Workshop

The Appalachian area, particularly Southeastern Kentucky, is rich in history and traditions. However, there is a negative stereotype concerning the educational status of Appalachians, which often clouds relationships between the people of Appalachia and the rest of the nation. The stereotype creates a preconceived inability to better oneself, leaving the Appalachians forever stuck in the stigma that the media continues to propagate. The region possesses higher unemployment and high school dropout rates than that of the rest of the nation, and it is invariably important that children are a primary focus if the problems are to be solved. It is the intent of this project to alleviate the misunderstandings between these cultural groups and increase the likelihood of students pursuing post-secondary education. The project, called Young Appalachian Writers, Readers and Artists Workshop or YAW! RAW! will provide biweekly workshops for the children of Bell County, Kentucky. The workshop serves as a means to provide a supportive network for students ranging from ten to eighteen years old as they work toward completing their secondary education. YAW! RAW! also has an important cultural aspect as it is used as a tool to facilitate awareness of the talent and potential of Appalachian students. The project will be used to showcase the artistic gifts of the proud “children of the mountains”. Through the negative documentaries such as Rory Kennedy and Diane Sawyers, the detrimental stereotypes are enforced, but YAW! RAW! seeks to explore the often neglected beautiful and intellectual souls possessed by the Appalachian students. The purpose of YAW! RAW! is to expand throughout the years so that it can be used to reach otherwise neglected areas of America.
150. Joseph Hall
Robinson Scholars Program
Mentor: Pamela McFarland

Food Drive for People in Eastern Kentucky

The poverty rate in Eastern Kentucky is among the highest in United States. People living in impoverished areas such as these face tremendous difficulties in adequately providing for their families. One of the main contributing factors to a high poverty rate is a lack of job opportunities. In Eastern Kentucky in particular, the demand for jobs is even higher than in the rest of US. The unemployment rate for the biggest city in my home town is almost twice the national average at 16.3%, 40% of their residence have an average yearly household income of less than ten thousand dollars a year, with the next highest being 13% earning between fifteen and twenty four thousand a year. That means that approximately half of their households have an income less than the required amount of twenty two thousand dollars a year to be classified as above the poverty line. A food drive has been proposed that would assist families in this particular area with a need for additional support. The food drive was performed by collecting and distributing non-perishable food items from several locations across Knott County. People were also informed about root causes through informative flyers. The inevitable goal of this project was to reach as many families as possible by lending some financial assistance in the form of food products. After the food drive was complete, the food was delivered to God’s Pantry Food Bank, where it could be properly distributed to families in need.

151. Camille Hooker, Whitney Bowling
Robinson Scholars Program
Mentor: Pamela McFarland

Blankets of Love: Providing the Elderly and Hospitalized Children with Homemade Blankets

Throughout hospitals and nursing homes, individuals can become very lonely. Some patients have families that visit often while others may not have this privilege. Thus, the goal of our project is to brighten their day, and to let them know that someone cares enough to take time out of their day to make something personal, but simple. We have chosen to make blankets out of fleece fabric. We will do so by cutting the ends of two pieces of fabric and tying them together. We chose blankets because it’s something simple that can be given to the patients, but it’s also something that’s handmade. This shows that people can take time out of their day to make something that will later be special to someone else. We purchased fabric to create blankets to deliver to the facilities, which include: UK Children’s Hospital and Shriner’s Children’s Hospital. We are also taking the project back to our hometowns by delivering the blankets to the Beattyville and Manchester Nursing Homes. Our expected results are to increase a more “at home” feeling for the patients. The overall goal of this project is to let the patients know that they are not forgotten and people still care.
152. Alyssa Howell  
Robinson Scholars Program  
Mentor: Pamela McFarland

**Literacy in the Mountains**

Literacy rates in Eastern Kentucky are at about sixty percent, so that leaves the other forty percent of Kentuckians being illiterate. Many of these Kentuckians lack the skills of being literate because they did not complete high school. However, this project focused on getting young children engaged in reading whose parents may or may not have finished high school. Getting young children interested in reading is essential for them to do better throughout their years in school. To get these young children interested in reading, reading parties were hosted at a local school as an after school program. A specific book was chosen and the party showcased the theme in decorations, crafts and snacks. As a result of these parties, the teachers of the children who attended reported an increase of the amount of parents who asked them to do crafts that go along with a book they are reading in class and to treat the children after finishing the book. The teachers also reported an increase in attentiveness while they are reading when the children know they are going to be rewarded in some way. If rewarding children with snacks and crafts work to keep their attention while reading to them or them reading a book alone then the students will be more willing to read and will probably read more often. Due to an increased interest in reading and because reading is often the key to other subjects, they could potentially get better grades in school.

153. George Miller, Matt Reams  
Robinson Scholars Program  
Mentor: Pamela McFarland

**Robinson Scholars in Worship**

Robinson Scholars are students from Southeastern Kentucky who are given a four-year scholarship to UK. Many of them are involved in church at home, but in their transition to college they experience difficulties keeping their faith strong. Scholars have concluded that joining a campus ministry is one of the best ways to keep your faith alive while in college and that the first step of being successful is being involved in extracurricular activities. Hence, the need to introduce Robinson Scholars to the many campus ministry opportunities available at UK in one night of fun, food, and worship which encourages them to achieve more, believe more, and be more. Ministry is an excellent way to get involved on campus. Being in ministry helps to create friendships that last a lifetime, a safe and satisfying lifestyle, and a faith that grows daily, all which are likely to help students be more successful. The goal of the project is to provide Robinson Scholars with an introduction to campus ministry and the benefits it offers students. In order to achieve this goal we will organize an exciting night for all Robinson Scholars to meet pastors and leaders from UK ministries, to learn about the different ministries offered on campus, to worship, to bond with other believing scholars, and to eat. Pastors and leaders will be speaking about college and faith, and a Robinson Scholar alum will be sharing his/her UK experience and
how their faith grew while attending UK. So far we know that the event will be held on April 22nd at St. Augustine’s Chapel. The rest of the planning is underway; booking the worship teams, speakers, and food. If the event is a success, it will become annual, happening every Fall semester for freshmen to be introduced to ministries and other believing scholars.

154. Ladetra Morgan
Robinson Scholars Program
Mentor: Pamela McFarland

Postsecondary Education Enrichment and Encouragement: Promoting a College Education in Eastern Kentucky

High school retention rates in Eastern Kentucky are significantly lower than that in other parts of the state. An equally low number of students do not pursue a college education after high school. This lack of a postsecondary education in Eastern Kentucky populations is a contributor to the economic and social strain placed on the area. In the hopes that more Eastern Kentucky high school students will pursue a college education, the aim of this project is to provide helpful information about college, financial aid, and ways to succeed. In an attempt to enrich and encourage students in association with attaining a post secondary education, students will hear firsthand accounts of the college experience. They will be directed in terms of the college application process and how to attain financial aid and scholarships. Students will be given a chance to ask questions and will receive answers to their inquiries. Students will be encouraged in a helpful manner to pursue an education as a way of bettering themselves and their community. The project’s expected results will be to visit Leslie County High School in Southeastern Kentucky. Any questions students have will be answered, and this project will hopefully increase the college enrollment rates of students in that area.

155. Heather Posey
Robinson Scholars Program
Mentor: Pamela McFarland

Beauty in the Mountains

Self-esteem has a very important role in everyone's life. If someone doesn't have good self-esteem then they are normally going to struggle throughout life. In today's society young girls struggle even more than normal with all the media. They have to watch reality shows, modeling shows, read magazines, and hear information on the radio about how girls should look. However, everyone knows that no one looks like the people portrayed in the media. It is important that children have high self-esteem because if they do not then it can cause them to have many problems, from health related to social problems. Self-esteem problems are especially high in southeastern Kentucky. The reason behind this is the stereotypes already placed on the area itself. Beauty in the Mountains is a program to help young girls improve their self-esteem. The way the program does this is by having someone speak to children about having good self-esteem.
esteem and how everyone is beautiful. There are activities involving group work to build self-esteem among the participants. Along with this, they will learn the importance of being nice to others, because being nice makes them a better person, in addition to keeping their communities beautiful. As a result, we hope to raise self-esteem levels in children, increase awareness of being nice to others, and increase community service participation. The long term goal of this program is to grow and to keep communicating with the young girls, while continuing to help improve self-esteem throughout Southeastern Kentucky.

156. Shay Raney, Ladetra Morgan  
Robinson Scholars Program  
Mentor: Pamela McFarland

*College Applications*

This research addresses the likelihood of high school juniors and seniors of Menifee County High School to fill out college applications. Information will be provided through a workshop held during the school day, where students will be informed of due dates and best times to fill out applications, along with first hand testimony. It is hypothesized that students who are given information about college applications will be more apt to fill out the applications and attend college.

157. Daniel Spencer, Carnegie Center for Literacy and Learning  
Robinson Scholars Program  
Mentor: Pamela McFarland

*Encouraging Imagination and Creativity through Reading*

When it comes to literacy, one of the key components that can drive success or failure is imagination. Imagination is not created but rather nurtured in children. Unfortunately, for many children, imagination is not always easy to come by. Television shows and movies have replaced literature as the prime source of entertainment and imagination. As a result, new programs are needed to rekindle the imagination and creativity that once stemmed from literature and make it so again. The goal of this program is to foster imagination and creativity through the reading of literature and thereby improving the literacy of young adults as they progress to adulthood. The objectives include the encouragement of reading, fostering of imagination, the promotion of literature discussion, and improve the critical thinking and creation of new ideas by young adults. This goal and objectives will be undertaken by having the young adults read a selection of literature and as the group progresses through the chapters have a discussion of events, characters, themes, etc that the literature may provide. Hopefully, as the young adults read the selection, they will feel the imagination and creativity that can jump right off the pages of a book. Therefore, the far reaching goal is to send every young adult on a journey through the pages of imagination and creativity that a book can provide and just maybe help them continue to find the joy and exhilaration that reading can bring through adulthood.
Sociology

159. Myrah Scruggs
Department of Sociology
Mentor: Bennett Marshall

Conspicuous Consumption's Twenty-First Century Validity

Thorstein Veblen was a highly educated economist, having been trained by the most esteemed of economists during his time. He, however, was a controversial individual. His extreme lifestyle carried into his writing, causing a great amount of dismay and discontent among scholars of the time. Although The Theory of the Leisure Class, his most famous work, was intended to be a scholarly work, many read it and felt that it was a satirical piece allowing Veblen to interject a pessimistic overtone to society as a whole. With the Gilded Age coming to a close and the Industrial Revolution beginning, Veblen saw that manufacturing was doing more than improving the process of creating goods; it was bringing goods to the masses and beginning a stage of sociological movement that would become a lifestyle — conspicuous consumption. This observed phenomenon, formerly unaddressed, was not an uncommon or new occurrence. This paper will outline the arguments made against Veblen’s theory of conspicuous consumption, while presenting information pertaining to the recent research done to show that conspicuous consumption has a strong pulse that continues to keep America’s economy alive. The validity of Veblen’s theories is debatable, but recent research will ultimately support the assertion that consumption for the purpose of visible status has been a factor for over a century in American society.

160. Brett Wolff
Department of Sociology
Mentor: Cynthia Leedham

The Writing on the Stall: Graffiti, Vandalism, and Social Expression

Graffiti and vandalism are everywhere in the modern city; it seems a part of the typical urban background. While graffiti is usually associated with concrete walls, bridges and train cars, one particular area of focus of vandalistic writing is the walls and stalls of public bathrooms. This area, for both obvious and sometimes unclear reasons, is a popular forum for anyone wanting to write. This project was conducted with the intent of better understanding the somewhat ubiquitous and seemingly mundane writings found on the bathroom walls. The path toward this goal of understanding was two-fold. First, a literature review of approaches to vandalism was conducted. This theoretical exploration, which comprised the majority of the work, was broader and it included general vandalistic activities with a particular emphasis on graffiti. Themes explored include opinions and approaches both against and in favor of graffiti, the debate over graffiti and street art, and a socio-cultural understanding of the phenomena discussed. The second step of research was a collection of photographs of bathroom stall graffiti on the campuses of both the University of Kentucky and the University of Louisville. Due to practical
problems incurred in data collection, the second step was slightly impeded. Regardless, this second step sought to take the general literature on vandalism and graffiti and apply it to the more specific example of bathroom wall graffiti. In its conclusion, this article proposes more effective approaches to understanding and dealing with graffiti and vandalism.

Veterinary Science

161. Zachary Willand, Sheila J. Cook, R. Frank Cook
Department of Veterinary Science
Mentor: Charles Issel

Gag Gene Diversity in Equine Infectious Anemia Virus (EIAV) Field Isolates from the United States

Equine Infectious Anemia Virus (EIAV) is a lentivirus and is used as a model in the study of HIV. In this study, we plan to investigate genetic variation in the gag gene, which encodes the major viral core proteins. Variation in this gene from isolates in different geographic locations has not been extensively studied. Universal primers were designed from what are believed to be highly conserved regions of gag and used for polymerase chain reactions (PCR). RNA will be isolated from plasma taken during multiple febrile episodes from EIAV-infected horses with two geographically distinct field isolates (FL & PA). RT-PCR will be performed followed by nested PCR reactions using internal primer sets. The nucleotide sequence on the amplified products will then be determined.
Doug Pham is an Art Studio Major specializing in digital media. His work includes animation, digital illustration, graphic design, computer programs, and 3D renders. His long-term goal is to work as an illustrator or concept designer.

Introduction:

The Pajama Game
Produced by the UK Theatre Department
Director: Russell Henderson
Musical Director: Ryan Shirar
Choreography: Alecia Fields

"I'll Never Be Jealous Again"
Allyson Smith & Josie McCoy
"Her Is"
Michael Baird & Jesse Pavlovic
"There Once Was A Man"
Alys Dickerson & Jim Trujillo
"Steam Heat"
Abby Sheridan, Amanda Rambo, Emanuel Williams, Tahj Tichenor & Jesse Pavlovic

Experiences in Undergraduate Research and Kreative Activities