THE SHOWCASE OF UNDERGRADUATE SCHOLARS

WEDNESDAY, APRIL 27, 2011 FROM 4-7 PM
Sixth Annual Showcase of Undergraduate Scholars
Abstract Book

Logistical Involvement:
Department of Nutrition & Food Science
Photography: Emily Remy
Design: Sara McSorley

Student Involvement:
Discovery Seminar Program:
American Sign Language and the Culture of the Deaf Community in America

Planners/Editors
Undergraduate Research Office
Evie Russell
Emily Strange

SPUR
Geraldine Goh
McKinley Heflin
Mary Jennings
Taylor Lloyd
James Rossi
Megan Schultz
Lindsey Smith

Office of Undergraduate Research
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**Sixth Annual Showcase of Undergraduate Scholars**

Wednesday, April 27, 2011
Student Center Ballrooms
4:00-7:00pm

4:00 pm  *Opening Remarks and Moderator*
Dr. Diane Snow
Director, Office of Undergraduate Research

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

4:15 pm  *Presentation* of the Fourth Annual Faculty Mentor Awards
Lindsey Smith, President of SPUR
(Society for the Promotion of Undergraduate Research)

4:30 pm  *Presentation* of the Oswald Awards

4:40 pm  Opening Performance – DSP 110 Class: *American Sign Language and the Culture of the Deaf Community in America* students will sign to the song “A Whole New World”

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.*
Dear Students, Mentors and Honored Guests,

Welcome to the **2011 Showcase of Undergraduate Scholars**!!
A component of the University of Kentucky Strategic Plan, and integral to any Carnegie designated “Research University (RU/VH) institution, is the embodiment of faculty-mentored research in the undergraduate educational experience. Although it is intuitively obvious to those who engage in research, numerous studies by education experts indicate participation in research by undergraduate students results in improved retention, greater satisfaction, and overall success in future careers and beyond.

For this reason, we strive at the University of Kentucky to foster undergraduate research in every way possible – from the Freshman year to completion. At various points along their research progression, we get the honor of learning about their methods and discoveries. To this end, as well as to honor the remarkable achievements of our undergraduate students, we bring you the Showcase of Undergraduate Scholars.

The Showcase of Undergraduate Scholars consists of many activities. Students, faculty, staff and guests will hear from administrators associated with research campus-wide, witness the unveiling of the Oswald Award winners (see www.uky.edu/UGResearch/Oswald), enjoy a special performance by University of Kentucky undergraduate students, and of course, meet undergraduate researchers, who present their interesting areas of research and scholarly work in both poster and oral formats. We are sure that you, like us, will be amazed and intrigued by the diversity, depth and breadth of research projects, the professional accomplishments and presentation skills of our students, and the superb mentorship provided by our devoted faculty and staff.

The rigors of undergraduate research challenges both mentor and student, with great benefits to each. The achievements of our students locally, nationally, and internationally speak to the success of this type of collaborative, hands-on instruction. We applaud the efforts of all of these students and their dedication to excellence by going ‘above and beyond’ their routine studies and delving deep into the questions that surround their field of inquiry. While the students are indeed dedicated and talented, we maintain their success is also highly dependent on the devotion and mastery of their faculty mentors, who work side by side with these gifted undergraduates to prepare them for the rigors of their chosen careers. As in the past three years, there will be a presentation at the Showcase to honor the **2011 Excellent Undergraduate Research Mentor**. Having been the 2009 recipient of this award, I can truly say it is one of the finest honors ever bestowed upon me. Congratulations to this year’s recipient, and to all mentors, who truly make a difference in the lives of others.

During my graduate training in Neuroscience, I was told by one of my mentors, “You can do the greatest research in the world, but it’s of little value unless you can successfully convey to others what you have learned.” Join me in welcoming and congratulating all the undergraduate student presenters at this year’s Showcase of Undergraduate Scholars, who will show what engaging in research and scholarly activities is all about!

With appreciation,

Diane M. Snow, PhD  
Director, Office of Undergraduate Research  
Showcase of Undergraduate Scholars
Welcome to the sixth annual Showcase of Undergraduate Scholars! Thank you for taking time out of your busy schedule to take time to discover the work undergraduates are doing here at the University of Kentucky. SPUR has been working closely with the Office of Undergraduate Research to bring you this spectacular event. We hope you will leave with a new understanding of the breadth of scholarly efforts many undergraduates are putting into their endeavors, and the things they are exploring each and every day. Please take the time to look at work in all of the various departments, both familiar and unknown to you. This will really help you to get a feel for the variety of scholarly work that the University of Kentucky endorses.

Personally, I have always seen research as an opportunity for discovery outside of the realm of the classroom, where learning is guided and a curriculum is followed. Research allows us to venture into areas where we are not as knowledgeable and helps us to realize things we’ve always wondered about, but haven’t been able to understand until our experience with research and the creation of new knowledge.

I want to take a few minutes to recognize our faculty mentors. Without these individuals, we would not excel as we do in our scholarly work. Our mentors invest time and effort in our work, and we greatly appreciate all that they do. Their enthusiasm encourages us to carry on even when things become difficult or we want to give up.

Thank you again for coming to the Showcase of Undergraduate Scholars. I hope you enjoy all aspects of the evening, from viewing presentations to the wonderful hors d’oeuvres served, and that you leave with an appreciation for the work that undergraduates are carrying out all over our campus in many various fields.

Sincerely,

Lindsey E. Smith
SPUR President

Executive Council (As pictured left to right)
Back Row: Jimmy Rossi, Shelby Malone, McKinley Heflin; Front Row: Lindsey Smith, Megan Schultz, Geraldine Goh, Taylor Lloyd, Mary Jennings
2011 Faculty Mentor Award Recipients

Dr. Gwynn Henderson, Department of Anthropology
Dr. Trevor Creamer, Department of Molecular and Cellular Biochemistry
Honorable Mentions: Dr. Bruce Downie, Department of Horticulture and Dr. Luke Bradley, Department of Anatomy and Neurobiology

2010 Faculty Mentor Award Recipients

Dr. Chana Akins
Dr. Chana Akins is an Associate Professor in the Department of Psychology in the Behavioral Neuroscience and Psychopharmacology area. She received her Ph.D. in Experimental Psychology in 1994 from the University of Texas. She was hired as faculty after completion of her postdoctoral position here at UK. The goal of Dr. Akins’ research has been to contribute to the understanding of learning and neurobiological mechanisms involved in motivated behaviors, in particular sexual behavior and drug-taking behavior. Both of these behaviors are heavily influenced by specific stimuli in the environment. Therefore, the main focus of her behavioral research has been on how various cues come to control and modify these highly motivated behaviors. Dr. Akin's research has been funded by the National Institute of Drug Abuse. She has had numerous undergraduate students help to conduct research in her laboratory as PSY 395s, BIO 395s, PSY 399s, and honor's thesis students. Many of these students have presented their research in several venues and have received authorship on publications as a result of their work on various projects. She is devoted to giving students an in depth research experience in the laboratory and encouraging students to present and publish. Dr. Akins has also received several teaching awards, including Top Ten Arts & Sciences, Great Teacher Award, and recently College of Arts & Sciences Distinguished Teaching Award. She continues to balance her research, mentoring, and teaching with service and has held various positions within the American Psychological Association. She is currently an Associate Editor for the Psychology of Women Quarterly and consulting editor for Experimental and Clinical Psychopharmacology.

Dr. David Rodgers
Dr. David Rodgers is an Associate Professor of Molecular and Cellular Biochemistry at the University of Kentucky. He received his Ph.D. in Biochemistry from Cornell University and completed his postdoctoral training with Stephen Harrison at Harvard University. Dr. Rodgers has received funding from the NIH, NSF, American Chemical Society, American Heart Association, and the Alzheimer’s Association. His research efforts focus on the structural and functional properties of proteins involved in neurotransmission and modulation of neuronal activity. In particular, Dr. Rodgers investigates the effects of congenital mutations in the enzyme choline acetyltransferase, which synthesizes the neurotransmitter acetylcholine, and he studies the basis for substrate specificity in neuropeptidases, enzymes that control the levels of peptide neuromodulators. Dr. Rodgers has published in a number of journals, including The Proceedings of the National Academy of Sciences, Journal of Biological Chemistry, EMBO Journal, Cell, Biochemistry, Biochemical Journal, PLoS ONE, and Protein Science. Dr. Rodgers helped to found the Center for Structural Biology at UK and continues to help direct the Center. He is a member of the Editorial Board at the Journal of Biological Chemistry.

2009 Faculty Mentor Award Recipients: Dr. Diane Snow, Department of Anatomy & Neurobiology; Dr. Elizbieta Wala, Department of Anesthesiology
2008 Faculty Mentor Award Recipients: Dr. Patricia Burkhart, Department of Nursing; Dr. Nicholas McLetchie, Department of Biology

Showcase of Undergraduate Scholars
## Schedule of Oral Presentations

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Sociology  
Master Status Between Race and Region |
| 5:20  | Andrew Dennis  
Biology  
Encouraging Plant Root Competition by Way of Fertilizer |
| 5:40  | Megan Cassidy  
Animal and Food Sciences  
Efficacy of Dewormers and Small Strongyle Egg Reappearance Time in Young Horses Treated with Pyrantel and Ivermectin |
| 6:00  | Sarah Kachovec  
International Studies  
Targeting Innocent Civilians: The True Determinants of Civilian Victimization in Counterinsurgencies |
| 6:20  | Ilya Vinogradov  
Chemistry  
Synthetic Approaches to Organometallic Complexes for Electronics Applications |

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<th>Times</th>
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| 5:00  | Melissa Cornett  
Animal and Food Sciences  
Impact of Water Intake on Dairy Cattle Reticulorumen Temperature |
| 5:20  | Rebecca Davis  
International Studies  
The U.S.- Latin American Alliance for Progress: Intentions, Outcomes, and Diplomatic Consequences |
| 5:40  | Terpsichore Maras-Lindeman  
Biology  
Microgravity as a Method of Therapy for Acute Spinal Cord Injury to Decrease Secondary Damage |
| 6:00  | Aaron Meacham  
Physics  
| 6:20  | Courtney Cox  
International Studies  
African Media, Civil Society, and the Propensity for Civil Unrest |
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Megan Cassidy
Department of Animal and Food Sciences
Mentor: Mary Rossano

*Efficacy of Dewormers and Small Strongyle Egg Reappearance Time in Young Horses Treated with Pyrantel and Ivermectin*

Small strongyles are the primary parasite of concern in adult horses, but have recently shown resistance to common dewormers. The purpose of this study was to determine the efficacy of pyrantel pamoate (PYR) and ivermectin (IVM) in reducing the strongyle-type fecal egg counts (FECs) in horses, and to determine the egg-reappearance time for the respective drugs. Sixteen horses between the ages of 2 and 4 years old were allocated into 2 groups of 8 based on pre-screening of fecal samples. To balance the groups, an initial FEC was determined. PYR was administered to the horses of one group and IVM was administered to the other. Fecal samples were taken on Day 0 of treatment and at days 7, 21, and 28 thereafter. The fecal samples were tested using a modified Stoll technique and examined with a microscope at 100x magnification. The FECs were determined and the percent reduction for each time period after treatment was calculated. The standard for a drug to be considered effective is at least a 90% reduction in FECs between Day 0 and Day 7. Egg reappearance time was measured as the time from treatment to when the percent reduction fell below 90%. The horses treated with PYR showed a 57% reduction between Day 0 and Day 7, while those treated with IVM showed 100% reduction in the first week. The PYR was determined to be ineffective against small strongyles. The IVM did meet the standard for efficacy, and 28 days post treatment had not yet reached the threshold to establish egg reappearance time. The FECs of these horses will continue to be monitored.

Melissa Cornett, D.L. Ray
Department of Animal and Food Sciences
Mentor: Jeffrey Bewley

*Impact of Water Intake on Dairy Cattle Reticulorumen Temperature*

Concerns remain about the effect of water intake on temperatures collected within the reticulorumen. The dramatic drop in reticulorumen temperature (RT) following water intake has been well documented; however, the time required for RT to return to pre-drinking baseline temperature (BT) has not been quantified. The objective of this study was to quantify the relationship between water intake quantity and BT. Four mid-lactation, multiparous, Holstein-Friesian dairy cows were equipped with SmartBolus® transponders (TenXSys, Eagle, ID) set to record RT at two-minute intervals. Cows were housed in a tie-stall barn at the University of Kentucky Coldstream Dairy Research Farm. A TMR ration was provided ad lib at 05:30 and 14:00. One poly water bowl (SMB MFG, Wallenstein, ON) equipped with a range water meter Recordall Badger Meter® (Badger Meter, Milwaukee, WI) was assigned to each tie stall to assess water intake. Drinking behavior was monitored by two observers for 48 consecutive
hours. The termination of a drinking bout was established when 30 minutes elapsed without another drink. Quantities consumed within each drinking bout were used for analysis. Mean (±SD) volume of water consumed per drinking event was 0.27 ± 0.31 L. Mean (±SD) temperature drop (TD) across all drinking events was 2.29 ± 1.82 °C. Mean (±SD) RT at the beginning of the drinking event was 39.76 ± 0.49 °C (N =84), while mean water temperature (WT) fifteen minutes before the drinking event was 3.63 ±3.14 °C. Mean (±SD) BT, identified in 50 drinking events (59.5% of total drinking bouts), was 57.75± 38.70 minutes. The BT was moderately correlated with pre-drinking RT (r=0.57, P<0.01), TD (r=0.49, P<0.01), and WT (r=-0.28, P<0.05). The TD was moderately correlated with the pre-drinking RT (r=0.57, P<0.01), the amount of water consumed (r=0.53, P<0.01), and BT (r=0.49, P<0.01). Regression was performed with the GLM procedure of SAS® (SAS, Cary, NC) to assess factors influencing BT (R²=0.36). The quantity of water consumed (P=0.03), and the RT prior to a drinking bout affected BT, while WT did not (P=0.92).

Rebecca J. Davis  
Department of International Studies  
Mentor: Erik L. Myrup

The U.S.- Latin American Alliance for Progress: Intentions, Outcomes, and Diplomatic Consequences

By means of a detailed analysis of U.S. diplomatic intentions, aid, and ultimate results, this project will look at two nations within the region, Chile and Uruguay, in order to determine the short and long term effects of this U.S.-Latin American Alliance for Progress. Chile and Uruguay have been chosen as the two cases studies as both represent two contrasting results of the Alliance. In part, thanks to the Alliance for Progress, Chile developed and maintains today, one of the strongest democracies within the region whereas the Alliance led to further political and economic corruption within the nation of Uruguay. This contradiction begs the question of how differing U.S. intentions within these two nations have helped create and determine the political and cultural trajectory of them both in present times and the future. Current literature and studies demonstrate that much of this contradiction between the levels of development in the nations of Uruguay and Chile can be explained via the amount of personal and social aid that was given to the nations, not the more commonly discussed fiscal aid. Whereas many of the nations within the region received comparable amounts of fiscal aid to implement programs for the development of their nations, the amount of time that U.S. diplomats spent conversing with the leaders of various nations, as well as the amount of aid that was sent in terms of personnel and physical goods differs greatly, and may help to indicate the U.S. diplomatic intentions within the differing countries. This along with various historical contexts including the Cold War and the predominant theory of the time, The Domino Theory, may help to explain what the true U.S. intentions of the time were in order to determine the implications of these actions for current U.S-Latin American diplomatic relations.


Andrew L. Dennis, Deric Miller  
Department of Biology  
Mentor: Phil Crowley

Encouraging Plant Root Competition by Way of Fertilizer

Plant root systems compete for nutrients in soil. Existing research shows that competing plants may overallocate resources to root production, even against their own long-term reproductive best interests, a phenomenon known as the Tragedy of the Commons (ToC). This study seeks to determine whether competition for different nutrients will lead to differing levels of ToC effects. We believe that ToC effects stem primarily from competition for nitrogen. As such, we predict that nitrogen-limited plants will experience a stronger ToC, measured in terms of reproductive mass produced by plants under competition per reproductive mass produced by plants not under competition. I chose soybean plants (Glycine max), as my focal species, because they grow well in relatively small grow room plots, and much of the existing literature uses them. The study includes four experimental groups: plants given no fertilizer (complete nutrient limitation), plants fertilized with urea (high-nitrogen), plants fertilized with phosphate (high-phosphorous), and plants given both fertilizers. Within the groups, I divided twenty-eight plants into fourteen pots, seven of the pots featuring a barrier between the two plants, and seven having no barrier. Within treatment, I expect to find that the plants with barriers will generate more reproductive mass and less root mass than those without barriers. Across treatments, I expect to find that the extent of the ToC will increase for plants under nitrogen limitation compared to those with adequate nitrogen. Broader applications of this research include the increasing agricultural yield by limiting ToC effects and inhibiting reproduction of invasives by maximizing ToC effects.

Sarah Kachovec  
Department of International Studies  
Mentor: Geoffrey Wallace

Targeting Innocent Civilians: The True Determinants of Civilian Victimization in Counterinsurgencies

This project investigated the determinants of civilian victimization in counterinsurgencies between 1980 and the present. Numerous theories have been presented that involve the targeting of civilians, but this study focused solely on counterinsurgencies, instead of any other type of conflict. The main theories tested in this project include regime type, the enemy’s identity, the duration of the conflict, the time period in which the war occurred, and specific components of the militaries involved. This study found that regime type is a significant factor in a military’s decision to target civilians, as autocracies revert to this strategy more often than democratic governments. The enemy’s identity was studied by deciding whether a military was an occupant of the land in which the dispute took place or not, and comparing this title to the number of civilians killed. This study found that identity is a pertinent determinant in a military’s decision to target civilians, and non-occupants are more likely to use this strategy. The time period in which the conflict occurs also proved to be significant, as wars occurring before 1991 were more...
likely to target civilians. The only theory that did not prove significant was the specific components of the involved militaries. This was studied through three variables: the number of military personnel involved, the number of vehicles possessed by the incumbent, and the military’s level of mechanization. This study proved that none of these variables were noteworthy in the decision to utilize civilian victimization.

Terpsichore Maras-Lindeman  
Department of Biology  
Mentor: Scott Gleeson

Microgravity as a Method of Therapy for Acute Spinal Cord Injury to Decrease Secondary Damage

From the Hadean time until today, all living organisms on earth, no matter how small have been living and evolving under the constant presence of gravity. From the first space flight until today, the examination of physiological responses of living organisms in space has been of interest to the scientific community. Most research conducted is to determine the negative effects of microgravity on humans, animals, plants and unicellular organisms, stimulated by the pathological conditions cosmonauts and residing life on space missions seem to express upon their return to earth. Thus in essence, the lack of this constant influence of gravity on earthly organisms seems to be altering their physiology. Preeminently, the reduced immune response of human monocytes seemed to be an interesting finding when recent research has expressed reduced monocyte activity assists in decreasing secondary damage in acute spinal cord injury. The mechanisms of this reduced immune response, specifically that of monocytes is unsubstantiated until today. Acute spinal cord injury is known to be an injury that undergoes two phases a primary and secondary phase in which the later is most deleterious and mostly responsible for permanent damage. In the secondary phase, a delayed immune response of macrophages and microglial cells once activated release glutamate and other neurotoxins, which increase cellular stress and neurons that were not effected by the primary local tissue damage are now irreversibly damaged by which regeneration that is instigated during primary phase is inhibited inducing die back since the injured neurons are now susceptible to macrophage attack resulting with a cascade of events and the formation of a glial scar. A trend in acute spinal cord injury is researching the effects of immunosuppressants and reduction of secondary damage, which have proven to be successful by way of adhesion molecule inhibition. This paper will be exploring the possibilities of secondary damage decrease in acute spinal cord injury in a microgravity environment due to its possible effect on adhesion molecules, integrins, cadherins, and selectins.

For virtually all experiments carried out in the lab (including those not mentioned in this abstract), mechanical exfoliation is the process utilized for depositing graphene. AFM is used for accurate height measurement of graphene (and other) samples that will be used for electrical measurements and potential electronic devices (i.e. etching of graphene into nanoribbons for FETs). Much work was done with regards to measurement of single- and few-layer graphene (SLG and FLG). A problem noticed throughout graphene literature (and verified in the lab) is of measuring the theoretical thickness (~0.34 nm) of SLG from substrate to graphene. It is typically reported that the AFM should, in practice, measure a range from 0.5-1.0 nm for SLG. This difference between the theoretical and measured height may be due to various parameters such as AFM scanning parameters or water layer below graphene flakes. In order to begin studying what is exactly going on we have measured (via AFM) SLG under ambient atmosphere (~45% relative humidity) as well as under very dry environments (~5% relative humidity, with desiccant beads). If there is a water layer that is causing this systematic error in height, then a “dried” sample (one that has been introduced to desiccant beads for 24+ hours) should measure close to 0.34 nm. We have seen this effect a couple of times in the lab (Figures available). In summary, we expect that relative humidity has an effect on the measured thickness of single-layer graphene (graphene-substrate interface). Currently I am working on performing AFM scans with the sample in a closed environment (using an adapted Asylum Research closed-fluid cell) with desiccant beads in order to have a constant, dry environment with known relative humidity. This will tell us, systematically, whether or not humidity is the main factor in AFM measurement of single-layer graphene.

**Master Status Between Race and Region**

Popular media portrays significant differences in Southern Americans compared to Non-Southern Americans. The terms 'redneck', 'good ole' boy', 'southern belle' are stereotypes that typically imply an individual is an American Southerner. Each has a list of characteristics that are implied for the status holder. However, is region still implied by these and other "Southern" stereotypes? Do the other traits and characteristic mute the regional affiliation? Southern stereotyping is one of the only socially acceptable forms of stereotyping that still exists. This study works to gauge whether "Southerners" are perceived as a distinct social group from "Non-Southerners" as well as to explore whether individuals associate "Southern" with the United States region as much as individual characteristics such as living in a rural area, being friendly, or being conservative. This study also aims to distinguish the perceived master status between
race and region. Master status is, "the status position that provides the basic structure of an individual's social identity and that dominates in instances of conflicts between statuses. An individual's master status may be rooted in occupation, race, or sex; it may be dependent upon age, appearance, illness, or any other central feature of a person's place in society. Moreover, it may change with time."

Ilya Vinogradov, Uttam Pokharel, Bidhya Maharjan, Deepshikha Gupta  
Department of Chemistry  
Mentor: John Selegue  

_Synthetic Approaches to Organometallic Complexes for Electronics Applications_

Organic chemistry has the potential for the creation of low-priced electronic units (semiconductors), such as transistors, sensors, etc. Unfortunately, there are a number of problems with classic organic semiconductors (acenes such as pentacene), including poor solubility and poor stability. One of many possible workarounds to these problems is by coordinating these organic acenes with metals (for example: iron, manganese, or ruthenium) to help improve solubility, stability, as well as introduce enhanced electrical properties (smaller band gap), redox potentials (electrochemical switches), and new optical properties (electrochromism). One way to synthesize useful organometallic compounds (such as metalloocene acenes) is to form 1,2-metallocaledicarboxylic acids (such as ferrocene-1,2-dicarboxylic). Double Friedel-Crafts reactions can be done to produce metalloocene acenes from the dicarboxylic acid, or the acid can be converted to dialcohols and dialdehydes to produce other potentially useful organometallic compounds. 1,2-Ferrocenedicarboxylic acid can be successfully synthesized via the reduction, cyclization, and then oxidation of acid (3-carboxy-1-oxopropyl)ferrocene. An alternative is a high yielding one-step approach to the production of 1,2-(α-ketotetramethylene)ferrocene from ferrocene and γ-butyrolactone followed by the oxidation to form the diacid. The 1,2-(α-ketotetramethylene)ferrocene could not be synthesized by literature conditions. Mayer et al. reported a high-yielding synthesis for 1,2-ferrocenedicarboxylic acid from 1,2-(α-ketotetramethylene)ferrocene via reaction with excess bromine and sodium hydroxide. This procedure often produces decomposition product. In order to find ideal reaction conditions for the synthesis of 1,2-ferrocenedicarboxylic acid from 1,2-(α-ketotetramethylene)ferrocene, the oxidation of acetyl ferrocene was performed to synthesize ferrocenecarboxylic acid. Generally, strong basic conditions cause decarboxylation of the product and forms ferrocene and excess bromine causes oxidation of the ferrocene framework to form ferrocenium compounds. Milder conditions yield ferrocenecarboxylic acid. An iodoform reaction with iodine, potassium iodide, and sodium hydroxide also yields ferrocenecarboxylic acid. An iodoform reaction with 1,2-(α-ketotetramethylene)ferrocene results in mostly recovered starting material and intractable black powder.
Table Abstracts

Bradley Akers, Zhefeng Chen, Seth Kravetz
Department of Computer Engineering
Mentor: Daniel Lau

Multi-view Stereo Vision

The project of Multi-view Stereo vision has a very ambitious task. We are using a single camera with a specialize Fresnel lens to create a 3-D image. To accomplish this task we are using many different technologies such as hardware engineering, to create our camera box, software engineering to create all the controls as well as image processing to deal with the photos themselves. Through the course of the project we will build a custom camera box which will be connected to a pc thorough a USB connection. From this connection we will be able to take a picture parse the image and load it into our graphical user interface or GUI. After all other task has been accomplished we will the use Luxand SDK to develop our own facial recognition software which will drastically improve the reliability of the technology which is out today. This project reduces the large task of taking multiple pictures, and brings it to one picture, which is easy to store and saves time.

Cynthia Crawford
Department of International Studies
Mentor: Liang Luo

Laogai: Profit or Principles?

In the history of the world’s violations against humanity, Nazi concentration camps have persisted as one of the most salient accounts of such transgressions. These concentration camps have been condemned repeatedly since the disaster of the Second World War; the complete exposure of the Nazi camps proved unacceptable in the eyes of the international society and was henceforth eliminated. A humanitarian lesson was thought to have been learned. In the neighboring Asian continent, China had manifested its totalitarian power through its own system of repression known today as the Laogai concentration camps. The Laogai are concentration camps modeled after the Soviet Union’s Gulags as a means to crush potential political, economic, and religious dissidents (Laogai Research Foundation). The Laogai camps were initiated in the early 1950s and still exist today, where they have been inextricably implanted into profiting the world’s second largest economy. It is largely due to this economic complication that an extremely repressive system tantamount to Nazi concentration camps has survived for over half a century. This paper aims to study the Laogai’s human rights violations, its relations to United States foreign policy, and even the complexities of the nomenclature. The functional existence of the Laogai serves as important evidence that profit will triumph over principles unless enough blood of political importance is shed.
Evan Gunter  
Department of Computer Science  
Mentor: Jerzy Jaromczyk  

*OnlyAtUK.com*

Recently, many forms of entertainment are more and more often utilizing the internet, and they focus around specific audiences. OnlyAtUK.com aims to be part of the Big Blue nation, a community of UK and its friends. OnlyAtUK.com is a user-generated content website, similarly to fmylife.com, textfromlastnight.com and facebook.com. The Big Blue nation community can submit their posts based upon their experiences, good or bad. Whether we are claiming to have the greatest tradition in college basketball, or complaining about UK parking, OnlyAtUK.com provides the basic hot spot for sharing experience and opinions. OnlyAtUK.com is developed and operates using a number of languages and web programming essentials: PHP, SQL, JavaScript, HTML and CSS. A number of key security features are implemented when the website receives input from the user: protecting the user's information, protecting the back-end data base, providing protection against SQL, HTML injection, and malicious programs that may attempt to sniff out user names and passwords. Collectively, OnlyAtUK.com is intended to inspire creative entries and to be entertaining while providing basic security for all users.

Madison McGhee  
Department of Theatre  
Mentor: Nancy Jones  

*The Making of "The Smoking Gun": An Exploration into the Creative Process, Development and Production of a Theatrical Work*

The Making of "The Smoking Gun" highlighted the delicate process of the creation of a theatrical work. Through this exploration, one was able to discover the process in which actors transform from the actor to the character, the role of the director, the process of writing a play and the integral parts cast and crew play in the eventual finished product. Through this exploration, the underpinnings of the theatrical process from paper to production have been brought to the general public, so that audiences may better understand the dedication, effort and work behind "theatre magic".
Dominic Pealer  
Department of Computer Science  
Mentor: Jerzy Jaromczyk

*A User-friendly Application for Creating Environments for Use in Traffic Simulation*

We present a computer user interface and the corresponding back-end to configure scenarios for a Wii-based educational game for a flagger training program. At locations where construction or an accident alters the normal flow of traffic, a traffic flagger is employed to direct driver behavior in what could be a dangerous situation. Providing a better way to train these workers is the aim of a collaborative project at the University of Kentucky. The solution uses two Nintendo Wii controllers to detect the trainee's movements and a virtual 3D world to provide feedback. The focus of this presentation is a tool that an instructor or a site-manager can use to build training scenarios that prepare a flagger for their task in a very specialized way. End-users have the option to create distinct scenarios that are highly relevant in their own setting. The settings involve the virtual scene and drivers' characteristics. A familiar drag-and-drop mechanic is used to place roads, cars, signs, and the traffic guard's location within the virtual world. This may include even aesthetic details like trees and buildings. Since the simulation of drivers is implemented with autonomous AI agents that respond to their environment appropriately, it is possible to create a very large set of scenarios only by moving the set-pieces. Similarly, the weather conditions can be configured, affecting visibility and automobile physics reflected in the simulation. Furthermore, each driver has personality characteristics that may be preset, such as alertness, aggression and response time. Finally, a sequence of scenarios can be assembled to make play-list of levels the trainee progresses through. The ability to create a variety of customized environments makes the project much more effective as a learning tool.

Mary Ellen Wimberly, Nolan Lowry, Ann Cooper, Austin Schmitt, Katelyn Brown, Megan Brown, Thomas Green, Daniel Cooper, Christopher Yared, Seth Phelps, Patrick Walker, Aleksey Graboviy, Will Spence, Madison Gooch, Jeffrey Howard, and Myrah Scruggs, Jeff Payne, Mark Toma  
Department of Marketing  
Mentor: Ajay Mehra

*Gatton Student Research Publication*

Gatton Student Research Publication (GSRP) for Business and Economics seeks to encourage undergraduate research at the University of Kentucky's Gatton College of Business and Economics. Unlike a conventional research project, which focuses on the research from a single, narrow topic, GSRP showcases all business-related student work. In addition to solely accepting undergraduate student submissions, GSRP relies on a student-review process to determine which papers are selected for publication. Through student submissions and editing, GSRP is able to create a platform for undergraduate output to become highly visible to the University and to the community. GSRP strives to create an environment that fosters collaboration between faculty...
and undergraduates on research endeavors, therein supporting the University of Kentucky’s goal of becoming a premier research institution. Through semi-annual publications of an online journal and sharing opportunities such as this, GSRP is able to provide a rewarding academic experience to undergraduates while creating a forum for the dissemination of knowledge.
Anatomy and Neurobiology

1. Joyce Achenjang
Department of Anatomy and Neurobiology
Mentor: Andrew Deane

*A New Angle on Dietary Inference in Apes: A 2D Morphometric Analysis of the Functional Significance of Hominoid Incisor Crown Splay*

Diet is among the most fundamental ecological factors defining living ape species. The continued study of the functional role of ape teeth and a detailed understanding of living ape dietary complexity are necessary to understand the role diet has played in shaping ape evolution. Incisors are tasked with preprocessing foods before consumption, whereas, post-canine teeth (i.e. premolars, molars), are responsible for breaking food into smaller portions. Incisor morphology is more often a result of foods consumed year round, however molar and premolar morphology are more often a reflection of keystone resources consumed during a limited timeframe (i.e. foods available year round but only consumed at times when preferred foods are scarce). The present study examines the functional significance of incisor crown splay (i.e. the difference between the mesiodistal length of the basal incisor crown and the occlusal margin) measured here as a series of discrete angles formed by the occlusal, left, right and inferior crown margins. Using ImageJ, measurements of incisal basal and occlusal angles were compiled in an attempt to distinguish among discrete living ape dietary categories (i.e. hard object frugivores, soft object frugivores, mixed frugivore/folivores, dedicated folivores). Results from this study failed to identify a statistical correlation between ape dietary proportions and incisor crown angle measurements. This suggests that, despite the observed dietary variability among living apes, ape diets are characterized by a significant amount of overlap in resource dependency and the resulting similarities in occlusal loading do not select for dissimilar incisal basal and occlusal angles.

2. Michael Bricken
Department of Anatomy and Neurobiology
Mentor: Luke Bradley

*An Investigation into the Relationship Between Calmodulin Protein Conformation and Binding Specificity*

A multitude of cellular processes, ranging from cell survival to neuronal excitability, are regulated by proteins that bind to a large number of diverse and physiologically vital binding partners. For nearly 30 years, calmodulin (CaM), the central calcium signaling transducer, has been a model system to study pervasive binding specificity. However, after numerous structural and biochemical studies, the molecular basis of this binding activity remains unclear. Given that CaM binding affinity arises from a combination of amino acid contacts, protein combinatorial
libraries offer an attractive approach towards investigating CaM binding specificity by identifying members with altered binding specificity for downstream biochemical structure/function studies. To maximize this search, productive regions of protein sequence space (i.e. folded and soluble) must be sampled. Here we present the first application of the binary patterning approach of combinatorial protein library design to the CaM central linker region. 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. In addition, ANS-binding data showed that each of these possesses significant diversity in binding specificity. Collectively, this 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 the investigation of selected proteins with altered CaM binding specificity. Furthermore, this research introduces a new platform biotechnology for downstream use in the state’s agricultural, pharmaceutical, and biotech industries.

3. Ashley K. Buchanan, Darren M. Miller, Juan Wang
Department of Anatomy and Neurobiology
Mentor: Edward Hall

*Quantification of Antioxidant mRNA in Ipsilateral Cortex and Hippocampus—a Time Course Study by qRT-PCR*

Traumatic brain injury (TBI) is a leading cause of morbidity and mortality among three key groups in the United States: children, young adults, and geriatric individuals. The pathophysiological sequelae associated with the secondary injury cascade following TBI include excitotoxicity, metabolic disruption, calcium homeostasis dysregulation, and oxidative damage. As a result, the secondary injury cascade exacerbates neuronal dysfunction, cell death, tissue loss, and ultimately behavioral deficits. It has previously been demonstrated that the severity of the primary injury closely relates to the extent of secondary injury (e.g. oxidative damage). This is due to overproduction of reactive oxygen and/or reactive nitrogen species and the decreased capacity for endogenous antioxidant defenses to cope with this increased oxidative stress. The present study was designed to measure relative expression of cortex and hippocampus antioxidant mRNA levels by Real-Time Quantitative Reverse Transcription Polymerase Chain Reaction (qRT-PCR) using Taqman chemistry. Young adult male mice were subjected to a unilateral moderate cortical contusion. At various times post-trauma (3 hr, 6 hr, 24 hr, 48 hr, 72 hr, and 1 week), animals were sacrificed and RNA was isolated using trisol protocol. Cortical and hippocampal mRNA was reverse transcribed to form cDNA, which then underwent qRT-PCR. Statistical calculations indicated that mRNA levels of numerous studied antioxidant enzymes varied in an injury-dependent and time-dependent manner, but upregulation of antioxidant expression often occurred many hours post-TBI (24 hours or later). Thus, antioxidant cellular defenses are often upregulated after most neuronal damage has already occurred. Therefore, any pharmacological treatments that may enhance the cell’s natural defense mechanisms (i.e. the Nrf2-ARE pathway) may help reduce the deleterious effects of the secondary injury cascade following TBI, ultimately leading to reduced neuronal loss in the patient.
4. **Jonathan T. Davies**, Thomas M. Hering, Adrian Centers, Justin Beller  
Department of Anatomy and Neurobiology  
Mentor: Diane Snow

**Transient Expression of ADAMTS-4 in HEK293T Cells**

Aggrecan, a large aggregating proteoglycan, accumulates following spinal cord injury and inhibits neurite outgrowth and regeneration in the injured spinal cord. Aggrecan core protein contains three globular domains: G1, G2, and G3. The N-terminal consists of G1, G2, while G3 is localized at the C-terminal end. Chondroitin sulfate and keratan sulfate side chains, attached to the core protein between G2 and G3, allow for distinct patterns of side chains and sulfation. Between G1 and G2 there is an extended region known as the interglobular domain or IGD; this region is susceptible to proteolysis. Aggrecanases are proteases capable of aggrecan degradation; these proteases are members of the ADAMTS (A Disintegrin And Metalloprotease with ThromboSpondin motifs) family of proteins. An ADAMTS-4-FLAG expression construct was used to transfect HEK293T (Human Embryonic Kidney) cells. Following transfection, the aggrecanase will be purified using FLAG-tag antibody affinity column chromatography. SDS-PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis) and Western blot (protein immunoblot) techniques will subsequently be used for qualitative analysis. Enzymatic activity will be assessed by the enzyme’s ability to degrade purified aggrecan. Following spinal cord injury, reactive astrocytes produce proteoglycans, including aggrecan, which inhibit regeneration of damaged neurons. Proteoglycans that restrict neuronal outgrowth and regeneration could be selectively targeted for degradation by ADAMTS-4. Therefore, purification of ADAMTS-4 will assist in elucidating the mechanism(s) that are involved with neurite outgrowth inhibition and regeneration following spinal cord injury. Furthermore, these findings have the potential to be translated into clinical applications. [Support provided by a grant from the Dept of Defense; DOD; the Office of Undergraduate Research; and The Chellgren Center].

5. **Alyssa Fountain**  
Department of Anatomy and Neurobiology  
Mentor: Luke Bradley

**Assessing Dopamine Neuron Stimulating Peptide-11 as a Monoamine Oxidase B Inhibitor**

Parkinson’s disease (PD) affects over one million Americans each year and expected to double over the next 25 years. While the cause of this disabling disease is unknown, its symptoms manifest following a loss of the neurotransmitter dopamine. While current treatments are able to relieve the physiological symptoms by restoring dopamine levels in the brain, over time they lose their effectiveness as the dopamine-producing neurons continue to be lost as the disease progresses. Thus as a strategy for the long-term treatment of PD, newer approaches should not only restore dopamine levels, but also provide protection to dopamine-producing neurons from further degeneration. Recently, Dopamine Neuron Stimulating Propeptide 11 (DNSP-11) has shown to restore dopamine levels in rat parkinsonian models, while providing neuroprotection.
In particular, evidence is emerging that DNSP-11’s molecular and cellular effects involve the mitochondria and the glycolytic protein GAPDH, a known drug target for the treatment of PD. To gain insight into DNSP-11’s effects on mitochondria and the metabolism of dopamine, its inhibitory monoamine oxidase B effect (the enzyme responsible for dopamine metabolism) was determined. The results from this experiment compare DNSP-11 with deprenyl, a specific inhibitor of monoamine oxidase B. While DNSP-11 is not as potent of an inhibitor as deprenyl, its inhibitory effects provide a start for further studies and development as a potential for the treatment of PD.

6. Clifford L. Freeman, Christopher M. Calulot, Adrian Centers, Thomas M. Hering
Department of Anatomy and Neurobiology
Mentor: Diane M. Snow

**Development of Retinal Ganglion Cells as a Model for Chondroitin Sulfate Proteoglycan Inhibition Analyses**

Approximately 256,000 people in the US live with Spinal Cord Injury (SCI), with about 12,000 new cases per year. SCI presents patients with many hardships, one of which is failed neuronal regeneration. Lack of regeneration stems in part from the upregulation of chondroitin sulfate proteoglycans (CSPGs), large, aggregating glycoproteins of the extracellular matrix. In many previous studies addressing axonal regeneration, dorsal root ganglia (DRG) neurons have been used as a model to characterize the inhibitory effects of CSPGs. However, DRGs may not be the optimal model for such studies since they are a heterogeneous population of neurons and can lead to variable results. An alternative approach for inhibition analyses *in vitro* may be the use of retinal ganglia cells (RGCs), which are a more heterogeneous population. Thus, we are developing RGCs to be used in specific neurite outgrowth assays testing inhibitory CSPGs. Briefly, embryonic chicken (day 7) retinae are dissected and dissociated by trypsination, and RGCs are isolated and purified. Outgrowth is assessed with epifluorescence microscopy and image analysis, using anti-Thy1.1 as a marker for RGCs. We are conducting detailed analyses of the responses of RGCs when cultured on substrata containing alternating stripes of laminin (growth-promoting) and CSPGs (growth inhibiting). The degree of inhibition on different concentrations and types of CSPGs will be quantified. In the future, similar methods will be used to measure the effectiveness of molecular alterations of CSPG structure to reduce inhibition, and potentially lead to a therapy for SCI patients. [*Support provided by a grant from the NIH, NINDS 053470, and from the Christopher and Dana Reeve Foundation*].
7. Gaberiel Jones  
Department of Anatomy and Neurobiology  
Mentor: Andrew Deane

*Reconsidering Dental Morphology as it Relates to Primate Ecology*

Correctly interpreting the diet of fossil primates affords a better understanding of the primate’s ecology. Hylander (1975) examined the distance between linear margins of adjacent lateral incisors and concluded that the length of the incisor row in frugivores is significantly longer relative to body mass than in folivores. However, more recent studies McCollum (2007) have disputed this conclusion stating that when adjusted for body size folivores *Gorilla gorilla* and frugivores *Pan Troglodytes* have similar incisor row lengths and suggests the disparity between her and Hylander’s (1975) results are a byproduct of different measurement protocols and Hylander’s failure to incorporate incisor orientation, spacing and incisal crown flare. This study integrates the measurement methods of Hylander (1975) and McCollum (2007) to resolve the discrepancy between the past studies. Absolute measurements of the Incisor row were compared to additive measurements of the incisor row using detailed 2D dental morphometric analysis of a sample of living hominoids with known dietary differences. High resolution digital images were generated for each individual in a variety of standard anatomical planes. Linear distances were calculated using the distances of known landmarks. The distances were standardized for body size using a scaling proxy (i.e the mesidistal length of the second molar). Results from this study identify a significant difference in the incisor breadth of Great apes and lesser apes based on the method of measurement used indicating that spacing, curvature and incisal crown flare play varying roles in different taxa. Moreover, this study suggests that morphometric data is available through the integration of measurement protocols that is not available using the protocols independently.

8. Brandon Kulengowski, Chris Calulot  
Department of Anatomy and Neurobiology  
Mentor: Diane Snow

*Single Filopodial Contact with Inhibitory Chondroitin Sulfate Proteoglycans Induces Behavioral Changes in Sensory Neurons In Vitro*

Chondroitin sulfate proteoglycans (CSPGs) are up-regulated by astrocytes of the glial scar in response to spinal cord injury (SCI), and consequently inhibit axonal regeneration. For successful regeneration, neurons must overcome this CSPG-induced inhibition and elongate to their appropriate targets. To promote regeneration, it is critical to understand the mechanisms mediating CSPG inhibition of axonal guidance.

The current study examined behavioral changes in the leading edge of elongating, regenerating neurons (the growth cone) as they come into first contact with CSPGs *in vitro*, thus modeling the glial scar following SCI. Using analyses of time-lapse video microscopy, growth cone properties...
such as general health, morphology, approach velocity (to the CSPG adsorbed to a culture dish), filopodia length (finger-like projections from the growth cone that path find), and approach angle were compared before and after first contact with CSPGs. Using this methodology, we documented that growth cone velocity was significantly reduced following first contact by a single filopodia. Since the other growth cone characteristics listed above did not correlate with behavioral changes, primary focus is now being given to approach velocity for continuing studies. This is the first demonstration of a single filopodial contact with CSPGs resulting in significant behavioral change in growth cone migration. Therefore, this result represents a potential approach to examining neuronal growth inhibition of the glial scar, and may lead to new therapeutic targets for regeneration and recovery of function following SCI. [Support provided by NIH (NS053470); Kentucky Spinal Cord and Brain Injury Research Center; and the Department of Defense].

9. Paul D. Parell
Department of Anatomy and Neurobiology
Mentor: Andrew Deane

**Did Early Humans Hang Around in Trees?**
*A Non-landmark Based 3D Morphometric Analysis of Early Hominin Proximal Phalanges*

Typically viewed as the hallmark adaptation that sets early humans (i.e. hominins) apart from other primates, bipedalism emerged with the genus *Australopithecus* at least 4.4 million years ago, but potentially as early as 7 million years ago. The selection for bipedality among early hominins is significant because it opened the possibility for the development of many important human characteristics such as tool use. Numerous morphological adaptations present in the fossil record make it clear that all early humans were obligate bipeds. However, there are also traits visible in the fossil record that are consistent with continued reliance on arboreal substrates such as elongated forelimbs and long, curved fingers. The present study delved into this debate by scrutinizing morphological differences of proximal phalanges. The high-resolution 3D morphometric scans of the articular surfaces of proximal phalanges of hominoid, cercopithecoid, platyrhine and fossil hominin specimens obtained were analyzed with quadric modeling software to achieve a cross-comparison examination via univariate parametric statistical testing. By ways of this testing it was determined that dorsoventral contour curvatures discriminate among taxa along phylogenetic lines while non-hominoid monkeys have convex mediolateral contours and hominoids have concave mediolateral contours. Also, while, hominoid and non-hominoid mediolateral contour curvatures overlap considerably, more terrestrial taxa have more pronounced mediolateral contour curvature than more arboreal taxa. The results of this study do not preclude arboreal climbing behaviors; however, *A. afarensis* phalangeal articular morphology is most likely a response to alternative loading patterns, either in addition to those associated with climbing or in isolation.
10. Aqsa Qureshi, Joshua Eason, Laura Whitnel-Smith, Edita Klimyte
Department of Anatomy & Neurobiology
Mentor: Stephen Onifer

Investigation of Glia in the Adult Rat Cuneate Nucleus Following Cervical Spinal Cord Injury and Chondroitinase ABC Digestion of Chondroitin Sulfate Proteoglycans

Dysfunctions occurring after traumatic spinal cord injury (SCI) are primarily due to axon damage and target neurons and tissues denervation. Strategies to restore and improve functions by intact axon collateral sprouting or damaged axon regeneration and subsequent target neuron reinnervation are being developed. We previously reported that some glia-associated inhibitory chondroitin sulfate proteoglycans (CSPGs) increase within the adult rat brainstem cuneate nuclei following cervical SCI that denervates them of forepaw primary afferents (Massey et al., 2008). Moreover, we found that bacterial chondroitinase ABC (ChABC) administration within the cuneate nuclei following cervical SCI to digest CSPGs led to anatomical and electrophysiological evidence of intact forepaw primary afferent collateral sprouting and cuneate nuclei neuron reinnervation (Massey et al., 2006). We now are determining whether this reinnervation improves forepaw sensorimotor function. Aside from CSPGs digestion, the mechanism by which ChABC exerts its therapeutic effects is largely unknown (Bradbury & Carter, 2011). Since the increased CSPGs within the denervated cuneate nucleus are synthesized by astrocytes, microglia, and possibly peripheral monocytes/macrophages, we hypothesize that changes occur to these cells after ChABC administration. This project began testing our hypothesis. Brainstem and cervical spinal cord sections from normal, sham, SCI, SCI and control penicillinase-treated, and SCI and ChABC-treated rats were collected at 2 weeks following SCI, treatment, and primary afferent neuroanatomical tracing. The sections were stained, and with microscopy, to see forepaw primary afferent terminals (cholera toxin B subunit antibody), CSPGs digestion (2B6 and 3B3 antibodies), cell somata and myelin (cresyl violet and eriochrome cyanine), cuneate nuclei neurons (MAP2 and NeuN antibodies), astrocytes (GFAP antibody), microglia (OX-42 antibody), and monocytes/macrophages (ED1 antibody). Should morphological changes be observed, future mechanistic studies will examine CSPGs synthesis for improving this treatment approach.

*This project was done for BIO395 Independent Work in Biology. Supported by KSCHIRT #9-9 (SMO) and 2P30NS051220 (EDH).

11. Thomas H. Rogers, Kathleen M. Franklin
Department of Anatomy and Neurobiology
Mentor: Marilyn Duncan

Effects of Aging and Fluoxetine Treatment on BDNF mRNA Expression in the Hippocampus and Dentate Gyrus

The evidence is clear that the BDNF (Brain-derived neurotrophic factor) signaling pathway is a critical mechanism of action for antidepressant drugs (Castrén, et al., 2007). Consequently, after
a few weeks of treatment with fluoxetine, a serotonin-selective reuptake inhibitor (SSRI), the levels of BDNF mRNA in the rat hippocampus show a significant increase (Rogóz, et al., 2008). Additionally, it has been shown that SSRIs are less effective in the elderly population than in younger adults. Therefore, we tested the hypothesis that aging attenuates fluoxetine-stimulation of BDNF mRNA expression in the hippocampus, thus reducing its clinical effectiveness in older subjects. Male hamsters, young (3-4 months) and old (16-17 months), were housed in cages with wheels and exposed to a 14:10 light-dark cycle. Animals received daily intraperitoneal injections of fluoxetine (12 mg/kg) or vehicle for two weeks. Animals were anesthetized and decapitated in the early evening. In-situ hybridization with computer-assisted microdensitometry was used to measure BDNF mRNA expression in hippocampal regions (CA1, CA2, CA3, & DG). In the CA1, CA2, and CA3, but not in the DG, the old animals had significantly lower BDNF mRNA levels than young animals (p<0.01, 0.001, & 0.05, respectively). Fluoxetine treatment did not stimulate BDNF mRNA expression in any region examined; rather, it decreased expression in the CA2, CA3, & DG. In conclusion, these results do not support the hypothesis. The lack of fluoxetine stimulation of BDNF mRNA in this study, in contrast with previous findings, may be related to the species, fluoxetine dose, or time of day examined (which is currently under investigation). Support: NIH AG-13418 (MJD).

12. Tiffany L. Taylor, Kristen A. Kelps
Department of Anatomy and Neurobiology
Mentor: Luke Bradley

**Investigation of the Heparin-Binding and Feedback Mechanism Roles of the Synthetic Pro-GDNF Peptide, DNSP-11**

Glial cell-line derived neurotrophic factor (GDNF) has been extensively evaluated as a therapeutic candidate for Parkinson’s disease (PD), due to its ability to promote the survival of dopaminergic neurons. However, GDNF has failed to advance from clinical trials primarily due to issues associated with the delivery of a large protein molecule directly intracranially, including: limited biodistribution and inconsistent targeting. Thus, smaller molecules, more suitable for downstream use in the clinic, with neurotrophic actions need to be identified. Investigation of a synthetic amidated, eleven amino acid peptide, named dopamine neuron stimulating peptide-11 (DNSP-11), exhibited neurotrophic-like effects *in vitro* and *in vivo*. Based on the GDNF prosequence origin of the DNSP-11 sequence, we hypothesize that 1) DNSP-11 lacks heparin binding which will permit greater biodistribution upon delivery to the brain, and 2) the observed, long-lived DNSP-11 neurotrophic effects are a result of the upregulation of GDNF following treatment. We show by affinity chromatography that unlike GDNF, DNSP-11 has no affinity towards heparin, which is highly abundant in the brain’s extracellular matrix; thereby suggesting that the DNSP-11 biodistribution and targeting will be greatly facilitated during intracranial delivery. Furthermore, we show by RT-PCR and western blot analysis that GDNF transcription and protein levels remain constant for up to 24 hours, following treatment of HEK-293 cells with either 1 nM or 10 nM DNSP-11. Collectively, these results support the further characterization of DNSP-11’s non-feedback, neurotrophic-like mechanism of action and its evaluation for the treatment of PD.
Funding: Support was provided by training research fellowships from NIDA (T32 DA022738, K.A.K.). This work was also supported by University of Kentucky College of Medicine Start-up Funds (L.H.B.), NIH COBRE Pilot (P20RR20171, L.H.B.), PhRMA Foundation (L.H.B.), NINDS (NS039787, L.H.B).

Anesthesiology

Department of Anesthesiology
Mentor: Elzbieta Wala

Effects of ZZ1-61c on Chemotherapy-Evoked Neuropathy, Motor Function, and Muscular Strength in Rats

One common dose-limiting side effect of chemotherapy (e.g. vincristine) is the development of neuropathic pain that occurs during and often persists after treatment. There are currently no clinically proven analgesics that treat this condition. An experimental drug, ZZ1-61c, which acts as an antagonist for the alpha9alpha10 subtype nicotinic receptor (nAChR) inhibited chemotherapy-evoked neuropathic pain. It is not know if ZZ1-61c can reverse established neuropathy. In this study, male Sprague-Dawley rats were given 10 injections of vincristine (100µg/kg/day, i.p.) during two five-day cycles with a two-day break between the cycles. Next, they received ZZ1-61c (100µg/kg/day, i.p.) starting at day 15 (after completion of vincristine) and continuing until day 33 of the study. Control rats were injected with ZZ1-61c alone (10 days with a two-day break in between). Pain thresholds were assessed using 4, 8, 15 g von Frey hairs (VFH) and paw-pressure tests (every other day). Naïve rats were administered ZZ1-61c (25-500 µg/kg, i.p.) prior to testing motor impairment (a rotarod performance test) and muscular weakness (a grip strength test). Vincristine-evoked neuropathy was alleviated by ZZ1-61c as indicated by significantly lower pain thresholds in rats treated with ZZ1-61c compared to non-treated rats [areas under the time action curves (day 15-33) = 436.7±73.5 vs. 795.8±43.1 (VFH 4g, P<0.0025); 695.0±63.4 vs. 1324.2±41.6 (VFH 8g, P<0.001); 974.2±72.1 vs. 1807.5±13.1 (VFH 15g, P<0.001) and 2278.9±175.3 vs. 3458.0±20.7 (paw pressure, P<0.001)]. ZZ1-61c alone did not show any significant changes in pain sensitivity, motor function or muscular strength at a dose of 100µg/kg/day. However, at high doses (300, 500 µg/kg, i.p.) ZZ1-61c showed toxic effects and caused lethality (4/8). These findings indicate that a novel nAChR antagonist ZZ1-61c may be a potential drug candidate for the reversal of chemotherapy-induced neuropathic pain.
14. Taylor Reiter  
Department of Animal and Food Science  
Mentor: Jeffrey Bewley

*Effect of PedicuRx Prevent A on Digital Dermatitis in Dairy Cattle*

Digital dermatitis (DD) is a highly infectious, painful dairy cow disease that impacts animal welfare, production, and farm profitability. This study was conducted at a commercial dairy farm for four months to evaluate the performance of PedicuRx Prevent A (GEA Westfalia-Surge) footbath and pre-bath systems. The size and shape of each DD lesion were scored at 30 day intervals using a 0 to 3 scale (0 being no wart or no pain and 3 being the largest or most painful). The percentage of hooves with active DD decreased as the study progressed from 20.7% in November to 7.7% in December, 8.9% in January, and 5.5% in February. The FREQ procedure of SAS was used to conduct a chi-squared analysis demonstrating there were significant differences among months ($P < 0.01$). The GLM procedure of SAS was used to compare DD lesion size and pain. LSMEANS for size were $0.36 \pm 0.03$, $0.14 \pm 0.03$, $0.16 \pm 0.03$, and $0.10 \pm 0.03$ for the November, December, January, and February test periods, respectively. LSMEANS for pain were $0.37 \pm 0.03$, $0.12 \pm 0.03$, $0.13 \pm 0.03$, and $0.06 \pm 0.03$ for the November, December, January, and February test periods, respectively. DD size and pain were significantly higher at the beginning of the study ($P < 0.01$) than for each month after the footbath product was used. PedicuRx Prevent A appears to be effective at reducing the incidence of DD.

Anthropology

15. Arlis Johnson  
Department of Anthropology  
Mentor: Richard Jeffries

*Using Optically Stimulated Luminescence (OSL) to Determine Construction and Destruction of Megalithic Sites and Rockshelter Roof Collapse*

Unfortunately, megalithic sites and rockshelter sites use the artifacts found in the peripheral environment to date a site. This is misleading because it only provides evidence of when a person was at the site and not the date of construction/destruction or roof collapse. Optically Stimulated Luminescence (OSL) is an absolute dating technique that has been around since 1984. A quartz crystal exposed to sunlight has its "clock" set to zero. Once it is no longer exposed to sunlight, covered or buried, it begins acquiring electrons. When the quartz crystal is exposed to sunlight again it releases the accumulated radiation, which can be precisely measured, and its clock is again reset. This technique is currently used in the archaeological context to date artifact bearing layers to determine the date of deposition. However, it is only able to give a general timeframe in which this occurred due to accumulation of sediment over a long period of time. In regards to the construction/destruction of megalithic sites and rockshelter roof collapse, an exact date can be determined due to the instantaneous burial of the soil. Samples are collected from the soil directly underneath a foundation stone, megalithic stone (Stonehenge), rockshelter...
collapsed roof, or butting up against a deep foundation stone and tested. This ability to precisely
determine the construction of a site would allow archaeologists to know precisely when a
civilization began construction and when others around them were beginning. The fallen walls
of sites would be an indicator of destruction. It would also be possible to chronologically
sequence every structure’s construction at large complex sites, such as Teotihuacan. In the case
of a rockshelter roof collapse, it could tell archaeologists when the site was no longer habitable.

16. V. Camille Westmont, David Pollack
Department of Anthropology
Mentor: Gwynn Henderson

Round, Ground, and Stone: Identifying Morphological and Functional Variation
Within Fort Ancient Groundstone Discoidals
Fort Ancient is an archaeological culture in the middle Ohio Valley. These prehistoric peoples
were village farmers who lived, worked, and thrived in the flatlands, rolling hills, and
Appalachian foothills of Ohio and Kentucky. Among the bone tools, pottery sherds, arrowheads,
and other remains archaeologists have recovered at former Fort Ancient village sites are stone
discoidals. These round worked stone objects were made in a variety of shapes, sizes, and
thicknesses. Some are decorated with engraved geometric designs, and others have drilled-
through central holes. Archaeologists have hypothesized that they were used as everything from
net-sinkers to “poker” chips. However, their age, function, and stylistic variability are unknown.
This poster presents the results of an analysis of discoidals collected from several Kentucky Fort
Ancient sites. Morphological differences observed in the artifacts are explained with reference to
use, age, or regional manufacturing style. Regional variation in particular can denote important
differences between communities/regions based on how the inhabitants were using their
discoidals. Identifying, understanding, and accounting for the morphological differences in
discoidals, with their widespread distribution and mysterious origins, allows researchers and
archaeologists to better explain some of the habits and life-ways of these native Kentuckians.

Art

17. Elizabeth Schaller
Department of Art
Mentor: Jane Peters

Museum Studies: A Hands-On Approach to Art
This research project focused on experiential learning at the UK Art Museum. The goals of this
hands-on learning experience were: to gain a better understanding of the various career paths in
an art museum; to develop skills necessary for succeeding in an art museum setting; to update the
UK Art Museum database with current values and information; and to become familiar with the
UK Art Museum collection. The research for this internship focused on accumulating new
values for works in the collection for insurance purposes, as well as adding to the information in
the database regarding artists and provenance. Hands-on research included the step-by-step installation of an exhibit; framing artwork; conducting partial inventories; lighting museum space; condition reporting; unpacking and repacking artwork; labeling and storage; and accessioning new pieces. Through this experiential process a deeper understanding of art museums and the art world in general was developed, along with many valuable skills that are essential to any type of museum or archival work.

**Arts Administration**

**18. Amanda Rambo**  
Department of Arts Administration  
Mentor: Rachel Shane

*Cultural and Entertainment Industry Union Disputes*

This research is comprised of a series of case studies of cultural and entertainment industry union disputes and their causes. The purpose of the research was to identify labor union disputes in the arts and entertainment industry by date, industry, and dispute circumstance, to track and categorize patterns of union/management discord, and to investigate correlations between internal disputes and external factors including economic indicators and technological advances.

Amanda would like to thank her research mentor, Dr. Rachel Shane, for her guidance and support throughout this project.

**Behavioral Science**

**19. McKinley Heflin**  
Department of Behavioral Science  
Mentor: John Wilson

*Portfolio Assessment of First Year Medical Students Using the Linguistic Inquiry and Word Count Program*

The focus of professional education is shifting from transmission of knowledge to skill in critical thinking. Traditional measures of assessment, such as multiple-choice examinations, often do not measure higher order levels of thinking. Portfolio-based assessment, using open response questions, may be better suited for demonstrating higher order levels of thinking. Our goal is to pilot assessment techniques to document achievement of higher order learning. Such assessment procedures could then be used to assess the effectiveness of different educational formats. Open-ended responses to three self-assessments following training in interviewing skills were obtained from 87 first year medical students. These responses will be used to pilot the use of coding by trained raters in combination with a program for linguistic inquiry and word count (LIWC). The first phase of this project is the description of initial LIWC analyses and the association between characteristics of students’ pre-matriculation characteristics (age, gender,
MCAT scores) and their responses to the open-ended questions. Students were asked to describe what they learned from their small group training, what they thought went well in their own practice interviews with actor patients, and what areas they thought needed most improvement. The mean word count of the responses was 366. The response contained 2.7% Positive emotion words and 1.4% Negative emotion words. Over the course of the semester, the percentage of negative emotion words in the self-assessments declined significantly (p<.05). Age and Total MCAT scores were not significantly associated with the LIWC measures. Female students’ responses were lengthier than those of male students (p<.05). Pilot testing of the LIWC was promising. Additional categories currently being explored include insight, certainty, and communication variables. The next phase of the project will involve content coding of the responses for Knowledge, Application, and Synthesis cognitive dimensions.

20. Emma Scott, D.C. Lee
Department of Behavioral Science
Mentor: Thomas Kelly

*Methylphenidate Self-Report Effects and Sensation-Seeking Status*

Methylphenidate (Ritalin®) is an effective medication for the management of attention and inhibition disorders. Recent reports also indicate that the medication is misused on college campuses. This study examined the behavioral effects of methylphenidate as a function of individual differences in the biologically-based personality dimension of sensation-seeking, which has been associated with impulsivity, drug abuse, and other risk-related behavior. It is hypothesized that self-report (e.g., Feel Drug, Like Drug, Total Positive) and other behavioral effects of methylphenidate will be positively associated with sensation-seeking status. Twenty healthy, non-stimulant abusing volunteers scoring in the top and bottom quartiles of gender-adjusted population norms on the sensation-seeking scale of the Zuckerman-Kuhlman Personality Questionnaire (10 high and 10 low sensation-seekers) completed an eight-session study consisting of four, two-session test blocks. During the first session of each test block, subjects received eight capsules, each containing one-eighth of a test dose. Test doses (0, 16, 32 mg) were presented under randomized, double-blind conditions. Self-reports of drug effect (VAS and POMS), task performance, and cardiovascular measures were assessed at the time of capsule administration and each hour after administration for three hours. The magnitude of methylphenidate effects on positive, sedative, and negative drug self-report measures was greater for the low sensation-seeking group. In contrast, high sensation-seekers exhibited greater cardiovascular effects to methylphenidate. Group differences in methylphenidate effects on task performance approached significance and varied as a function of task. Individual differences in sensitivity to methylphenidate effects were not consistently related to sensation-seeking status although low sensation-seekers were shown to have higher sensitivity to self-reported effects of the drug. Because low sensation-seekers were more sensitive to both positive and negative effects, it is unclear whether the abuse-related effects of methylphenidate vary as a function of sensation-seeking status.
Biology

21. Azita Bahrami, Gautami Shashidhar, Christopher M. Calulot, Adrian P. Centers, Thomas Hering
Department of Biology
Mentor: Diane Snow

*Dorsal Root Ganglia Neurons Secrete Factor(s) That Reduce Chondroitin Sulfate Proteoglycan-Induced Inhibition*

Spinal cord injury (SCI) is a serious condition that affects approximately 300,000 people in the USA alone. Since neurons in the adult central nervous system do not regenerate following injury, permanent conditions such as paralysis can result. After SCI, a glial scar is formed by reactive astrocytes. The glial scar produces chondroitin sulfate proteoglycans (CSPGs), which inhibit regeneration and block recovery of function. This study addresses a means by which CSPG inhibition may be overcome to promote regeneration of injured neurons. The hypothesis is: *explants of sensory (dorsal root ganglion; DRG) neurons secrete an undetermined factor(s) that can induce DRG axons to grow onto typically inhibitory CSPGs.* To test this hypothesis, we grew chicken DRG neurons in tissue culture dishes adsorbed with striped patterns of laminin alternating with CSPGs. These dishes contained a variety of geometries of explant placement. After 2 days, neurite outgrowth was analyzed and cell identification was performed using immunofluorescence and image analysis. The short term goal of the study was to determine if factors present within sensory neurons and associated tissues may be able, under certain conditions, to attract one another to lure outgrowth into typically inhibitory CSPG-bound regions in culture, and the data support this tenet. Further studies will continue to challenge these data. In the long term, we aim to use these results to identify mechanisms responsible for CSPG-induced inhibition to develop potential clinical therapies *[Support - NIH, NINDS, R01NS053470 and a grant from the Christopher and Dana Reeve Foundation]*.

22. Jordan C. Childers
Department of Biology
Mentor: Elizabeth Debski

*Neuronal Nitric Oxide Synthase (nNOS) Expression in Normal and Regenerating Axolotl Retina*

The gas nitric oxide (NO) is an important signaling messenger in the vertebrate nervous system. In the retina it both plays a role in the normal processing of visual information and is thought to be responsible for cell death following tissue injury. NO is produced by three different isoforms of nitric oxide synthase (NOS): neuronal NOS (nNOS), endothelial NOS, and inducible NOS. These enzymes are expressed at only low levels in the normal mammalian retina but are up-regulated after injury. In the axolotl salamander retina, which, unlike the retinas of mammals, can replace damaged tissue, levels of NOS are initially high and retinal injury results in their down regulation. We have examined nNOS expression to see if it undergoes changes...
coincident with either the damage or repair phases of axolotl retinal regeneration. Immunocytochemical detection of nNOS in the retinas of normal juvenile and adult animals showed intense staining in the outer and inner plexiform layers (ONL and INL, respectively) with occasional positive cell staining in the inner nuclear layer (INL) and ganglion cell layer (GCL). Five different classes of immuno-positive cells were identified based on their shape, processes, and orientation within the retina. nNOS expression in all of these retinal elements was severely down regulated in animals in which the optic nerve and ophthalmic artery had been previously lesioned. This period of decreased nNOS expression extended through the phase of degeneration that follows retinal injury and persisted into the repair phase. We conclude that this observed dynamic regulation of nNOS expression is likely a reflection of the structural integrity of the axolotl retina rather than a driver of damage and/or repair processes.

23. Yoo Sun Chung, Justin Graff, Richard Cooper
Department of Biology
Mentor: Robin Cooper

*The Acute and Chronic Effect of Temperature on Heart Rate in Prawns and Crayfish*

Animals that are conformers to the environment, such as invertebrates, face difficult physiological and behavioral tasks to survive in extreme environments. In addition, species that are able to live in a wide range of environments can then reap the benefits of various resources. The ability of the crayfish *Procambarus clarkii* and the prawn *Macrobrachium rosenbergii* as being an invasive species in their ability to adapt to cold environments was addressed. This is particularly important in Kentucky since people are developing prawn farms for aquaculture. The species of crayfish used has invaded many areas around the world. A set of experiments was devised to address physiological abilities of these species to manage rapid changes in temperature to cold environments as well as their ability to respond physiologically to sensory stimuli by using behavior and heart rate (HR) as a bioindex. Three questions were asked: (1) How does heart rate of a crayfish and prawn species respond to prolonged exposure of a low temperature? (2) How is the heart rate affected to a stimulus (tail tap) while in different environmental temperatures acutely as well as when the animals are held at particular temperatures? (3) Do the animals survive equally well in cold temperatures? The prawn species died within 2 hrs when moved from 21 to ~10°C and sensory neurons stopped firing. Crayfish reduced their HR but survived for at least a week with this rapid change. Changes in temperature of 5°C each week resulted in death of the prawns when 10°C was reached. Some died at 16°C and some lasted at 10°C for 1 day before dying. Crayfish remained responsive to sensory stimuli and survived with rapid and slow changes in temperature from 21 to 5°C.
Department of Biology
Mentor: Edmund Rucker

Generation and Characterization of a Beclin1 56 Knockout Mouse Model

Autophagy, Greek for “self eating”, is a highly conserved mechanism of energy homeostasis and the cell’s only method of degradation of damaged organelles. Cytoplasmic vesicles called autophagosomes sequester proteins and damaged organelles and deliver to lysosomes for disposal and recycling. Beclin1 (Becn1), a fundamental protein in the autophagy pathway, functions at the induction stage of autophagosome formation. Autophagy malfunction has been implicated in many human diseases including cancer, neurodegenerative, skeletal, and cardiovascular disorders, and infectious diseases. Becn1 contains 12 exons, exons 5 and 6 code for a Bcl-2 homology 3 (BH3) domain. Antiapoptotic Bcl-2 and Bcl-x negatively regulate autophagy by binding this domain and inhibiting the formation of autophagosomes. Thus Becn1 serves as a biochemical liaison between apoptosis and autophagy. Several questions persist regarding the co-regulation of apoptosis and autophagy via Becn1. Our lab has addressed these questions by generating a targeted transgenic mouse model that floxes exons 5 and 6 of Becn1. We hypothesized up-regulation of autophagy will occur due to lack of inhibition at the BH3 domain. Recent evidence from the mouse model indicates embryonic lethality of homozygous Becn1 56 deletion mice. To further investigate the role of exons 5 and 6 we will use the LC3GFP autophagy reporter transgenic line to quantitate autophagosomes. Additionally, to examine the effects of homozygous Becn1 56 deletion in adult mice we will use a Wap-Cre mouse model that induces recombination in a tissue specific manner.

25. Ashley Ginn
Department of Biology
Mentor: Dan Wetzel

The Effect of Brood Size on Nestling Development in House Sparrows (Passer Domesticus)

Offspring growth and development is influenced by numerous different factors. In birds, brood size is known to affect the amount of parental care (provisioning) nestlings receive. To test how brood size affects nestling growth and immune response, we performed a brood size manipulation on paired house sparrow (Passer domesticus) nests and measured nestling growth rates, PHA response, and blood glucose levels. We found that glucose levels of nestlings in reduced nests were significantly larger than nestlings in enlarged nests, and that glucose levels were negatively correlated with date in the season. Nestling survival rates were not affected by the nest size manipulation but were positively correlated to PHA response. Nestling growth rates initially appear to be affected by the nest size manipulation, but this result was driven by difference among dyads and box identity. The lack of a relationship between survival and growth rates to the nest size manipulation differs from the findings of several other studies and suggests that parents may have been able to provide a sufficient level of care to nestlings regardless of our nest size manipulation.
26. Geraldine Goh  
Department of Biology  
Mentor: Philip Bonner

*Is Calmodulin Methyltransferase Necessary for Chick Cmbryo Neural Development? An RNAi Investigation*

Calmodulin is an important intermediate in many calcium-dependent signal transduction pathways. The primary structure of calmodulin contains a lysine at position 115, which is subject to mono-, di-, or tri-methylation by the enzyme calmodulin-dependent methyltransferase. Although the hydrophobic nature of methyl groups typically plays an important role in the structure of proteins, the function of the methyl groups on calmodulin has yet to be proven. In this study, chick embryo nerve cells were cultured on laminin-coated Petri dishes as explants or single cells. Within 24 hours of culture neurites extend away from the neurons. To assess the involvement of calmodulin-dependent signal transduction in neuronal differentiation, anti-sense or mis-sense inhibitory vivo-morpholino constructs (AS- or MS-VM) were included in the culture medium. The formulated hypothesis was that the AS-VM would block expression of the methyltransferase gene and thus prevent methylation of calmodulin and, in turn, reveal involvement of methylated calmodulin in neuron differentiation. Axon growth from explant cultures was greatly inhibited relative to control cultures and less in comparison to MS-VM-treated explants.

27. 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 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 always breeding to the normotensive BN male with subsequent generations up to the F6 generation. 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. Angiotensin II, type 1 receptor protein expression is being evaluated (Western Blot Analysis) between the normotensive and hypertensive offspring to assess the relationship between AT Type 1 receptor expression and the development of genetic hypertension. These data show that in SHR dominant alleles for hypertension are expressed in a BN genome that is resistant to high blood pressure.

28. Ravi Mahajan, Rebecca Peyyala, Thadler Schroeder, Karen Novak  
Department of Biology  
Mentor: Michael Novak

**Antibacterial Effects of Tea Tree Oil Against Oral Bacteria**

Essential oils have been shown to have antibacterial activities but there are limited data on their efficacy against oral bacteria. The objective of the present study was to investigate the antibacterial activity of the essential oil of *Maleleuca alternifolia* (Tea-Tree Oil) against a selection of Gram positive and Gram negative oral bacteria. The oral bacteria tested in this study were the cariogenic Gram positive aerobic bacteria *Streptococcus gordonii* and *Streptococcus mutans* and the periodontopathic Gram negative anaerobic bacterium *Fusobacterium nucleatum*. *Staphylococcus aureus* was included as a positive control since previous studies have demonstrated that Tea-Tree oil has antibacterial activity against this organism. Bacterial suspensions were prepared at 0.3 OD$_{620}$ in 10mM phosphate buffer. A 1/10$^{th}$ volume of each bacterial suspension was challenged with 0.125%, 0.25%, 0.5% and 1% Tea Tree Oil (TTO) in 1X PBS supplemented with 1% Tween 80 solution for an hour at 37°C in 5% CO$_2$ chamber. Tween 80 was used as an emulsifier. Each condition was performed in triplicate. Controls were run for each condition without TTO. Ten-fold serial dilutions of each suspension were then plated on blood agar plates and grown either aerobically or anaerobically at 37°C overnight. The data was calculated as the percentage of viable bacterial colonies compared to controls. The results showed that TTO was highly bacteriocidal against the Gram negative *F. nucleatum* with over 99% of bacteria killed at 0.125% TTO versus 84% for *S. mutans*, 65% for *S. gordonii*, and 20% for *S. aureus*. 100% killing was achieved at 0.25% TTO for *F. nucleatum* and *S. gordonii* with 90% killing for *S. mutans* and *S. aureus*. We concluded that Tea Tree Oil is antibacterial against Gram positive and Gram negative oral bacteria and may be effective in controlling oral infections that are associated with dental caries and periodontal disease.
29. Asri Mumpuni  
Department of Biology  
Mentor: S. Randal Voss  

**Genetic Analysis of the Mexican Axolotl Collection at University of Kentucky**

The Mexican axolotl (*Ambystoma mexicanum*) is a model amphibian that is used in a number of research areas, including tissue regeneration, embryogenesis, and evolutionary biology. The world’s largest collection of axolotls is housed on campus at University of Kentucky and these animals are distributed to researchers throughout the world. There is a need to develop methods to assess genetic variation among axolotls to more effectively manage the collection. One way this can be done is by establishing markers for the sex-determining locus to prioritize individuals for breeding. The goals of this project were: 1) To develop a method that will allow stock managers to best assess genetic variation among individuals, and 2) To develop a method that can be used to determine the sex of individuals early in life, before the expression of sexually dimorphic traits. At this point in the project, tissue has been sampled from approximately 150 different axolotls from the collection, which have been sent to Cincinnati Children’s Hospital for DNA isolation. The technique of polymerase chain reaction (PCR) will be performed in order to survey the genome for genetic markers that are highly variable among individuals. Furthermore, PCR will be used to search for markers that are closely linked to the sex-determining locus. These findings will promote genetic variation and enhance the genetic records of the axolotl colony, which are two important factors to consider with populations of endangered species.

30. Kristina Pescosolido, Thomas Gawriluk  
Department of Biology  
Mentor: Edmund Rucker  

**Generating an in Vivo Model for Detecting Autophagic Flux**

Autophagy is a catabolic pathway through which cytoplasmic organelles and proteins are degraded. Selected organelles are sequestered into a double membrane vesicle, the autophagosome, which then fuses with a degradative lysosome. With a continually expanding connection between autophagy and an array of diseases, it is necessary to obtain assays that will most effectively facilitate the quantification, manipulation, and detection of the autophagic process. Experimentally the detection of autophagosome accumulation does not sufficiently determine autophagic flux: the progression of autophagy from initiation to degradation. Currently, verification of autophagy initiation requires interpretation of several assays that together permit observation of autophagic flux. Monitoring the quantity and localization of LC3-II (microtubule associated protein light chain3-II) and p62 in the cell is integral in identifying autophagic flux. At the onset of autophagy, LC3-I is converted to LC3-II, which is incorporated into autophagosomal membrane and lumen. Degraded solely by autophagy, p62 accumulation in the cell implies that autophagy is reduced. Traditional methods used to detect autophagic flux include combinations of different immunoblotting techniques that monitor LC3-II and p62 turnover, fluorescence microscopy to observe mRFP-GFP labeled LC3 in transgenic mouse tissues, and measurement of degradation of long lived isotope labeled proteins when autophagy
is compromised. Measuring autophagic flux requires utilization of custom tailored assortments of assays. As interest in the field of autophagy rises it is essential to generate assays to more efficiently measure autophagic flux. To diminish ambiguity in the functions and regulation of autophagy like the uncertainty of the role of p62 in autophagic induction, new assays are crucial. The development of transgenic mice that globally express fluorescently labeled p62 and LC3 would provide an assay to efficiently monitor autophagic flux in vivo and in real-time.

**31. Raven Price**  
Department of Biology  
Mentor: Jeffery Osborn  

*Effects of Ouabain on Intestinal Sodium Reabsorption in Procambarus Clarkia*

*Procambarus clarkii*, or swamp crayfish, experience daily fluctuations in salinity, and are known to both osmoregulate, as well as osmoconform. In a previous experiment I have found that the lower gut of the decapod *P.clarkii* will reabsorb normal crayfish solution (~200mM NaCl) at an average of 32ul/min. I hypothesize that saturating the outside of the GI track with ouabain will decrease reabsorption rate. Ouabain binds to and inhibits Na⁺/K⁺ ATPase. The inhibition of the Na⁺/K⁺ pumps will stop the transfer of Na⁺ out of the intestinal lumen, in turn stopping reabsorption. Since Na⁺/K⁺ ATPase are mostly located on the basolateral membrane, ouabain is administered on the outside to effectively block the Na⁺ pumps. Large *P.clarkii* (25-30g) were obtained from Atchafalay Biological and allowed to acclimate for 2 weeks. Crayfish were sedated in an ice water bath prior to experiment. Polyethelyne tubing was inserted into the anterior opening of the GI tract for perfusion, as well as the anus for collection of perfusate. Five different concentrations of ouabain saturated the outside of the GI track for 20 minutes: Normal Crayfish solution, $10^{-9} M$, $10^{-7} M$, $10^{-5} M$, and $10^{-3} M$. Simultaneously a constant flow of normal crayfish solution was perfused through the GI track and the perfusate was collected. Results did not show a uniform decrease or increase of the reabsorption rates. I conclude that the potential osmoregulatory function of the intestine of the freshwater crayfish *P.clarkii* is not regulated by Na⁺/K⁺ ATPase. Future experiments will be carried out to investigate a potential role for osmoregulation in the intestine of *P.clarkii*.

**32. Ariel Robinson, W.H. Wu**  
Department of Biology  
Mentor: Robin Cooper  

*Ephaptic Transmission Between Motor Axons*

This project is to see ephaptic transmission between the tonic and phasic motor neurons in the leg extensor of the crayfish. Ephaptic transmission is the passage of a neural impulse from one nerve fiber, axon, or dendrite to another through the membrane. This can be addressed in axons in which one can record with intracellular electrodes. The crayfish offers this opportunity to address this question/problem because the sizes of the axons in this arthropod allow stimulation
access. The first prep is the nerve to the opener muscle which contains one excitatory and one inhibitory axon. The leg extensor muscle will also be used because the muscle is innervated by two excitatory motor axons, tonic and phasic. Since these two motor axons run beside each other they will be monitored to see if ephaptic transmission occurs. Ephaptic transmission will be detected by the use of a stimulated microelectrode to one of the two motor axons. Stimulating the axon at a high frequency may depolarize the neighboring axon due to a rise in extracellular $[K^+]$ within the tight connective tissue of the axons. When depolarization occurs, our results are expected to show depolarization of the resting potential in relation to the degree of stimulation of the neighboring axon along with alternations to the action potential shape. Currently data is being gathered and analyzed. These results will help identify if an electrical field associated with activity occurring in one neuron can polarize the membrane of another neuron. If there are significant effects seen this type of communication between these two axons will indicate ephaptic transmission. Human neurological disorders, such as, epilepsy could benefit from these findings.

33. Amanda Sutton  
Department of Biology  
Mentor: Edmund Rucker

*Analysis of Anatomical and Temporal Expression in the MMTV-CreD and Wap-Cre lines using a DsRed.T3 Reporter*

In our lab, we focus on conditional knockouts of Beclin using the Cre-lox system in mouse mammary glands. Both WapCre and the MMTV-CreD lines express in the mammary glands, and are used in our lab (Wagner et al, 2001 & 1997). More specific details pertaining to time and location of expression is essential for our lab in order to better understand the resulting phenotypes we see in the conditional knockouts of Beclin. This project is meant to determine exact anatomical location and time of expression in both the WapCre and MMTV-CreD lines. Although there is general information about Cre expression published for both the MMTV-CreD and Wap-Cre lines, our lab requires more specificity (Wagner et al, 2001 & 1997). Therefore, knowledge of the exact day of Cre expression and anatomical and cellular location for these two lines will be examined in this project. According to Wagner et al (2001), MMTV-CreD expression occurs mostly in secretory cell types such as in the mammary glands, salivary glands, and pancreas in mice of all ages. Therefore, we took the first time point for the CreD mice at five weeks, the time at which mammary glands begin pubertal development. For DsRed-WapCre mice, time points will be taken at 12, 14, 16, and 18 days after fertilization since WapCre expression is known to express in the alveolar epithelial cells of mammary tissue during pregnancy and lactation (Wagner et al 1997).
34. Peter M. Wallenhorst  
Department of Biology  
Mentor: David W. Weisrock

*Habitat, Health, and Genetic Diversity: The Fate of the Malagasy Indri indri Lemur*

Throughout the history of human habitation on Madagascar, numerous lemur species have gone extinct while many others have become endangered. Central to these events is habitat fragmentation, which results in overcrowding and decreased habitat quality. This, in turn, may influence the health of lemur populations, and more importantly, it may reduce genetic variation, further limiting the ability of populations to respond to environmental and health pressures. In order to help guide successful conservation plans, current research is being conducted to investigate the relationships between habitat quality, health, and genetic diversity in lemurs.

Here, we worked as part of a project to quantify these factors and their potential correlations in the lemur species *Indri indri* at three different sites in Madagascar, with the proposed hypothesis that a correlation exists between levels of genetic variation and various measures of lemur health and habitat quality. 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. Using 17 microsatellite loci specific to *Indri indri*, we genotyped individuals sampled from three different localities of varying habitat quality. These data were used to estimate genetic variability and population size within populations and migration rates between populations. Measures of both observed and expected heterozygosity were similar across populations, yet the observed heterozygosity for each population was lower than what was expected. Our results also suggest high levels of gene flow and migration between the two most proximal populations (Mitsinjo and Torotorofotsy), while the more geographically disjunct population (Betampona) appeared to be completely isolated on a genetic level. Ultimately, this data will be combined with measures of habitat quality and used to study correlations between genetic variation, habitat viability, and overall lemur health.

**Biomedical Engineering**

35. Jennifer Brooks, Paul Fisher, Yuan Zou  
Department of Biomedical Engineering  
Mentor: David Puleo

*Development and Efficacy of Drug Delivery System for the Treatment of Legg-Calvé-Perthes Disease*

Legg-Calvé-Perthes disease (LCPD) is a pediatric condition characterized by idiopathic osteonecrosis of the femoral head. Without treatment, the femoral head may become deformed, increasing a patient’s susceptibility to early onset degenerative arthritis. The objective of this project was to develop an injectable, biodegradable drug delivery system and to test its efficacy as a treatment for Perthes disease. The delivery system consisted of simvastatin-loaded gelatin
microspheres suspended in a solution of carboxymethylcellulose (CMC) containing clodronate. This design allowed the sequential release of an antiresorptive drug (clodronate) followed by an osteogenic agent (simvastatin). Once the desired release profile was achieved, the delivery system was tested in immature piglets. Ischemic osteonecrosis of the femoral head was surgically induced. After one week, the delivery system was injected and allowed to take effect for six weeks. The five experimental groups were as follows: normal (no osteonecrosis induced), untreated, treated with a drug-free vehicle, treated with clodronate only, and treated with clodronate and simvastatin. The macrostructure and microstructure of the bones were examined using radiographs and microCT. The bone volume, relative bone volume, trabecular bone thickness, trabecular bone number, and trabecular bone separation of the femoral heads treated with clodronate and simvastatin were closest to those of the normal model. Histological analysis was also performed, which included a qualitative assessment of the articular cartilage, growth plate, epiphyseal trabecular bone, and prevalence of osteoclasts. Likewise, the sections from the femoral heads treated with clodronate and simvastatin appeared to be most similar to the sections from the normal femoral heads. These results indicate that the two-phase drug delivery system may help prevent deformation and collapse of the femoral head in Perthes disease patients. Ongoing in vitro studies are focused on identifying other agents that can be co-delivered to potentiate the osteogenic activity of simvastatin.

Chemical Engineering

36. Anastasia Kruse, Robert J. Wydra, J. Zach Hilt
Department of Chemical Engineering
Mentor: Kimberly Anderson

Biocompatibility Analysis and Cancer Therapy Applications of PEG-Iron Oxide Core-Shell Nanoparticles

Composite magnetic nanoparticles provide the opportunity for direct tumor targeting, thermal therapy, and controlled drug release. However, the magnetic nanoparticles must be biocompatible in order to be used in cancer therapy applications. By coating iron oxide magnetic nanoparticles with hydrogels formed from poly (ethylene glycol) 400 dimethylacrylate (PEG400DMA), it is hypothesized that their toxicity can be decreased while maintaining their property of heating in alternating magnetic fields. In this study, it was found that when the concentration of nanoparticles was increased, cell viability of NIH 3T3 fibroblasts and A549 lung cancer cells decreased. For example, the cell viability of NIH 3T3 fibroblasts exposed to 100μg/ml PEG400DMA coated nanoparticles was found to be 66%, while fibroblasts exposed to 500μg/ml PEG400DMA coated nanoparticles had a cell viability of 2%, and exposure to 1000μg/ml resulted in a zero percent viability, after 24 hours of exposure. Cells exposed to iron oxide nanoparticles coated with citric acid had higher viabilities than cells exposed to PEG400DMA coated iron oxide nanoparticles, which was likely a result of differences in particle stability. In the thermal ablation studies, A549 lung cancer cells were exposed to citric acid coated iron oxide nanoparticles at a concentration of 15mg/ml for 3 hours to allow particle interaction. The cells were then exposed to an alternating magnetic field for 10 minutes and incubated for an additional two hours. The heat generated by the magnetic nanoparticles in the
alternating magnetic field caused a change in temperature of greater than 15 degrees Celsius, which was enough to induce significant cell death.

37. Sarah E. Seger, Kimberly W. Anderson, Robert J. Wydra
Department of Chemical Engineering
Mentor: J. Zach Hilt

*Improving Hyperthermia Treatment of Cancer Using Heat Shock Protein Inhibitors*

Hyperthermia, the heating of tissue to 42.5°C-44°C, has been proven effective in shrinking many different types of tumors by inducing apoptosis or sensitizing cancer cells to other cancer therapies. The major drawback to hyperthermia is that it induces expression of heat shock proteins (HSPs). HSPs protect cells from heat-induced apoptosis making hyperthermia less effective. Heat shock protein inhibitors could potentially make hyperthermia a more effective treatment in certain cancers by disabling HSPs. HSP90 is of particular interest for cancer therapy because it protects cell growth proteins, transcription factors, and kinases that are crucial to cancer cell survival. Geldanamycin and 17-allylamino-17-demethoxy geldanamycin (17-AAG) are HSP90 inhibitors which lead to proteasomal degradation of proteins vital to cancer cells. In this research, combination therapy of hyperthermia and these specific HSP90 inhibitors were studied with various cancer cell lines. A549 lung carcinoma cells were pre-incubated (16 h) with 50, 100, and 200 nM concentrations of the inhibitors (i.e., Geldanamycin and 17-AAG) followed by a thirty minute 43°C hyperthermia treatment. Cells were incubated at 37°C for an additional eight hours prior to staining and imaging. The fluorescent dyes calcein-AM and ethidium homodimer-1 were used simultaneously to stain and differentiate between live and dead cells. Images were captured with a fluorescence microscope. Live and dead cell counts were obtained to measure percent cell viability and normalized cell concentration. The effect of this combination therapy on cancer cell viability will be presented.

38. David Spencer, Chirra Hariharasudhan
Department of Chemical Engineering
Mentor: J. Zach Hilt

*Enhanced Stabilization and Loading of Nanoparticles Using the ISOFURE Methodology*

Agglomeration is often a major issue during the functionalization of nanoparticles, and the various methods used for stabilization (such as charge, steric hindrance, etc.) reduce the surface area available for reactions. A novel strategy to isolate, functionalize, and subsequently release (ISOFURE) functionalized nanoparticles using a polymer matrix was harnessed to solve such issues. Specifically, a biodegradable poly(β-amino ester) hydrogel composite was synthesized with gold nanoparticles (GNPs) entrapped in its matrix. Atom transfer radical polymerization
(ATRP) was used to coat the ISOFURE GNPs with temperature responsive poly(N-isopropyl acrylamide) hydrogels. Characterization using dynamic light scattering and UV-Vis spectroscopy showed that ISOFURE GNPs demonstrated higher stability than the solution-based ATRP reacted GNPs. Also, a biomolecular reaction was done via biotin-streptavidin affinity to load the enzyme catalase over the GNP surface. Bioassaying showed that the loading of catalase was higher in the case of ISOFURE GNPs since the entire surface area was dedicated to biofunctionalization in the absence of a stabilizing reagent. The use of the ISOFURE strategy proves to be a simple yet powerful method to reduce agglomeration and increase loading during the functionalization of nanoparticles for biomedical applications.

Chemistry

Department of Chemistry
Mentor: Allan Butterfield

Met35: A Key to Amyloid Beta Peptide’s Role in Alzheimer’s Disease

One of the characteristics of Alzheimer’s Disease (AD) is the presence of senile plaques (SP). The main component of SP is amyloid beta peptide (Aβ), a 40-42 amino-acid peptide, which is deposited outside of neuronal cells and causes cellular dysfunction through the generation of free radicals. The Butterfield laboratory proposed the mechanism of Aβ-induced toxicity and associated oxidative stress, and suggested that the Methionine (Met) residue at position 35 is the key to the generation of these free radicals. The sulfur of the Met 35 is within a Van der Waals distance of Ile (the i+4 residue); hence, the oxygen atom on the carbonyl group of the Ile backbone is able to pull electron density away from the sulfur, making the S atom vulnerable to undergo a one-electron oxidation more easily, resulting in a sulfuranyl radical. This sulfuranyl radical can then abstract an allylic H-atom from the acyl chains of adjacent lipids that are also present in the membrane, therefore propagating a chain reaction and increasing free radical production, through a process called lipid peroxidation. In order to test the role of methionine-35 of Aβ (1-42), an in vivo animal model of AD was used. The J20 mouse is a double mutant of Swedish and Indiana familial forms of AD that overexpress the precursor to Aβ, i.e., APP (amyloid precursor protein), and another mouse model in which the Met35 was replaced with Leucine, an amino acid whose structure is similar to that of Methionine (M35L mice). The hypothesis was tested that the levels of certain AD-relevant proteins would be similar in brains of the Leu-substituted animals as those in wild-type mice. The results support proteomics studies recently conducted in the Butterfield laboratory. This research was supported by a NIH grant to D.A.B.
40. David John Dirkes III  
Department of Chemistry  
Mentor: John Anthony  

*Organic Photovoltaic Solar Cells*

There is an increasing demand in the world today for cheap and efficient sources of clean, renewable energy. Solar cells have shown great potential in clean energy generation and may one day be able to meet the world’s staggering energy demands. One of the main problems is that conventional silicon solar cells are currently very expensive, limiting solar energy’s utilization. Organic solar cells are a promising low-cost alternative for solar energy generation. The goal of this research project is to develop and test new types of organic solar cells in the hopes of furthering the development of cheap, effective organic solar cells. One of the main requirements of organic solar cells is that they contain donor and acceptor molecules that absorb strongly across the entire visible spectrum. This project involves modifying Heteroacene molecules (BTBTBs) to create a push-pull system. The work begins with the synthesis of the required donor and acceptor substituted phenyl acetylenes, the first of which have already been synthesized in Dr. Anthony’s lab this semester. Once these substituents have been created, they will be added piece by piece onto the BTBTB chromophore and the relationship between donor and acceptor strength vs. absorption profile will be tested. The most promising arrangements will undergo X-ray crystallography to examine the crystal structure of the molecule in question for signs of the necessary π-stacking, which is essential for good solar cells. The molecules with good π-stacking will then be subjected to electrochemical studies. This information will help in the selection of an appropriate acceptor material to use in the creation of the solar cells. Finally, solar cells, formed from the molecules that show the greatest potential, will be created and tested to assess their suitability for device studies performed by our engineering collaborators.

41. Michael Goodman, Govind Warrier, Rukhsana Sultana, Robert Yokel, Sarita Hardas  
Department of Chemistry  
Mentor: Allan Butterfield  

*Biodistribution of Nanoscale Ceria from Blood and its Effects on Oxidative Stress Endpoints*

The main purpose of this study was to assess the ability of engineered ceria nanomaterials to induce oxidative stress in peripheral organs in rats. Oxidative stress is a hallmark in neurodegeneration seen in chronic illnesses such as Alzheimer’s disease. In this experiment, 30 nm size nanoparticles were injected into rats and terminated at various time intervals for up to 90 days. Furthermore, five peripheral organs were analyzed including the liver, lung, heart, spleen, and thymus. The modification of proteins in these tissue samples was investigated by initially performing a bicinchoninic assay (BCA), followed by slot-blot analysis, probing with specific antibodies. Each sample was analyzed in duplicate, and compared to samples from control rats processed in the same analysis.
42. **Andrea Hiller**, Kara Larson, Gabriel Popa, Jianyu Liu, Tianyan Gao  
Department of Chemistry  
Mentor: Sabire Özcan

*Analysis of the Glucose Regulation of PHLPP Phosphatases in Pancreatic β-cells*

Diabetes mellitus is a chronic disease that affects approximately 8.3% of the American population. When a normal individual consumes a meal, blood glucose levels rise and insulin is secreted from the pancreas. However, a patient suffering from diabetes maintains high blood glucose levels due to their inability to produce or secrete insulin. Glucose acts as a signal to the beta-cell (the insulin producing cell in the pancreas) to secrete insulin, the mechanism of which isn’t completely understood. Preliminary data suggest that recently discovered phosphatases, PHLPP1 & PHLPP2 play a role in the regulation of insulin secretion in pancreatic beta cells. Pleckstrin Homology Domain Leucine Rich Repeat Protein Phosphatases (PHLPP) are a pair of PP2C-type serine/threonine phosphatases in the PPM phosphatase family. They dephosphorylate the hydrophobic motifs of Akt at serine 473 and protein kinase C at serine 660. PHLPP has been shown to have a role in cancer cells but has not been studied in many other cell types. Overexpression of the protein in cancer cells causes increased apoptosis as well as reduced tumor size via downregulation of Akt signaling. Previous experiments have shown that glucose regulates PHLPP1 expression and this regulation may be important for insulin secretion. To further elucidate this, we have performed Western Blot analysis using mouse insulinoma MIN6 cell lysates from cells grown in various glucose concentrations. Through this and other experiments we hope to better understand the molecular mechanisms of glucose-regulated PHLPP expression in pancreatic beta cells and how this relates to glucose-induced insulin secretion.

43. **Eleni Maroudas**, Xiaonan Mei  
Department of Chemistry  
Mentors: Anne-Frances Miller

*Using NMR to Study the Dynamic Structure of the Protein Nitroreductase*

The purpose of this research is to optimize a protocol for purifying large amounts of nitroreductase protein (NR) and then to study the dynamic transition of the protein using NMR. In order to be able to purify the protein with a Ni affinity chromatographic column we have re-engineered the gene for NR by adding DNA that encodes 6 His residues and an sequence of amino acids that should be recognized and cleaved by the enzyme TEV leaving only one glycine residue at the end of the NR gene. The resulting tagged protein was over expressed upon induction of transcription with IPTG (Isopropyl-β-D-thio-galactoside ) and binds tightly to Ni-decorated chromatographic resin via the six His residues. After purification, the His -tagged protein was treated with TEV. Mass spectrometry indicated successful removal of the His$_6$ tag. We anticipate that the extra glycine attached to the protein will not affect the behavior of the nitroreductase. We plan to test the new nitroreductase to see if it retains the thermal transition of
natural nitroreductase. This will be done by collecting NMR spectra as a function of temperature from 4 °C to 37 °C to determine whether it has a well-defined structure at higher temperatures and a fluxional state at lower temperatures, like the natural nitroreductase.

44. Aaron D. McKee, Hemali Rathnayake
Department of Chemistry, Western Kentucky University

_Perylenediimide Functionalized Bridged-Siloxane Nanoparticles: Synthesis, Characterization and Particle Morphology_

In this work, we describe a suitable method to prepare electronically active ligands-functionalized polysiloxane nanoparticles having controllable size ranging from 30 nm to 200 nm. Perylenediimide derivative functionalized polysiloxane (PDI-SSQ), and bridged-polysiloxane (PDI-bridged-SSQ) nanoparticles were prepared by adapting the modified Stöber method. In a typical procedure, nanoparticles were prepared by base catalyzed hydrolysis and condensation of their respective silane precursors in the presence of catalytic amount of tetraethoxysilane (TEOS). In PDI-SSQ case, when the mole ratios of the silane to NH4OH to TEOS were 1: 250: 0.40, the average particle size was ~30 nm. Similarly, in PDI-bridged-SSQ synthesis, the smaller size particles were obtained by increasing the concentration of NH4OH with addition of catalytic amount of TEOS. In both cases, we were able to control the size of the particles ranged from 30 to 250 nm by changing the catalyst concentration. FT-IR spectroscopy of both particles showed IR stretching signals at 2974 - 2856 (C-H stretching of alkyl chains), around 1700 (weak, ester carbonyl stretching), 1454 (weak, N-C stretching from perylenediimide) and 1043 cm⁻¹(Si-O-Si stretching from siloxane network). The size and the shape of these nanoparticles were visualized using transmission electron microscopy (TEM), which indicate the successful preparation of these novel polysiloxane nanoparticles. The photophysical studies of these nanoparticles in solution have provided further evidence of successful incorporation of perylenediimide into siloxane network.

45. Govind Warrier, Sarita Hardas, Rukhsana Sultana, Peng Wu, Eric Grulke, Robert Yokel
Department of Chemistry
Mentor: David Butterfield

_Early Stage Oxidative Stress Effects of Ceria Nanomaterial on Peripheral Organs_

Cerium(IV) Oxide, also known as ceria, is an engineered nanomaterial (ENM) used primarily as a diesel fuel catalyst. However, questions abound about the danger this material may pose if contact with the body occurs. This study uses systemic delivery of in-house engineered ceria nanoparticles into rats to study oxidative stress effects in five peripheral organs (liver, lung, heart, spleen, and thymus). Organs collected 1 and 20 hours after treatment were analyzed, allowing for comparisons between two early time frames. To quantify the oxidative stress present, an immuno-histochemical approach was taken. The levels of three specific oxidative
stress parameters, including, protein carbonyls, 3-nitrotyrosine (3-NT), and protein-bound 4-hydroxy-2-trans-nonenal (HNE) were examined in each organ. Support: EPA grant to D.A.B.

Computer Engineering

46. Matthew Wiggins
Department of Computer Engineering
Mentor: Henry Dietz

One Program, One GPU Kernel Invocation

GPUs (Graphics Processing Units) have the potential to achieve high performance at low cost for non-graphical applications. Normally, GPUs are used by a PC host invoking a separate kernel on the GPU for each simple parallel operation. Significant overhead is associated with each invocation, thus this research centers on methods that might allow a entire program to run within a single GPU kernel. The parallel Bitonic Sort algorithm was selected as a non-trivial test case for single-kernel implementation. This sort uses two key programming features not directly supported within a GPU kernel: (1) recursion and (2) inter-block communication and synchronization. For comparison, there are multi-invocation versions provided by NVIDIA as well-tuned coding examples for both CUDA and OpenCL. Both CUDA and OpenCL GPU programming environments were used for programming experiments. At this writing, a single-invocation CUDA version has been developed and shown to work on an NVIDIA GTX280 GPU. Unfortunately, the multi-invocation reference version is nearly 3X faster. We believe this is because it places temporaries in local shared memory instead of the 100x slower global memory. Future optimization to place temporaries in local shared memory is thus expected to give the single-kernel version a significant performance advantage.

Computer Science

47. Grant Schwartz, Hannah Atkinson
Department of Computer Science
Mentor: Jerzy Jaromczyk

Rediscovering the Hypertext by a Computer Science Major

A good story can inspire and such was the intention of a reading assignment in the CS-485 course on Concurrency. Quoting John Dewey [1859-1952], the American philosopher whose educational ideas were influential worldwide, "Art is the most effective mode of communications that exists." We were asked to read a short story "The Garden of Forking Paths", a masterpiece written by Jose Luis Borges, an Argentinean genius, whose writing often concerned the nature of time. His innovative style -- non-linearity of narration -- inspired many authors and movie directors and made him an inventor of hypertext novel, a concept that is present in current
hypertext documents and in hypermedia. To fully appreciate that, note that "The Garden of Forking Paths" was first published in 1941. This beautiful story made us to think about time, parallelism and non-determinism; fundamental concepts, certainly not limited to computing. The assignment asked to explain how we understood these concepts. We show our own short stories that we wrote in response to the assignment.

Earth and Environmental Sciences

48. Alexandria Sehon
Department of Earth and Environmental Sciences
Mentor: Philip Kraemer

*Bedrock Structures of the Blount Springs, AL Area*

The purpose of this mapping project was to create a visual representation of the bedrock underlying the Blount Springs area of Blount County, AL in the form of a detailed geologic map. In addition, two geologic cross-sections bisecting the map area were constructed in order to better understand the underlying anticline and monocline that trace through the northern region of Alabama. Over a consecutive three-day period, data was collected through observation and measurement of bedrock outcrops surrounding the springs as well as road cuts along State Road 127. Extrapolations were made from these observations in order to construct a complete map, cross-sections, and lithologic description.

49. Will Spence
Department of Environmental Studies
Mentor: David Atwood

*A Critical Look at Water Availability: How Rising Populations Will Shape New Courses of Action*

This project was designed to put to question the overall status of water availability and water management by region. By assessing three main factors about each location—the per capita water consumption, renewable freshwater resources, and the expected population by 2050—the author was able to make inferences about projected water needs. Further extrapolating this idea, new methodologies of converting impure water to potable water were also evaluated in the context of their costs relative current technologies. By emphasizing the disparities in current water consumption and water needed to support larger populations, it is obvious that the current rate of consumption is unsustainable, ultimately requiring greater prudence with water allocation and a more focused investment in desalination technology.
**Electrical Engineering**

**50. Tyler Orr, Ryan Palmer, Mike Fitzgerald, Jessie Turpin**
Department of Electrical Engineering  
Mentor: Regina Hannemann

*Senergy: Home Energy Monitoring System*

Senergy - a portmanteau of the words "sense" and "energy" - is a system that enables customers of electric utilities to track, view, and analyze their energy consumption. This, in turn, empowers users to take charge of their energy usage and, ultimately, save money. Instead of tracking the electrical consumption of an entire house as a unit, Senergy allows users to do so for each individual circuit in their home. Most comparable systems - including smart meters installed by electric utilities, as well as commercial product offerings from major industry players - do not offer this level of granularity with their measurements. This can leave users without the information they need to effectively change their consumption behavior. By pinpointing exactly which devices in the home are using the most electricity, user behavior can be modified to have the greatest possible impact on reducing demand for utilities, reducing the user's impact on the environment, and saving the user money. This is accomplished by installing the Senergy control module in an electrical panel box adjacent to the main breaker box for the house. Wires for individual electrical circuits run through the Senergy system and then back into the main panel. Sensors measure the current and voltage values needed to compute power and energy usage, and this information is sampled and sent via wireless networking to the Senergy software web application. This application allows users to view their consumption data and history, and is the main way that the user interacts with Senergy. Being a web application, this information is accessible anywhere in the world, as long as the user has an internet connection.

**51. Matthew Sparks, Christopher Tyler, Joshua Shank, Eric Westfall**
Department of Electrical Engineering  
Mentor: Regina Hannemann

*Development of Standard Module for High Altitude Balloons*

High altitude balloons have been used to access near-space for years by researchers and hobbyists for their low cost, simplicity of use, and lack of limitations based on weather and locations. The current generation of high altitude balloons takes one of two forms: a fully customized system designed from scratch, or a pre-built and packaged system sold commercially. Although a fully custom balloon payload system will generally satisfy the customer's requirements, the expertise and expense of such a system usually relegates such designs to larger research universities. Pre-built systems are easily obtainable and usable by high schools and other customers with less complex needs, but these systems often fall short of even the requirements of simple experiments. For this project, a payload system was designed for a high altitude balloon that maintained the customizability and flexibility of a custom system,
while capturing the ease of use and low cost of a pre-built system. To accomplish this goal, the
design took the form of a master payload communicating with optional slave payloads. The
master payload uses a microcontroller to cover basic functionality desired by both beginning and
advanced users, and leaves the option of allowing the slave payloads to be attached to customize
the system to the needs of more advanced users. The master payload also performs GPS tracking
and basic environmental sensing to provide the end user with the most commonly used data from
high altitude balloons.

Entomology

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

The Characterization of a Novel Cypovirus in a Parasitoid-Host Relationship

Polydnaviruses (PDVs) in parasitoid wasps are an iconic example of the curious and expansive
realm of viruses that directly benefit their host species. In this case, PDVs allow such wasps to
overcome the defense responses of their host organisms. In the parasitoid/host relationship
between Campoletis sonorensis and Heliothis virescens we have recently discovered two variants
of another virus, present in both the parasitoid wasp and its caterpillar host. We have identified
this new virus as a cypovirus (CPV), and suggest that, while it appears to have little effect upon
the caterpillar hosts, it may be responsible for a high mortality rate that we have observed in our
parasitoid wasps, which become exposed to the virus while feeding on their hosts. The activity of
the cypovirus in the PDV lifecycle provides us with a unique chance to study the complex
relationship that exists between these viruses and their development as biological weapons in
their primary hosts.

Family Studies

53. Zach Motes, Claire Kimberly
Department of Family Studies
Mentor: Ronald Werner-Wilson

Adolescent Sexuality and Spirituality: The Effects of Using Sexually Explicit Material

The present study examined the effects of using sexually explicit material on adolescent
sexuality. Subjects (ages 18-25) responded to an Internet questionnaire, in which they were
asked to define the term sexually explicit material. It was predicted that (a) the adolescent with a
high rating in selfism would be more likely to view sexually explicit material, (b) the adolescent
who viewed sexually explicit material more regularly would have a lower sense of sexual
efficacy and a more negative view of sexuality, and (c) a high rating of spirituality would correlate with less usage of sexually explicit material.

**Gender and Women’s Studies**

**54. Catherine Brereton**  
Department of Gender and Women’s Studies  
Mentor: Susan Bordo

*(Non) Reproducing Lesbians: The Case of 20th Century Fiction*

My research, which has taken place under the mentorship of Dr. Susan Bordo, examines the representations of motherhood and lesbianism in literature of the 20th century. Within this literature, lesbians are rarely portrayed in any kind of maternal role, let alone with a positive representation, despite the fact that their biologically female bodies allow them the potential to become mothers. Beyond this, the lesbians’ relationships with their own mothers are frequently presented as dysfunctional, and certainly in early lesbian literature there appears to be a correlation between the dysfunctional mother-daughter relationship and the lesbians’ subsequent desire (or lack thereof) to become a mother. But as the psychologist Erik Erikson argued, the need for reproduction is powerful and in these lesbians biological reproduction is often replaced by some form of creative reproduction. However, as literature advances into the 21st century, and as developments in fertility treatments impact lesbians in the real world, lesbian literature also shifts to reflect what seems to be a requirements for lesbians to become mothers in order to more fully inhabit their identity as women. This research will be ongoing for several months to come.

**Geography**

**55. Jon Finnie**  
Department of Geography  
Mentor: Richard Schein

*Racialized Landscapes of Lexington*

I have been serving as a research assistant for Dr. Richard Schein on a project centered on racialized landscapes in Lexington. The project is built from a series of case studies—investigations into the cultural landscape of various sites throughout the city—in which features of the cultural landscape reflect and contribute to processes of racial formation in Lexington, with implications for landscape study in the contexts of racial formation in the nation and in the south. Themes emerging from these investigations include questions of urban form and social order; how people “belong” in parts of the city and how they perceive of the city as home; how “race” and racism are represented, practiced, and resisted through particular sites; and how one may “read” and interpret the city’s organization, order, and appearance with regard to race. The
sites studied include the following: Cheapside and the old Courthouse Square, post-Civil War African American urban and rural settlements, the Lyric Theater, slavery and museum exhibits, and public parks and public space. The work primarily entails gathering data by seeking out information in map libraries and map archives, city directories, and newspaper archives.

56. Madeline Wright  
Department of Geography  
Mentor: Richard Schein

Museums in Public Space

Museums contribute to public identity as mixtures of historical configurations and selective display. This research attempts the following – to understand how museums shape and reflect personal and group identity; to reveal the nature and process of learning as it occurs within the museum context; to represent the museum as a landscape of cultural representation; as well as understand museums as symbols and sites for the playing out of social relations of identity, difference, knowledge, representation, and power. Within these understandings, this essay will examine the demographics of museum visitors as well as why they visit museums and what they experience while engaging with the collections. In addition to an examination of museum literature, field research contributes largely to this project. Five history museums in Lexington, KY have been chosen for their cultural, historical, and societal significance, including the Lexington History Museum, the Headley-Whitney Museum, the International Museum of the Horse at the Kentucky Horse Park, the Henry Clay Estate at Ashland, and the Waveland Historic Site. Using these five museums as lenses for understanding the museum literature, this research will accomplish four tasks. First, the project will place each museum in a historical and societal context. Second, the project will attempt to reveal the physical and social significance of each museum’s grounds; this revelation will involve an analysis of how each museum functions as a landscape as well as how the museum’s location either affects or reflects the mission of the museum. Third, the project will identify the programs and collections offered to the public by these Lexington museums. Finally, the essay will identify how these museums contribute to local identity through an assessment of the histories being told for whom and by whom.

Health Sciences

57. Ann Cooper, Amanda Dempsey  
Department of Health Science and Rehabilitation Sciences  
Mentor: Tim Uhl

Correlational Study of General Health Questionnaires and Observed Measures

Most patients complete general health questionnaires after surgery. These patients are then referred to a physical therapy clinic to regain strength and motion in the area of the surgical
procedure. The purpose of this study is to determine if a correlation exists between the scores on the general health questionnaires and measured outcomes in a physical therapy clinic. The patients in this study have undergone surgery for a tibial fracture with or without fasiotomies. They completed three questionnaires: the Short Form General Health survey (SF-36), Lower Extremity Functional Scale, and Short Musculoskeletal Function Assessment (SMFA). The questionnaire scores used for this study will be questions about lower extremities. Strength and range of motion were measured by a cybex isokinetic machine in a research physical therapy clinic. Data from both surveys and observed measures are collected, but are currently being statistically analyzed. It is predicted that there may be a correlation between the scores of the surveys and observed measures. If there is a strong correlation, this may reduce the time it takes for a physical therapist to determine an exercise protocol for the patient and determine if the patient needs therapy. Also physical therapists may provide an exercise protocol for patients that live in rural areas that would not be able to come to therapy every day.

Hispanic Studies

58. Lindsay Oberhausen, Ivonne Marte
Department of Hispanic Studies
Mentor: Susan Carvalho

*Exploring Methods of Research: Masculinity in Contemporary Dominican-American Literature*

This research project emphasized the learning process of attaining and organizing extensive research for a Doctoral thesis, which highlighted the different modes of masculinity presented in contemporary Dominican-American literature. The goal of this project was twofold: to ascertain a deeper knowledge of research methods available at the University of Kentucky and to utilize these methods effectively in order to simplify the process of developing a Doctoral thesis. Steps taken included seeking out relevant research based on bibliographical indexes, utilizing the Interlibrary Loan program to obtain any necessary texts that were unavailable at the University of Kentucky, organizing said research by type and topic, and creating complete bibliography pages for each topic. The outcome of this project was a well-developed knowledge regarding advanced research methods, which proved to be vital in a future project inspired by the research obtained and organized regarding Dominican-American literature.
Horticulture

59. Taylor Lloyd
Department of Horticulture
Mentor: A. Bruce Downie

Seed Maturation Protein (SMP): Regulating Seed Behavior Following Temperature Shock

Spontaneous conversion of L-Asn or L-Asp residues in proteins to the unusual, uncoded amino acid, L-isoAsp, occurs in many proteins. This conversion can be detrimental to protein function contributing to Alzheimer’s disease and Lupus in humans. In the model plant, Arabidopsis thaliana, it had previously been discovered that the At3g12960 gene product, SEED MATURATION PROTEIN (SMP), was susceptible to isoaspartate accumulation. Also, this damage could be repaired by the enzyme, PROTEIN ISOASPARTYL METHYLTRANSFERASE (PIMT). Why this protein in particular was susceptible, and why its repair was of importance to normal seed function provided the impetus for my project. The approach chosen to elucidate the role of SMP was to use an allelic series of insertional mutants in the gene, thereby obviating SMP protein (and its function) from seeds. This mimics a situation where a loss of PIMT would result in unrepaired isoaspartyl formation in SMP, assuming no further SMP production (a situation similar to that in the mature, dry seed). My project was to identify the insertional mutants, their penetrance, and eventual phenotypes for smp mutants. The gene was found to control seed behavior following high temperature shock. The implications of this discovery could have significant value in ameliorating the pressures that agriculture will face in the future due to climate change. Climate change threatens to alter how we plant our crops. It may become necessary to metabolically reprogram our seeds to better suit the perturbations in the environment.

Integrated Strategic Communications

60. Kelsey Joseph
Department of Integrated Strategic Communications
Mentor: Buck Ryan

Deming Faces the Music

The management principles of W. Edwards Deming that inspired programs like Total Quality Management, or TQM, have long been established as effective ways for manufacturing companies not only to improve the quality of products but also to reduce the costs of production. Rarely have those principles been applied to the creative process, though success stories have been told from school rooms to newspaper newsrooms (Ryan, 1993, 1995). The purpose of this study was to see how those principles might be applied to improving the success of a high school choral program, particularly through methods that involve social networking. The result is a semester-long case study of how Deming's principles, especially the alignment of aims with
indicators, methods, and structure, helped the director of a Lexington, Kentucky high school choir program to focus his aims and to tackle the challenge of creating a new competition, modeled after the NBC program "The Sing-Off," for high school and college a cappella groups. The case study reveals that the key to success in implementing Deming's principles has more to do with a logical order of questioning in short bursts to the leader of an organization than in any formal introduction of Deming's notions or even seeking buy-in of the concepts in advance. The results from the case study provide valuable insights for any organization interested in improving their public relations or promoting their success stories in the news media.

Journalism

61. Lindsey Austin, Gary Hermann
Department of Journalism
Mentor: Buck Ryan

Coming to Public Judgment: A Young Voter’s Analysis of Election 2010 in Kentucky

A content analysis of front-page newspaper headlines in the landmark 2010 election campaign for U.S. Senate in Kentucky showed student journalists “bowling alone” (Putnam, 2000), publishing only one front-page election headline for every six published by a professional newspaper in the same city. Meanwhile, the professional journalists continued a “horse race” approach to coverage focusing on conflict, polls, and fund-raising totals, an approach long-criticized by public journalism reformers (Rosen, 1999). A related case study revealed that front-page newspaper headlines, framed either in traditional-elite or public journalism ways, were not key determinants in young voters “coming to public judgment” on which candidates to support (Yankelovich, 1991). For this study, headlines were analyzed in The New York Times; Wall Street Journal; USA Today; Courier-Journal of Louisville, Ky.; Lexington Herald-Leader of Lexington, Ky.; and the Kentucky Kernel student newspaper at the University of Kentucky. In the two weeks leading up to the November 2 election, the professional seven-day-a-week newspaper, the Lexington Herald-Leader, published seven front-page election headlines in fourteen issues for a frequency rate of 50%. The student five-day-a-week newspaper, the Kentucky Kernel, published zero front-page headlines out of ten. All the newspapers mentioned above used traditional-elite “horse race” journalism for campaign coverage over public journalism coverage focusing on solutions, issues, and public forums. In a compilation of front-page headlines related to the 2010 midterm election from October to November, 92% of the headlines were framed in a traditional-elite “horse race” style and only 8% were framed in a public journalism style.
**Henry Clay Meets Sandra Day O’Connor: A Case Study of Kids Lobbying for Civic Education**

A hands-on service-learning research project through the School of Journalism and Telecommunications during the short legislative session of 2011 in Kentucky revealed lessons about the complexity and difficulty of getting legislation passed for middle school and high school students. This project was a “Super” Project Citizen in which the students identified the problems facing civic education and sought ways to address them through drafting a bill called the “Henry Clay-Sandra Day O’Connor Civic Education Act for Kentucky”. The students were made aware of the analysis that people in Kentucky are “bowling alone” (Putnam 2000) in matters of public life. The students including freshman from the University of Kentucky worked with eighth graders at Christ the King School and International Baccalaureate students at Tates Creek High School. The students sought sponsorship and lobbied in an attempt to have their ideas turned into law. Two of student’s ideas made it into House bills that are now working their way through the Senate. The students were able to meet with state representatives, state senators, and former Secretary of State Trey Grayson. Through their work, the students were “coming to public judgment” (Yankelovich 2010) by working to address the lack of informed citizens in Kentucky. The students came up with specific ways to address a lack of civics education, including a bill for voter instruction of 12 graders and a bill to allow convicts to receive a reduce sentence by passing a civics test. The students analyzed the likelihood of their bills being made into law, and pursued sponsorship for the “Clay-O’Connor Act” for next legislative session. This study will summarize lessons that the students learned through the process of drafting legislation and lobbying for it in Frankfort.

**Kinesiology and Health Promotions**

**63. James Rossi**
Department of Kinesiology and Health Promotions
Mentor: Brian Cook

*Examining Exercise Dependence in Men Trying to Gain Weight as Compared to Women Trying to Lose Weight*

Exercise Dependence is a psychological need for physical activity. Secondary exercise dependence may greatly affect health, because the resulting excessive amount of exercise is driven by a need to control body composition. Most scientific literature has examined secondary exercise dependence in women, but there is a lack of focus on men. The cultural norm for women is to lose weight and get lean, while the cultural norm for men is to gain weight and to exemplify muscles. Thus, exercise dependence should be studied in men trying to gain weight in
the same way women trying to lose weight are. Very few studies have examined this relationship between men trying to gain weight and exercise dependence, but one study found that exercise dependence was a significant driving factor for men looking to gain muscularity. The purpose of my experiment, then, was to examine the role exercise dependence plays in men trying to get more muscular as compared to women trying to lose weight. I hypothesized that exercise dependence scores would be similar in men exercising to gain weight and women exercising to lose weight. Secondary analyses were conducted on an existing data set that included measurements of undergraduate students’ weight satisfaction, exercise, and exercise dependence. Participants were 351 [M age=19.84 (1.15)] students [women=86.1 %; Caucasian=61.5 %] recruited from a large southeastern university who completed the Exercise Dependence Scale (Hausenblas & Symons Downs, 2002), Leisure-time Exercise Questionaire (Godin and Shepard, 1985) and demographic questions which included ideal and current weight. Participants were then grouped by weight loss/gain intent and gender. Independent sample t-tests were conducted to examine differences in exercise behavior and exercise dependence scores in men who want to gain weight (n = 49) and women who want to lose weight (n = 302). Men who wanted to gain weight reported significantly higher exercise dependence scores \[t (343) = 4.17, p = .01\], strenuous exercise \[t (349) = 5.42, p = .01\], and total amount of exercise \[t (348) = 4.19, p = .01\] than women who wanted to lose weight. These analyses indicate that men trying to gain weight may exhibit more exercise dependence than women trying to lose weight. Future research should consider men when researching exercise dependence, because these preliminary analyses show that there may be a significant gender difference in exercise dependence scores.

Markey Cancer Center

64. Victoria A. Elliott, Yekaterina Y. Zaytseva, Piotr G. Rychahou, Kathleen L. O’Connor
Markey Cancer Center
Mentor: Mark Evers

The Potential Role of De Novo Lipogenesis in the Regulation of Cell Motility and Invasion in Colorectal Cancer

ATP-citrate lyase (ACLY) and Fatty Acid Synthase (FASN), key enzymes of lipid biogenesis, are significantly up-regulated and their activity is associated with poor prognosis in colorectal cancer (CRC). The impact of aberrant activation of lipogenic enzymes on the progression of cancer and development of metastases remains unknown. The purpose of this study was to determine (i) expression of lipogenic enzymes in CRC tissues and CRC cells, and (ii) the effect of their inhibition on migration and invasion. The study demonstrated that inhibition of lipogenesis may reduce metastatic potential of CRC cells by disrupting CD44-associated signaling and attenuating the interaction of CRC cells with endothelial cells. These findings suggest that de novo lipogenesis may be a potential therapeutic target for advanced CRC.
Mechanical Engineering

65. Heba Yusuf, Lee Thompson
Department of Mechanical Engineering
Mentor: Christine Trinkle

Formation of Protein Gradients Through Micro Contact Printing Utilizing 3-D Anisotropic Capillary Hydrogels

Micro-contact printing of proteins has been long established as a useful technique for controlled cellular growth and precise cellular analysis. However, the addition of gradients within the patterned surface is still a goal that is not easily attained with accuracy, repeatability, and cost effectiveness. The basis of this experiment was to determine if protein gradients could be formed through the diffusion of fluorescent Immunoglobulin G (IgG) protein in 3D alginate-based anisotropic capillary hydrogels. Based on its structure, these alginate-based anisotropic capillary hydrogels should direct linear oriented protein diffusion, as well as having the benefits of hydrophilicity and bio-compatibility. These hydrogels molded into 3D wedges should promote higher diffusion rates in areas with less thickness and lower diffusion rates in areas with more thickness of hydrogel. In effect, a protein gradient should be the result visible under fluorescence microscopy. Pore size of the hydrogel may be an issue inhibiting protein diffusion through the hydrogel and in that case manipulation of pore size will be further examined. Findings suggested uses for anisotropic capillary hydrogels as precursors to directed nerve regeneration in spinal cord injuries as well as in other medical applications, and this analysis will potentially further the usage of these fascinating structures.

Molecular and Cellular Biochemistry

66. Travis M. Bridges
Department of Molecular and Cellular Biology
Mentor: Matthew Gentry

Lafora Disease E3-ubiquitin Ligase Malin is Related to the TRIM Family of Proteins at Both the Phylogenetic and Functional Level

Malin is an E3-ubiquitin ligase that is mutated in Lafora disease, a fatal form of progressive myoclonus epilepsy. In order to perform its function, malin forms a functional complex with laforin, a dual specificity phosphatase that facilitates targeting of malin to its corresponding substrates. While the laforin phylogeny has been deeply studied, there are no data on the evolutionary lineage of malin. After an extensive search for malin orthologs, we discovered that malin is exclusively present in vertebrate species and a cephalochordate, in contrast with the broader species distribution previously reported for laforin. These data suggest that in addition to forming a functional complex, laforin and perhaps malin may also have independent functions. In addition, we discovered that malin shares significant identity with the E3-ubiquitin ligase
TRIM32, which belongs to the tripartite-motif containing family of proteins. Also, experimental data is presented that provides evidence that TRIM32 is capable of ubiquitinating malin substrates. Taking together, these results suggest a common origin for malin and TRIM32 and provide insights into functional redundancy of both proteins.

67. Kelsey Field
Department of Molecular and Cellular Biology
Mentor: Rebecca Dutch

Substitution of a Conserved Lysine Residue Negatively Impacts Paramyxovirus F-Mediated Membrane Fusion

Paramyxoviruses utilize a fusion (F) protein in order to enter cells and cause infection. In order for the virus to fuse to cells, the F protein must undergo conformational changes. These conformational changes are considered to be irreversible so it is vital that triggering is properly controlled. It has been shown, via mutation, that several regions within the F protein are critical in facilitating fusion triggering. We hypothesized that a buried lysine residue at position 52 within the heptad repeat A (HRA) interacting domain of F2 may play an important role in destabilizing the region so that the conformational changes and subsequent fusion promotion can occur. This lysine is unique in that it has no charge-pair interacting partners. To test the importance of this amino acid, we employed site-directed mutagenesis to substitute the lysine residue with either a glutamine or methionine residue. These uncharged residues are of similar size to lysine but methionine is hydrophobic and glutamine hydrophilic. The mutant genes were inserted into the mammalian vector pCAGGS so that transient expression in mammalian cells could be possible. Initial results show a reduced amount of syncytia (formation of multinucleated cells as a result of F protein-promoted membrane fusion) in wells with the mutated forms of F protein relative to the wildtype F protein. Thus, these changes impact fusion promotion. Initial analysis suggests that there is a reduction in a proteolytic cleavage of these mutants that is needed for fusogenic activity, indicating that the mutations may be impacting the stability or fold of the pre-fusogenic activity, indicating that the mutations may be impacting the

68. Courtney Ford
Department of Molecular and Cellular Biochemistry
Mentor: Becky Dutch

Examination of a Critical Valine Residue in a Paramyxovirus Fusion Protein: Roles in Protein Folding and Membrane Fusion

The paramyxovirus PIV5 is able to fuse its viral envelope to the plasma membrane of cells through conformational changes in the viral fusion (F) protein. Infection is initiated when the viral attachment protein, the HN protein, binds the virus to the host cell. This binding then triggers changes in the F protein which drive the critical membrane fusion process. It has been
shown that decreasing the size of the residue at position 50 in the F2 domain of the F protein by mutation of the residue from valine to alanine significantly decreased the ability of the F protein to promote fusion (A. Gardner and R. Dutch, J. Virol 81:8303-8314, 2007), suggesting that the packing of the amino acid side chains in this region is critical. We hypothesized that increasing the size of the residue at position 50 would increase the ability of the F protein to fuse. To test this, site-directed mutagenesis was used to change the valine residue to an isoleucine, a leucine, or a phenylalanine residue. Each mutant will then be inserted into the vector pCAGGS and the subsequent effects on fusion will be observed.

69. Shelby Malone  
Department of Molecular and Cellular Biology  
Mentor: Rebecca Dutch

**Immunological Analysis of Tagged HMPV P Protein**

Human Metapneumovirus (HMPV) is a member of the paramyxovirus family, and is responsible for severe respiratory infections in young children and immunocompromised adults, accounting for at least 6% of all hospitalizations for respiratory infections. By analogy to other paramyxoviruses, one of its eight proteins, the phosphoprotein or P protein, is thought to be involved in assembly of the RNA polymerase complex and is hypothesized to be one of only two proteins required for the formation of inclusion bodies, or areas of viral replication within an infected host cell. Because HMPV was only discovered in 2001, the exact interactions involved in these crucial replication events are unknown. We inserted a FLAG epitope tag into the C-terminus of the P protein through expression of the modified gene in competent host cells, allowing visualization with immunofluorescence and purification through immunoprecipitation using FLAG-specific antibodies. Immunofluorescence studies indicate that the tagged P protein is present in a diffuse staining pattern throughout the cytoplasm in unaffected cells, but relocates to punctuate localization upon HMPV infection, indicating that the tagged protein localizes to viral inclusion bodies. We are currently using immunoprecipitation to examine interactions of P with viral and host cell proteins at various stages of infection. Our studies are aimed at a greater understanding of HMPV pathogenesis to reveal a possible method of replication attenuation that could be used for novel antiviral therapies.

70. Emily Meier  
Department of Molecular and Cellular Biology  
Mentor: Louis Hersh

**Nardilysin Enhances A-Secretase Activity – A Potential Drug Target for Alzheimer’s Disease**

The accumulation the amyloid β-peptide or Aβ in the brain is widely believed to cause senile plaque to form leading to Alzheimer’s disease. It is assumed that α-secretase prevents the
formation of Aβ. Recent studies have also shown that this activity of α-secretase is enhanced by a peptidase known as nardilysin. Understanding the map out of the interacting surface of nardilysin and α-secretase will allow us opportunities to explore possible drugs for Alzheimer’s disease. In particular, my project is to express and purify the human nardilysin to study this interaction. My initial results have shown that nardilysin increases α-secretase activity and I will next test the activity of α-secretase using various forms of nardilysin.

71. Scottia Miller  
Department of Molecular and Cellular Biology  
Mentor: Robert Dickson

*The Effect of Iron Deprivation on Mutant Strains of Saccharomyces Cerevisiae*

The regulation of genes contributing to iron homeostasis is essential in any organism. In conditions where iron is low, all organisms must develop a mechanism to enhance their ability to survive. However, the contribution of genes to iron homeostasis is still a grey area in the way of signal transduction pathways. *Saccharomyces cerevisiae* (Baker's yeast) is one organism in which the effect of genes on iron utilization can be studied. *Saccharomyces cerevisiae* display a relatively short lifespan and can be evaluated within the laboratory. By studying the Chronological Life Span of *Saccharomyces cerevisiae*, which is the time they survive after entering the non-dividing state (Go), it can be determined whether or not selected genes are essential for survival in conditions of stress (eg. iron deficiency).

72. Mittul Patel  
Department of Molecular and Cellular Biochemistry  
Mentor: Qingjun Wang

*Finding the Missing Link Between Autophagy and Cell Growth Control — a Novel Target for Treating Cancer?*

One of the most life-threatening diseases that plagues human beings today is cancer. Autophagy is a cellular degradation pathway that is essential for the removal and degradation of unnecessary and damaged organelles along with proteins in time of stress and starvation. Autophagy impairment can lead to unregulated cell division and unrestrained cell growth characteristics of cancer. Beclin1 is a critical regulator of autophagy. Partial deletion of Beclin1 leads to increased incidence of tumors, and total deletion of Beclin1 leads to death in mice at the embryonic stage. This study examines the role of a novel Beclin1-interacting protein, p40, in cell division and proliferation. We have shown that transient knockdown of p40 increases cell proliferation. We have also shown that p40 co-localizes with the key cell division protein gamma-tubulin on centrosome, suggesting that p40 is involved in cell division. We hypothesize that autophagy may directly regulate cell division via p40 at the centrosome. We further hypothesize that alteration of p40-Beclin1 or p40-gamma-tubulin interaction can lead to increased cell proliferation. We have generated a series of DNA constructs encoding either full length or truncated p40. Using these
constructs and a variety of protein-protein interaction and cell growth assays, we characterize the protein domains of p40 that interact with Beclin1 and co-localize with gamma-tubulin. Furthermore, we also study whether disrupting these protein-protein interaction domains in p40 leads to impaired starvation-induced cell proliferation inhibition. This study will shed light on our understanding of cancer and our adventure towards effective cancer treatment.

73. Emily Pena, Jessime Kirk
Department of Molecular and Cellular Biochemistry
Mentor: Trevor Creamer

Calmodulin-Peptide Interaction

Calmodulin is an essential protein that regulates the activity of about two hundred proteins by turning them either on or off. It has been suggested that the sites within these proteins, to which calmodulin bond, lack structure. When it binds to a protein it gives an alpha-helical structure, resembling a loosely coiled “spring”. Two parts are considered in this research. First, the correlation between how easily an alpha-helical structure is made and how tightly calmodulin bonds is considered. The calmodulin bonds to all proteins, however, the strength varies. Therefore, it is hypothesized that it all depends on how easily an alpha-helical structure is made. A number of peptides were tested for comparison of data. Trifluoroethanol was used in order to induce a helical structure, which was measured using circular dichroism spectroscopy. Secondly, although calmodulin forms an alpha-helical structure, in some proteins there is even more structure that occurs apart from the binding region. Calcineurin is an example of another protein studied also using circular dichroism. These data and future studies will lead to a better understanding of how calmodulin discriminates between various proteins.

74. Fei Xiong
Department of Molecular and Cellular Biology
Mentor: David Rodgers

Conformational 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 caused the enzyme to tumble faster, indicating a conformational change that narrows the channel. In contrast, the novel inhibitor C28, which
bonds 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. And 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.

Neurology

75. Mary Jennings, Wangxia Wang
Department of Neurology
Mentor: Peter Nelson

Co-Immunoprecipitation of Argonaute Complex Provides Opportunity for
Exploration of Novel Neurochemical Factors Involved in Alzheimer’s Disease

The rapid increase in the number of individuals affected by Alzheimer’s disease (AD) in recent
years (a 46.1% increase in AD deaths from 2001 to 2006) has prompted growth in this research
field to discover the cause of this debilitating disease. Interestingly other causes of death such as
stroke, prostate cancer, and heart disease have decreased in number of individuals who lost their
lives. This decrease in mortality rates caused by other ailments is due partly to determined
research in these fields. Focused research into the prevention and causes of AD is necessary as
the baby boomer generation ages. AD is currently the seventh leading cause of death for all ages
in the United States despite the fact that approximately 96% of those diagnosed are over the age
of 65. AD must be combated through increased research into the field of neurobiology. This
project focuses on microRNA (miRNA) and its affect on mRNA transcripts and the proteins they
encode. The down-regulation of certain proteins that occurs in AD is thought to contribute to
some of the nerve degeneration that occurs during the progression of AD. Previous research has
shown that miRNAs and the associated protein (“Argonaute”) complex tag mRNA for
degeneration and thus prevent the production of a given protein. The Argonaute complex is
associated with miRNA and can be studied to determine all its components and functions. A
more complete understanding of this complex could lead to a better comprehension of the onset
and progression of AD by tracing neuronal death back to protein down-regulation and
miRNA/mRNA interaction because miRNA function is altered early in AD.
76. Saumya Mehta, Erming Wang, Filomena Papa  
Department of Neurology  
Mentor: Franca Cambi

*Genome-wide Analysis of Alternative Splicing Events Regulated by hnRNH and F*

Alternative splicing is the process by which an individual exon of an RNA produced by transcription of a gene is either included or excluded in the final mature RNA; more importantly, over 90% of human genes undergo alternative splicing, thus generating multiple isoforms and defective RNA processing is widely recognized as a major cause of human disease. The heterogeneous nuclear ribonuclear proteins (hnRNP) H and F are two splicing factors that regulate alternative splicing. It has been found that silencing hnRNPH and hnRNPF concurrently produced exciting results. The specific gene examined was proteolipid protein (PLP), which is found in differentiating oligodendrocytes, the myelin producing cells of the central nervous system. In the experiments being carried out, there has been examination of alternatively spliced events that are affected by silencing hnRNPH and F together in Oli-neu cells, an oligodendrocyte cell line. These events were identified by exon profiling of Oli-neu cells in which hnRNPH and F are silenced vs. unsilenced cells. The focus of this project is primarily on alternatively spliced events generated by selection of competing 3’ splice sites (ss). Reverse Transcription-Polymerase Chain Reaction (RT-PCR) were performed on RNA prepared from A.) a mock treated and B.) a siF/H treated (silenced heterogeneous nuclear ribonuclear proteins H and F) Oli-neu cells. By using the techniques of RT-PCR with the given templates and primers designed to amplify across the alternatively spliced exons, genes with alternatively spliced 3’ss were examined. The PCR products were separated by agarose gel electrophoresis (on 1.5% ultrapure agarose and 3% nu Sieve gels) and bands stained with ethidium bromide were visualized using Gel Logic 212Pro. The intensity of the bands from each transcript in the siF/H was compared to mock treated samples. It was found that silencing hnRNP H/F greatly affects alternative splicing of a number of alternatively spliced 3’ss in some cases increasing the inclusion, while in other there is decreasing inclusion.

Nursing

77. Cecilia Boateng, Andrea McCubbin, Susan Westneat  
Department of Nursing  
Mentor: Kristin Ashford

*An Examination of Maternal Stress; Inflammatory Markers, and Preterm Labor in Caucasians and African American Pregnant women Throughout Pregnancy*

African American women are more likely to have poor pregnancy outcome as compared to other races. High stress, anxiety, inflammation and depression can be contributing factors for this disparity. The purpose of this study was to examine the relationship between inflammatory markers and reported maternal stress in a multiethnic sample of pregnant women. The specific aims for this study was to: 1 Compare levels of reported prenatal stress among African American women...
(AA) and Caucasian (CC) women across all trimesters; and 2. Examine the relationship between C-reactive protein (CRP) and reported prenatal stress. Subjects were recruited from University of Kentucky Chandler Hospital. Twenty AA and sixty-two CC women aging between 18-40 years old participated. Maternal stress was measured using the Everyday Stressors Evaluator tool. This was a 20 item questionnaire used to measure chronic stress in women of childbearing age (Cronbach’s–α ranged from 0.80-0.85). Potential prenatal stress was also measured via CRP levels obtained in three mediums, serum, saliva and cervical-vaginal-fluid(CVF) each trimester. Statistical data analysis included descriptive measures, T-tests, and Pearson Correlation Coefficient. AA women report higher prenatal stress levels scores than CC women throughout pregnancy. Higher stress levels during pregnancy are a contributory factor to poor pregnancy outcome, therefore it is necessary for healthcare professionals to screen for stress and offer stress reduction interventions. Furthermore, prenatal CRP levels have not been shown to reflect reported prenatal stress in the subjects. For this reason, further research should be conducted to identify more reliable biomarker for prenatal stress.

78. Viktoria Melnyk, Richard Dylan Murphy, Katherine Crush, Dr. Susan Frazier
Department of Nursing
Mentor: Melanie Hardin-Pierce

Mortality, Baseline Inflammatory Status and Cardiovascular Function in Adult Mechanically Ventilated, ICU Patients

Cardiovascular, oxygenation, and respiratory muscle dysfunction contribute to unsuccessful ventilator weaning. Inflammation may induce cardiovascular dysfunction, prolong mechanical ventilation and contribute to weaning failure and mortality. A comparison of baseline inflammatory and cardiovascular status in patients requiring mechanical ventilation who survive with those who die may contribute to understanding of factors that increase mortality in this population. The purpose of this study was to compare baseline demographic, clinical, inflammatory and cardiovascular variables measured in adult ICU patients receiving mechanical ventilation who survive their illness with those who die. Adult patients who required a minimum of 12 hours of mechanical ventilation were enrolled in this descriptive, comparative, repeated measures study. Demographic and clinical data were abstracted from the medical record. Cardiovascular variables were measured using impedance cardiography. Venous blood was obtained for measurement of C-reactive protein and inflammatory cytokines. Patients (n = 38) were primarily male (57%), married (54%), Caucasians (95%) with an average age of 53.16 years. Patients were ventilated for 12 ± 7 days, primarily for a respiratory diagnosis (62%). One third of patients (32%) died and those who died exhibited twice the comorbidity burden (p = 0.02); higher central venous pressure (19 ± 6 versus 12 ± 6 mmHg, p = 0.01), lower mean arterial pressure (65 ± 13 versus 81 ± 13 mmHg, p = 0.04) and higher NTproBNP (6898 ± 4631 versus 2944 ± 2648 pg/ml, p = 0.05) without significant differences in inflammatory status between those who survived and those who died. Heart failure, exhibited by elevated venous pressure, B-type natriuretic peptide, and hypotension, were more likely at baseline in ventilated patients who later died during hospitalization.
79. Laura Traynelis, Susan Westneat
Department of Nursing
Mentor: Kathryn Moore

Pre-hospital and Emergency Department Registered Nurses’ and Paramedics’ Knowledge of Evidence-based Ischemic Stroke Care

The purpose of this study was to assess pre-hospital and emergency department registered nurses and paramedics knowledge of evidence-based ischemic stroke care. A cross-sectional, descriptive study was conducted to assess knowledge of evidence-based ischemic stroke care. Data was collected using a 10-item multiple-choice survey designed to assess knowledge of evidence-based ischemic stroke care. The multiple-choice survey was used in the initial pilot study and used with permission from the pilot study investigator. Survey items were developed from evidence-based practice guidelines. The target population was registered nurses (RNs) and paramedics providing pre-hospital and emergency department care. Demographics collected included: age; gender; education; certification; years of experience. Letters of inquiry were sent to emergency department managers and Emergency Medical Services managers. There were 63 voluntary participants (n=63), including 56 emergency department RNs and 7 paramedics. The survey was completed online, and completion was considered consent to participate. There was no exclusion of any sex/gender or racial/ethnic group. The survey scores ranged from 10% to 90% correct with a mean of 58% SD (17.0) on a scale of 0 to 100%. Of respondents, 83% indicated they had read literature on evidence-based ischemic stroke care and that group did not have significantly higher scores when compared to participants who had not read ischemic stroke care literature. Of respondents, 70% indicated they had completed stroke-specific continuing education in the past year and these individuals did score significantly higher on the survey (p=0.003). There were no significant differences in the scores of the following demographics: number of stroke patients for which participants cared; years of experience as an RN; educational preparation of the RN; or between RN and paramedic. There was a significant difference in those RNs reporting certification in emergency nursing (p=0.02). There was an overall knowledge deficit in evidence-based ischemic stroke care.

80. Nutrition and Food Science

Annmarie Behr
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

Correlation Between Stress and Likelihood to Increase Calorie Consumption and Alter Food Preferences

The incidence of chronic stress in the United States continues to increase. Chronic stress can be brought on by a multitude of factors including job-stressors, school, family, and economic and traumatic stress. Stress is seen as just a nuisance to most; however it may also be contributing to the nation’s epidemic of obesity. Most people under chronic stress seek out energy dense foods
and increase their calorie consumption. This study will evaluate stress levels of college students at the University of Kentucky and how eating patterns are associated with stress. Surveys will be distributed to 200 of the students. Questions will be asked for students to rank their stress levels as well as the estimated calories and food preferences. It is hypothesized that there is a positive correlation between stress and increase of calorie consumption, and intakes of high fat/high sugar foods.

81. Katherine Bentley  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

How Does the Built Environment of the University of Kentucky Affect Freshman Weight Gain?

The obesity pandemic that has spread across America is also affecting students in universities across the nation. Research is being done in the fields of biology, psychology, nutrition, and sociology trying to pinpoint causes for the increased prevalence of obesity in our country. Lack of physical activity and poor diet are known contributors to weight gain. The purpose of this research was to evaluate the effects of built environment on freshman weight gain on a college campus. A survey was administered to 304 freshmen living on-campus at the University of Kentucky. Students were asked questions relating to their gender, age, weight, eating habits, and exercise habits. Students living on North campus gained an average of 1.33± 10.9 pounds more during the fall semester than students living on South campus (p= 0.25). Students on North campus exercised 2.31±1.8 days per week and students on South campus exercised 3.02±1.9 days per week. Students on South campus exercised an average of 0.71 ± 2.62 days per week more than North campus students (p=0.007). Interestingly, 53% of North campus students reported eating at buffet style campus restaurants most often while only 38% of South campus students ate there frequently. When comparing à la carte style restaurants, only 22% of North campus residents reported eating there frequently, while 46% of South residents ate à la carte frequently. This data suggests that food availability, rather than access to recreational facilities, may play a greater role in freshman weight gain. College students need to continue to be educated on importance of a well-balanced diet and physical activity in preventing weight gain and achieving optimal health while living in the dorms.

82. Allison Bond  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

Correlation Between Breakfast Intake and Physical Activity

A nutritious breakfast and regular physical activity are both known to help improve an individual’s weight status, reduce risk for chronic disease, and contribute to optimal physical performance. The relationship between breakfast choices and physical activity involvement was
investigated in students, faculty, and staff members at the University of Kentucky. A total of 200 individuals participated in the study including 104 males (age 22.61 +/- 5.13 years) and 96 females (age 23.47 +/- 7.03 years). Subjects completed surveys regarding their breakfast and exercise habits. The average BMI reported for females was considered normal at 23.3 while males averaged a higher BMI of 25.1, placing them in the overweight range. Thirty-eight percent of participants reported skipping breakfast often compared to the forty-four percent which reported eating breakfast regularly. Those who reported consuming breakfast frequently were found to be three times more likely to rate themselves as very active. In comparison, seventy-one percent of participants who often skip breakfast exercise less than 3 days a week. The most commonly consumed breakfast food was cereal or cereal bars, with over half of participants consuming these. This research supports the importance of eating breakfast as part of a healthy lifestyle. Those who eat breakfast are also more likely to engage in physical activity.

83. Elizabeth Bray
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*Illicit Use of Prescription Drug Adderall Among College Students and its Nutritional Side Effects*

The prevalence of prescription drug stimulants, such as Adderall, has shown a steady increase on college campuses over the past decade. It is believed that students use these drugs as a way to increase alertness, lose weight, stay awake longer, and improve their overall academic performance. To examine the nutritional side effects of prescription drug Adderall abuse, 200 undergraduate students were surveyed at the University of Kentucky. The participants included 66 males and 134 females (age 20.32 +/- 2.73 years). The subjects were surveyed on side effects, reasons for consuming Adderall, and how they thought it affected their overall nutritional health. The majority of the students who reported taking Adderall believed that it allowed them to study and perform better. The main reason students took the drug was to help them study and concentrate. 65% of students surveyed reported experiencing a loss of appetite while taking the stimulant. Out of those 65% participants, only 13.4% believed that taking Adderall affected their overall nutritional health. All of the students reported that it was easy to obtain Adderall on the University of Kentucky’s campus. This demonstrates that prescription drug stimulants are being abused on college campuses. Students need to be informed of the negative side effects associated with abusing prescription drug stimulants, like Adderall, so that they can become more knowledgeable of how it will affect their overall nutritional health.
84. J. Elizabeth Clark  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

**Nutrition Education and Body Mass Index in College Students**

The obesity epidemic in the United States demands immediate attention. Obesity and weight gain rates are particularly high for young adults and college students, with 36.7% being overweight or obese. If students are better educated on dietary choices, physical activity, and risks of chronic disease, it is likely they will engage in a healthier lifestyle. The relationship between students’ nutrition knowledge and their body mass index (BMI) was investigated in 200 undergraduate students at the University of Kentucky. The participants included 100 Human Nutrition and Dietetics students (age 21.8 ± 4.4 years) and 100 students of other majors (age 20.6 ± 2.7 years). The students completed surveys regarding their current health status, level of nutrition education, nutrition knowledge, and diet and exercise behaviors. The average BMI was 22.8 ± 3.7 kg/m² for Human Nutrition/Dietetics students and 23.5 ± 3.2 kg/m² for students of other majors. Human Nutrition and Dietetics students had completed an average of 5 to 6 more health/nutrition classes than the other students. Students with more nutrition education consumed more vegetables (2-3 servings/day) and engaged in more physical activity (>30 minutes/day for 3-4 days/week) compared to students with little nutrition education (consumed 1-2 servings/day and engaged in >30 minutes for 2-3 days/week). It was found that students with more nutrition education have a healthier BMI, make better dietary choices, and engage in more physical activity. Based on this research, it can be concluded that there is a relationship between nutrition knowledge and BMI in college students. In order to decrease obesity and improve the health of young adults, college students need to be better educated on dietary choices, physical activity, and a healthy lifestyle.

85. Brooke Dailey  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

**Consumption of Caffeinated Beverages and the Effect on BMI**

The incidence of obesity has significantly increased in the past several years with 72.5 million Americans now considered overweight or obese. Poor diet and inactivity contribute to unwanted weight gain. Recent marketing strategies target young adults with modern, flashy ads promoting products such as caffeinated energy drinks. These high calorie, caffeine-containing drinks (energy drinks, sodas, coffee, tea, and chocolate) are popular among teens and college students. For many, these beverages have become an early morning routine to combat fatigue, a pick-me-up to get through the day, or simply a way to stay awake late into the night. The relationship between caffeine consumption and body weight was investigated in 200 undergraduate and graduate students at the University of Kentucky. Participants included 145 females (age 21.2 ± 4.51 years) and 55 males (age 20.3 ± 3.38 years) who completed a survey regarding physical activity as well as frequency, type, and reasons for consuming caffeinated beverages. The average body mass index (BMI) for those that consume caffeinated beverages was
23.45±4.56kg/m² and for non-caffeine consumers was 24.11±3.45kg/m². Those individuals who consume caffeinated beverages on a monthly basis were found to have a lower BMI of 21.59±2.20kg/m² compared to those who consume caffeinated beverages more frequently (BMI 23.16±5.00kg/m²). This research provides evidence that frequent consumption of caffeine-containing drinks may contribute to unwanted weight gain in college students.

86. Brett Dickens, Sara Y. Ngo Tenlep  
Department of Nutrition and Food Science  
Mentor: Kevin Pearson  

The Effects of Endurance Training During Pregnancy on Offspring Health

Childhood obesity rates have reached a staggering 17%, and the goal of the Pearson laboratory is to find novel methods to combat this trend. Previous work has shown that maternal voluntary exercise during pregnancy in mice significantly improved glucose disposal in mature offspring. However, maternal exercise was voluntary so females ran long and variable distances. The goal of this follow-up study was to use a controlled endurance training program prior to and during pregnancy and nursing in order to minimize variation in maternal running distance. The endurance training paradigm required female mice to run 360 m/day as opposed to voluntary exercise when females ran between 1-10 km/day. Based on results from the prior experiment, it was hypothesized that the offspring born to exercised dams will exhibit significantly lower body fat as well as improved glucose disposal compared to the offspring from sedentary dams. For this purpose, twenty C57BL/6 female mice were endurance trained for 2 weeks using individual running wheels on a rotary exercise machine (speed set at 6 m/min for 1 h) before breeding. Twenty mice were treated similarly only without powering the rotary machine as a sedentary control. The exercised dams continued training throughout gestation (19-21 days). Following a 3 day rest period after giving birth, the females were again endurance trained daily until the offspring were weaned at 28 days of age. Body weights of the offspring were significantly decreased in offspring born to exercised dams at 7 days of age. Body weights will be collected weekly, and glucose tolerance and body composition will be measured when the offspring reach adulthood at 8 weeks of age. These studies will provide novel information on the positive impact maternal exercise can have on offspring health, and the shorter controlled running distance should be more physiologically relevant to humans.

87. Jennifer Ernst  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Correlation Between Practicing Yoga and Following a Balanced Diet

Yoga and a well-balanced diet are both known to reduce stress and improve overall quality of life. However, little research is available examining the relationship between practicing yoga and dietary practices. The relationship between a balanced diet and a yoga practice was analyzed in
100 persons living in Lexington, Kentucky. Participants included ten traditional students (average age 21+/- ___ years) and ninety yoga students whom are working professionals (age range 26-84 years; average age 54.5+/- ___ years) and have been practicing yoga for longer than one year. The participants completed surveys regarding their dietary habits, stress level, and frequency of yoga practice. Ninety-three percent of participants regularly practice yoga. Of the subjects who do not practice yoga, 57% of those believe a mind body workout like yoga does decrease stress level. Ninety-six percent of those that take yoga classes do so primarily for relieving stress. It was found that all participants regularly consumed whole grains, dairy, fruits and vegetables. Eighty-nine percent of the participants also consume animal foods and treats. Ninety-two percent of the participants also consume alcoholic beverages several times a week. Participants prefer their yoga practice in a classroom setting with only 12 % reporting a home practice. The average frequency of taking a yoga class was 1-2 times per week. This study found persons who practice yoga report a low to moderate stress level and that eating a balanced diet does improve their physical and mental health. It is not known if the mind body workout influenced the balanced dietary habits or the balanced diet drew the participants to engaging in yoga.

88. Stephanie Fawbush
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

Correlation between Alcohol Consumption and Weight Gain in College Students

As American teenagers make their way to college campuses, many are aware of gaining the dreaded “freshman fifteen.” Along with the gaining of weight in their college years, many students also begin to increase their alcohol intake upon entrance into a university. It becomes commonplace to drink to get drunk on the weekends in college, pumping the body with alcohol and many empty calories.

The relationship between the consumption of alcohol and weight gain was examined in 200 undergraduate students at the University of Kentucky. The participants included 137 females (age 19.99 ± 1.44 years) and 63 males (age 20.87 ± 1.43 years). The participants completed surveys with questions pertaining to alcohol consumption, weight, eating behaviors, and exercise behaviors. Out of the 200 students surveyed 77% of students reported consuming alcohol on a weekly basis, with the average amount of alcohol consumed being about 3-4 drinks per week. The average body mass index (BMI) of college students was increased from high school to college (22.61 ± 3.83 kg/m² and 23.26 ± 3.67 kg/m²). Students who were infrequent drinkers (averaged 2 or less drinks per week) had a BMI increase of 0.63 kg/m² while in college while those who were frequent drinkers (averaged 3 or more drinks per week) had a BMI increase of 0.70 kg/m² while in college. This shows that students who consumed more alcohol were more likely to gain weight while in college. With the increase in obesity in America today, it is important to stay informed on risks of weight gain. Many college students consume alcohol so it is important to inform students of the amount of empty calories that alcohol provides and the benefits of decreasing the amount of alcoholic beverages that one consumes.
89. Jeremy Gilbert  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Correlation of Organic Food and Physical Activity  

In recent years, the United States has seen a significant increase in consumption of organic foods. Organic food intake is greatest in individuals who lead a “healthy” lifestyle, including eating a well-balanced diet, not smoking, consuming alcohol in moderation, and engaging in regular physical activity. The relationship between consumption of organic foods and physical activity was examined in 130 undergraduate students at the University of Kentucky. The participants included 85 males and 45 females. The students completed surveys inquiring about their weight, height, health conditions such as hypertension or diabetes, frequency of physical activity, consumption of organic food, time period of being an organic food consumer, and factors that would exclude them for purchasing and eating organic foods. A large percent of students consumed organic foods on a regular basis. Thirty-two percent of males and twenty-seven percent of females reported being both consumers of organic foods and participating in regular physical activity. As well, it was found that students who consumed organic foods had a lower Body Mass Index, BMI and scored higher on the scale of regular physical activity levels. Because higher consumption of organic foods correlate to lower BMI and higher levels of physical activity, students need to be informed of the potential health benefits that are associated with consuming organic foods and being physically fit.

90. Michael A. Girton  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Effect of Employment on Dietary and Physical Activity Habits  

Attending, and ultimately graduating, college is a life’s dream for many of those currently enrolled in many colleges and universities around the world. While exciting college is also a time of stress and overcoming obstacles. One of these obstacles is paying tuition or expenses associated with college including; books, food, and gas for commuters. More students today, than ever before, are working to pay for their own college education. These students are working at the same time they are taking classes. This adds another dimension to the college experience and makes completing it all the more difficult. Good nutrition and regular physical activity often suffer the more a student works. This is due to the decreased amount of time these students have throughout their normal day because of their strenuous schedule. This study will examine the diet and physical activity habits of full-time students who are also working. The data was collected by distributing surveys to 180 undergraduate students (95 female & 85 male) at the University of Kentucky. The analysis of the data is still in progress. Preliminary results show that working students do not participate in regular physical activity nor do they make as healthy dietary choices as their peers who do not work. This research is important because, as previously stated, there are more students today now than ever working to pay their own college expenses.
These students need to be aware of the importance of good nutrition and regular physical activity. These things will not only help the students’ academic performance but will help with their work performance as well.

91. Maggie Grisanti  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*The Correlation Between Instances of Digestive Problems/Diseases and Ethnicity, Dietary Intake and Stress*

The incidence of digestive disorders, including inflammatory bowel disease, has increased significantly in the United States. Stress from a fast-paced society and poor diet are thought to increase both the risk and severity of intestinal disorders. The relationship of stress, ethnicity, diet, and intestinal disease was investigated through survey research in 200 students at the University of Kentucky. Participants included 30 males and 163 females with an average age of 20.5±3.3 years. Eleven percent of students reported having an intestinal disorder, and 21.5 percent of students reporting having intestinal difficulties. Ethnicity did significantly impact disorder risk with 100% of people who reported having an intestinal disease being white/Caucasian. However, only 90% of people who reported having intestinal difficulties were white/Caucasian. Stress level was measured on scale of 1 to 5, 1 being low stress and 5 being high stress. The average stress level of those with intestinal disease was 3.77±.75, while the average for those without intestinal disease was 3.51±.92(p=0.1). Diet was also measured on a scale of 1 to 5, with 1 being poor diet and 5 being diet of good quality. The average quality of diet of those with an intestinal disease was 3.45±.80 while the average quality of diet for those without intestinal disease was 3.32±.74 (p=0.5). Further research is needed to explore the relationship between stress, diet, ethnicity, and intestinal disorders.

92. Laura Guy  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*The Relationship Between Consumption of Fast Food Meals Late at Night and Obesity on a College Campus*

Obesity is a health concern that has become increasingly prevalent in the United States. Lack of physical activity, decreased energy expenditure, increased energy intake, and genetics are all recognized as contributors to unwanted weight gain. In college students, additional lifestyle factors including increased stress level, lack of sleep, excessive alcohol intake, skipping meals, and frequent consumption of calorie-rich foods, contribute to weight. The relationship between obesity and lifestyle choices was investigated in a survey of 200 undergraduate students at the University of Kentucky. Those surveyed included both males and females ranging in age from 18 – 24 years old. The survey included questions inquiring about the frequency of eating fast
food after 9 pm, where and what they choose to eat, how many hours they generally sleep per night, and questions concerning how alcohol consumption effects these choices. It was found that most students are consuming fast food meals after 9 pm at least once per week. As well, those students who report consuming alcohol have a higher incidence of eating meals after 9 pm. This research is important in developing educational tools targeted at college students to promote a healthy body weight and overall wellness.

93. Michael Haag
Department of Nutrition and food Science
Mentor: Tammy Stephenson

*Are College Students Meeting or Exceeding Their Dietary Needs during a 24-hour Dance Marathon?*

With the ever-increasing pressure college students are put under, their bodies are often the last on a laundry list of items to be completed. Students put their regular sleep patterns and eating habits aside when the pressure hits, especially during times of sleep deprivation, often resorted to the night before a major test or assignment. When looking at the diets of those who forgo normal sleeping patterns to accomplish tasks like staying up through the night, little research has been conducted in this area. The goal of this research project was to analyze the caloric intake and physical activity level of students participating in DanceBlue, a 24-hour dance marathon.

Subjects were asked to complete 7 total surveys; one introductory survey to collect background and anthropometric data and 6 subsequent surveys completed during the marathon, which asked detailed accounts of the caloric intakes of 21 participants. Participants were undergraduate students, 9 males and 12 females, ranging in age from 18 to 22 years. The average Body Mass Index (BMI) of participants was 22.96 +/- 2.88 kg/m², with 76.19% of participants being of normal weight (18.5 – 24.9 BMI). During the 24-hour marathon period, participants completed surveys every four hours, which included a detailed description of the foods consumed from the meal provided, as well as any beverages or snacks which were consumed. Seventy-one percent of participants responded positively when asked if the food choices made during the time were typical for their diet. As well, 43% of participants believed that sleep deprivation affected their food choices during the Dance Marathon. This research provides evidence that many college students change their food intake when sleep deprived. Strategies and educational tools need to be developed to better educate students about making nutrient-dense, healthy food choices, even when tired.
Correlation Between Relationship Status and Body Mass Index Among Students at the University of Kentucky

There are many factors and qualities one looks for when selecting a romantic partner; physical appearance, specifically body type, is recognized as an important trait. The correlation between Body Mass Index (BMI) and relationship status was investigated in 223 students at the University of Kentucky. Participants included 124 males (average age 19.97 ± 1.56 years) and 98 females (average age 19.91 ± 1.91 years) who completed surveys regarding their relationship status, BMI, relationship satisfaction, and self-perception questions. Only 37.7% of the 223 students stated that they were in an exclusive relationship. It was found that the average BMI for students in a relationship was 23.39 ±3.86 kg/m² and the average BMI for students that are single was 24.10 ±4.65 kg/m². It was found that both males and females with a higher BMI were less likely to be in a relationship. The average BMI for males in a relationship was 25.20 ±3.95 kg/m² and the average BMI for single males was 25.46 ±4.88 kg/m². The average BMI for females in a relationship was 21.50 ±2.72 kg/m² and the average BMI for single females was 22.23 ±3.58 kg/m². Relationship satisfaction was ranked on a scale of 1 to 5, 1 being very satisfied and 5 being very unsatisfied. 6% of participants in a relationship had been told by their partner that they needed to gain or lose weight. Their average relationship satisfaction was a 1.2. Their relationship satisfaction was less than the satisfaction of those who had not been told to gain or lose weight, who indicated a relationship satisfaction score of 2.01. On the other hand, 14% of those in a relationship had told their partner that they needed to gain or lose weight, reporting an average relationship satisfaction level of 2. Those who had never told their partner that they needed to gain or lose weight had an average relationship satisfaction of 1.95. Research on the correlation between BMI and Relationship Status is important because it investigates the effect of obesity on self-esteem, and relationship satisfaction. This information could be useful in psychological studies that look at obesity and interpersonal relationships, and factors when choosing a romantic partner.

Tobacco Usage and Body Weight of College Students at the University of Kentucky

College is a high-stress environment for many students, leading to risky habits and behaviors. Indeed, tobacco usage is greatest in young adults between the ages of 18-25 years. Many college students believe smoking helps them to feel more at ease in social settings. Those individuals who smoke are also more likely to engage in other unhealthy lifestyle habits, including making poor dietary choices. The relationship between college students consuming tobacco and body weight was examined in 150 undergraduate students at the University of Kentucky. The average
age of the participants was 21± 1.24 years. The students completed surveys inquiring the frequency of tobacco usage, level of healthy eating, and amount of physical activity. The average body mass index (BMI) of the surveyed was 25.58 ± 1.03 kg/m². Fifteen percent of the surveyed students meet the weight criteria for obesity (BMI > 30 kg/m²). Tobacco usage was greatest in overweight and obese individuals. Thirty-three percent of overweight individuals consumed tobacco while twelve percent of normal weight participants smoke tobacco. It was found that the individuals that consumed tobacco were less likely to engage in regular physical activity as compared to non-smokers. Also, the smokers did not refer to themselves as “very healthy eaters”; the majority insisted that their eating habits were “some what healthy”. Due to tobacco use having a positive correlation to body weight and other unhealthy behaviors, students need to be informed of the “unspoken” side effects of consuming tobacco.

96. Lauren Hodel  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

*Portion Sizes and BMI*

Obesity and other health related issues are on the rise in United States, particularly in the state of Kentucky with obesity rates reaching 32%. Experts believe that the increasing portion sizes that people consume have a direct correlation to the rise in body mass index (BMI). This relationship was investigated in 200 undergraduate students at the University of Kentucky who completed a survey about portion sizes and eating habits. The participants included 121 females (age 22.75±5.63 years) and 79 males (age 22.17±2.58 years). The average BMI for the participants was 23.88±3.12 kg/m². Of the 200 survey participants, 115 of them believed that they did consume portion sizes that were larger than recommended on a regular basis. They ate out on an average of 2.58±1.5 times per day with burger places being the most common location to dine. Sit down restaurants were the second most common location for eating out. This research found no direct correlation between dining out and BMI. There was also no correlation found between an increase in cups of pasta and BMI. For chicken consumption, the largest increase in BMI was found in those who ate a very small amount. This lack of positive correlation could mean that students are unaware of how much they are consuming, or that the students are already consuming appropriate portion sizes for their bodies since they are, as a whole, not overweight. Students need to be more informed on the recommended portion sizes and how to determine how much they have consumed.
97. Jennifer Humkey  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

The Comparison of the Dietary Consumption of College Students Before and After Spring Break

The pressure to have the perfect, slim, and fit body for young adults, especially college students, is higher than ever. This pressure can come from the media, friends, family, or themselves, and tends to become even higher when spring break nears. Spring break for most college students consists of vacation time at the beach with friends. Many college students are concerned about their appearance in front of their peers, which often leads to changes in food intake in the weeks prior to spring break. To assess the effects of spring break on food choices, a survey was distributed to 101 undergraduate students in an introductory nutrition class at the University of Kentucky. Surveys were distributed both before and after spring break. The subjects consisted of 25% males and 75% females with an average age of 20.36 ± 2.76 years. Sixty-nine percent of the subjects had plans for spring break, with the majority (48%) going to the beach, pool, or on a cruise. Of those with plans for spring break, 61% felt pressure or anxiety to lose weight and/or be in shape for spring break. Sixty-four percent of those who felt pressure changed their diet in preparation for spring break. This research shows that college students are changing their diets in an effort to improve physical appearance and leanness before spring break. Further research should explore the safety of such changes in diet to ensure that college students are meeting their nutritional needs.

98. Megan Johnson  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

Correlation Between College Students’ Majors and Vegetarian, Vegan, and Pescetarian Diets

Vegetarian diets have become increasingly popular in the United States during the last century. Approximately 3.2% of U.S. adults follow a strict vegetarian diet while 10% of Americans claim they largely follow the diet. The correlation between college students’ majors and their decision to partake in a meat exclusion diet was examined by surveying 197 University of Kentucky students. Of the students surveyed, 24.4% were studying nutrition, and the sample consisted of 21.3% students in freshman standing, 23.3% in sophomore standing, 21.3% in junior standing, and 34.0% in senior standing. 18.75% of nutrition majors claimed to follow a vegetarian or pescetarian diet while only 5.37% of non-nutrition majors followed a meat-exclusion diet. In addition, all surveyed participants were asked what they viewed as the most compelling argument to follow a vegetarian, vegan, or pescetarian diet. Students in food science majors ranked “health benefits” as a more compelling reason to become a vegetarian than students in non-food science majors. Also, non-food science majors on average ranked “animal rights” as the most important argument, and both groups of students ranked “to lose weight” as a weak
argument. According to this data, vegetarian diets are a more popular choice among students in nutrition majors, and “health benefits” was the strongest reason for choosing a vegetarian diet. Students studying nutrition seem to be more aware of their health and dietary choices while non-food science students were more conscious of animal rights and food conservation issues. Although college students are often criticized for unhealthy dieting to lose weight, the surveyed students knew that vegetarian diets are not a weight loss tool.

99. Jenna Klingenberg
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*The Effect of Family Dinner’s and College Weight Gain and Body Mass Index*

Family dinners have always been thought to be of great importance in a child’s upbringing. They have been shown to positively affect a child’s mental and physical well-being. The nutritional quality of the diet has also been found to be enhanced through regular family meals. Of concern to healthcare professionals is what happens to an adolescent’s weight when they leave home? Most college students live in dormitories on college campuses, apartments, or houses with friends. A striking trend among college students is an average weight gain of .73 pounds per week to 4.2 pounds per every twelve weeks. In order to study the correlation of family dinners and its effect on the weight gain of college students a survey was administered to 187 undergraduate students at the University of Kentucky. The average high school weight was 157.13 ± 45.52 lbs and the average college weight was 162.16 ± 47.91 lbs (p=0.0002). Subjects reported eating 4.49± 1.67 family dinners per week in high school. Students who ate 0-1 family dinners per week gained less weight during college than students who ate 4 or more family dinners per week (2.25 ± .81 lbs vs 5.66 ± 3.32 lbs). This research provides evidence that eating a well-balanced diet in college is more difficult for students who regularly engaged in family dinners in high school. These students may have a more difficult time making nutrient-dense, calorie-controlled, food choices.

100. Stephanie Laganis
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*The Effect on Student Health When Organized Sports played in High School is no Longer Played in College*

Many American children participate in organized youth sports. Youth sports engage students in regular physical activity, promote team-building skills, and improve self-esteem. For children who excel at their sport, training for that sport is often necessary. Choices of what to eat and how to become physically fit can be influenced by different factors such as by a coach, teammate, or the desire to improve within his or herself. In organized sports, the number of participants drops dramatically when students enter college. Many students who ate healthy and trained for sports in high school no longer have those sports to play in college. To evaluate the effects of sports participation on college students, a survey was administered to 253 students at the University of Kentucky. Sixty-eight percent of subjects were female and the average age of the students was
all participants was 20 +/- 1.6 yrs. The participant’s average body mass index (BMI) was significantly lower (p<0.001) in high school (21.934 +/- 4.188 kg/m²) compared to college (22.963 +/- 4.004 kg/m²). Of the 253 participants 80.65% played a sport in high school; only 8% of these high school athletes played a sport in college. High school athletes who no longer play a sport in college need to be aware that a reduction in physical activity from high school and food intake changes often results in unwanted weight gain and other risk factors for chronic disease. These individuals should be encouraged to engage in intramural or club sports to promote optimal health.

101. Tiffany Lawson
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*Correlation between Merchandising, Apparel, and Textiles students and Their Perception of Body Image*

Society is known to have an impact on teenage women in America. Magazines, commercials, and advertisements all show thin, lean models to sell products. The relationship between MAT students at the University of Kentucky and their perception of body image was examined in 100 undergraduate students. The participants included 95 females (age 20.65 +/- 1.42 years) and 5 males (age 20.21 +/- 1.50 years). The students completed surveys inquiring about their opinion on the body image society prefers, their personal body image, and that of models in America. 57% of the participants felt that society’s perception of body image should change and 43% felt that it should stay the same. When given the option to choose a model from three images (underweight model, overweight model, and normal weight model) all of the participants chose the normal weight model. There was a hypothetical situation described in the survey about the body type they would choose for their models, participants had many different reasons for the choice they made. These students also did have some concerns about their body as they get older which could be due to their career goals. Body image and appearance plays a huge role in fashion students and fashion careers. Not all of the students felt that same about the topics but they were all very strongly opinionated. It is true that society makes the rules but from the outcome of this study it looks like not everyone is ready or willing to accept it.

102. Regina Lewis
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*Food Choices: How Nutritional Choice Causes a Difference in Body Mass Index of College Students Living On Campus and Off Campus*

According to recent statistics, over two-thirds of Americans are overweight or obese. More than 142 million Americans suffer from increased levels of weight and body fat, leading to a high body mass index (BMI) and increased risk of chronic diseases. The growing obesity epidemic
hits every age group, including that of college students. In this study, 200 students at the University of Kentucky were administered a survey that asked for self-reported data on height, weight, and intakes of various foods. The BMI of students living on campus (117 students) and off campus (83 students) were recorded and compared. The study included 137 females and 63 males ranging from age 17 to 49 years (average = 19.8 years ± 3.1). It was found that in the past six months, 33% of on-campus students have gained weight, 23% have experienced weight lost, and 48% have maintained the same weight. In contrast, only 14% of off-campus students have gained weight, 20% have lost weight, and 68% have maintained their current weight over the past six months. The average BMI of all students surveyed was 23.26 ± 3.9 kg/m²; BMI’s of on-campus (23.27±3.6 kg/m²) and off-campus students (23.25±4.34 kg/m²) were the same. This research provides support that living on-campus and eating most meals at cafeteria- and quick-serve food establishments can lead to weight gain in college students. The findings of this study can be used to provide educational programs to college students living on campus.

103. Katharine Marx
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

The Effects of Vegetarian Diets on Body Mass Index in College Students

Vegetarian diets have become more prevalent in the United States in recent years, with about 3% Americans currently following a vegetarian diet. In the 1990’s studies have been published identifying the overall health benefits that one could achieve from following a vegetarian diet. Several organizations, including the American Dietetic Association, officially began endorsing vegetarianism and a plant-based diet. The United States government changed the four food group’s concept to the food pyramid which encourages individuals to consume the majority of their food in grains, fruits, vegetables and beans, key components to a vegetarian diet. To determine if following a vegetarian diet contributes to a lower body mass index, (BMI) a measure of health, 200 surveys were distributed to undergraduate students at the University of Kentucky. The participants included 64 males (age 22.71 +/- 5.1 yrs) and 136 females (age 21.68 +/- 4.3 yrs). The students were asked questions about body size, food choices and whether or not they participate in a vegetarian lifestyle. If the student engaged in a vegetarian diet, they were asked to indicate which type and for how long. Twenty out of 200 (5%) students indicated that they participate in a vegetarian diet. Sixty five percent of those follow a semi vegetarian diet, 10% follow a lacto vegetarian diet, 15% follow a lacto ovo vegetarian diet and 10% follow a vegan diet. Those who engage in a vegetarian diet had a lower BMI (non vegetarians: 24.48 +/- 3.3 kg/m², vegan: 20.1 +/- .51, lacto vegetarians: 20.4 +/- .08 kg/m², lacto-ovo: 23.67 +/- 3.3 kg/m² and semi vegetarians: 23.9 +/- 2.45 kg/m²). These findings are consistent with prior research done on the subject. As America moves toward promoting a healthier nation, this information should be made readily accessible so that people are aware of the possible health benefits of following a vegetarian lifestyle.
104. Alisha Moore  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

Caffeine—a Study Measuring Its Use and Memory Retention in a University Setting  

With the evolution of energy drinks, there has been an increase in consumption of caffeine, particularly on college campuses. Students consume caffeine for a wide variety of reasons, including staying up late studying, driving long distances, and to enhance social situations. Many college students believe that consuming caffeine will allow them to stay up all night working on homework or studying for an exam. This research examined the relationship between caffeine intake, study habits, and academic achievement, as measured by grade point average (GPA). A survey was administered to 100 freshmen and 100 seniors at the University of Kentucky. Of these 200 students, 105 were male (average age = 21±2.3 years) and 95 were female (average age = 20±2.0 years). 79.5% of college students consume caffeine daily. Most commonly caffeine is consumed in soft drinks. No statistically significant differences were found in GPA when comparing caffeine consumers to non-consumers. The average cumulative GPA of non-consumers of caffeine was 3.36 ± 0.50, while the average cumulative GPA of caffeine consumers was 3.30 ± 0.44. Students were consuming caffeine from a variety of sources: 14.5% consumed tea, 39.5% consumed coffee, 52.5% consumed energy drinks, 4.5% consumed pills, 57% consumed soft drinks, and 0.1% consumed caffeine in some other form. College students should be better educated on the true effects of caffeine on study habits and academic success, as well as the potential side-effects from caffeine consumption.

105. Harriet Oduro  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

The Effects of Stress on Weight in College Students  

Most college students experience stress, often daily. Stress is frequently caused by a job, school, home responsibilities, and/or relationships. Internal factors that determine how one’s body responds to and deals with the stressful situation includes overall health and fitness level, emotional status, nutritional status, and quality and amount of sleep and rest. The relationship between stress and body weight was examined in 200 undergraduate students at the University of Kentucky. The participants included 114 female students (age 20.46±1.51 years) and 86 male students (age 20.37±1.62 years). The students completed surveys inquiring about their level of stress, what causes them stress, what they do and eat when stressed and body weight changes between freshman and sophomore year. Of those surveyed, 89.5% of females and 93.0% of males showed a change in body weight due to stress. School was shown to be the most often cause of stress among participants (100% of participants). School was shown to cause stress daily and weekly among participants (98.5% of participants). Participants reported consuming more pizza, soda, chips/snack foods and fast food during times of stress (87.5% of participants).
Students also reported eating more during times of stress (52% of participants). Because stress correlates to body weight change it is important to teach students how to better cope with stress.

106. Eric Pettinato  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*The Effects of Physical Activity on Sleep Patterns and Breakfast Consumption of College Students*

Research over the past fifty years has shown the benefits of regular physical activity enhancing physical fitness, reducing stress, and creating an overall sense of well-being. These effects are particularly important to college students, who often experience significant stress and sacrifice health during their time in college. Adequate sleep and breakfast are often neglected in young adults attending college. The relationship between physical activity, sleeping patterns, and breakfast patterns was examined in 205 undergraduate students at the University of Kentucky. The participants included 106 female students and 99 male students. The students completed surveys which inquired into the level of physical activity (on a scale from 1=low to 5=high), frequency of the physical activity; time spent sleeping each night, and frequency of breakfast consumption. High school and college Body Mass Index (BMI) was also calculated to observe how these factors related to current weight status. Data analysis revealed that students’ who are classified as overweight (BMI 25.0-29.9) skip breakfast more often, sleep more hours, engage in lower intensity physical activity, and engage in the physical activity less often than normal weight students (BMI 18.5-24.9). Normal BMI was related to sleeping an average of 7.32 +/- 1.12 hours per night, skipping breakfast an average of 2 days a week, and engaging in physical activity 4 +/- 1.34 days per week. Students who engaged in the most intense workouts slept on average 8 hours a night, and did not skip breakfast throughout the week (3.36 +/- .91 intensity; 3.45 +/- .97 intensity respectively). The results confirm that healthy physical activity levels, along with proper sleeping and breakfast patterns all play a vital role in maintaining the healthy weight of college students.

107. Abby Priddle  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*Physical Activity and GPA*

It is suggested that regular exercise improves both the physical body and enhances the mind. The supposed cognitive benefits of exercise include improved mood, reduced stress, and enhanced memory and brain functioning. Based on these observations, it appears that the implementation of regular physical activity would have a positive effect on students’ academic performances. The relationship between participation in regular physical activity and a student’s GPA was examined in 308 undergraduate students at the University of Kentucky. The
participants included 169 female students (age 19.68 +/- 1.33 years) and 139 male students (age 19.65 +/- 1.55 years). The students completed surveys inquiring about their physical activity level and the type of exercise they most commonly practiced, as well as his or her major, amount of time spent studying, and grade point averages. According to the survey, 66% of females and 80% of males participate in physical activity on 3 or more days per week. Of the females surveyed, those who exercised 0-2 days per week had an average GPA of 3.40 +/- 0.53, while those who exercised 3 or more days per week averaged 3.51 +/- 0.44. Of the males surveyed, those who exercised 0-2 days per week had an average GPA of 3.43 +/- 0.45 and those who exercised 3 or more days per week averaged 3.25 +/- 0.59. While these values appear to suggest that more frequent exercise has a positive effect on the GPA of females, but a negative one on males, neither of the GPA comparisons was statistically significant. There is, however, a statistically significant (p=0.01) difference in GPA for those students who reported themselves as “extremely active” versus those who claimed to be “inactive”, Students who were “extremely active” had an average GPA of 3.24 +/- 0.62 and those who were reportedly “inactive” averaged 3.59 +/- 0.31. The fact that the most active students had significantly lower GPAs than those who were inactive suggests that perhaps the mental benefits of regular exercise are not as substantial as other lifestyle factors, such as time spent studying, on a student’s grades.

108. Rebecca Quinn
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

*Correlation between the Lifestyle and Dietary Habits of College Students and Dental Health*

In recent years, it has been found that more than two-thirds of college students suffer from oral diseases. These diseases not only cause pain and discomfort, but also result in functional problems. In addition, students with dental problems have reported having lower self-image and experience social anxiety. Dental professionals agree that the most common factors for these oral diseases are diet and lifestyle. The relationship between the lifestyle (sleep, stress level, and hygiene practices) and diet of college students and dental health was examined in 200 undergraduate students at the University of Kentucky. The participants included 50 male students (age 20.54 +/- 1.59 years) and 150 female students (age 19.77 +/- 1.4 years). The students completed surveys inquiring about their diet, lifestyle, oral hygiene, and prevalence of any oral diseases during their college years. It was found that 21.5% of participants suffered from dental problems during their college years. Fifty-two percent of participants reported going to bed at least once a week without brushing their teeth. Of this 52%, 26.2% reported dental problems. On the other hand, of the 48% of participants who always brushed their teeth before bed, only 16.7% reported dental problems. In addition, it was found that the prevalence of dental problems increased with the consumption of coffee and alcohol. Also, those participants who reported being extremely stressed were more likely to have dental problems. Because of the prevalence of dental problems and lack of oral hygiene among college students, students need to be informed of the potential dangers associated with their lifestyle and diet in regards to oral health.
April Nicole Scherzer  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*The Effects of Stress Management Techniques on Academic Performance in College Students*

Stress is common, particularly in college students when it comes to juggling school, work and social lives. How college students manage their stress is different from person to person. Common stress management techniques include leisure exercising, aerobic exercising, smoking, drinking, over eating, and under eating. How a college student manages their stress can ultimately affect their academic performance, commonly measured by grade point average (GPA). To evaluate the relationship between academic performance and stress management techniques, a survey was administered to 200 undergraduate students at the University of Kentucky. The participants included 65 males (age 20.907 +/- 1.809 years) and 135 females (age 20.037 +/- 1.975 years). The average Fall 2010 GPA for the 2010 of all the participants was 3.38 +/- 0.53. Nearly 40% of the participants reported using aerobic exercise when stressed, 16.37% reported using leisure activities and 14.71% reported eating more when stressed. It was found that there was a statistically significant negative correlation between participants who smoked cigarettes to relieve stress (Smokers GPA = 3.05 +/- 0.639; Non-smokers GPA = 3.435 +/- 0.367) and GPA. As well, there was a positive correlation between aerobic exercise as a form of stress management and high GPA. Participants who reported an increase in aerobic exercise when stressed had an average GPA of 3.515 +/- 0.42 versus participants who reported a decrease in aerobic exercise when stressed (3.345 +/- 0.549). This research offers further support that how a college student handles their stress does ultimately affect their academic success. College students should be better educated on effective and safe stress management techniques.

Ashley M. Smith  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

*Correlation between Eating Breakfast and Academic Success of College Students*

Breakfast is deemed the most important meal of the day by many experts. Yet, many college students skip breakfast for a variety of factors, including lack of time. Many studies have even shown that there is a direct correlation between eating breakfast and higher academic achievement in primary and secondary school students. However, research at the college level is limited. The purpose of this study was to determine the effects of breakfast consumption on academic performance, as measured by grade point average (GPA) in college students. Surveys were collected from 251 undergraduate students at the University of Kentucky. Subjects included 251 students, 106 males and 145 females. The results that were statistically significant included: (1.) Females (3.28±0.44) had a higher GPA than males (3.10±0.59, p> 0.01495), (2.) Those who ate breakfast (3.30±0.46) had a higher GPA than those who did not (3.06±0.58, p>0.001254), (3.) Those who were very alert (3.53±0.395) had a higher GPA than those who
were alert (3.21±0.502), somewhat alert (3.12±0.514), or not alert (2.90±0.764), (4.) GPA was higher in those who did not (3.30±0.54) have a hard time concentrating versus those who did (3.08±0.49, p>0.001587), (5.) GPA was highest in those who eat breakfast daily (3.40±0.45). However, it was only statistically significant between those who ate breakfast 2-3 times daily versus daily and 5-6 times a week versus daily, and (6.) GPA was higher in those who considered breakfast as the most important meal (3.28±0.44 vs. 3.14±0.58). It is clear from this research that regular consumption of breakfast does impact academic performance at the college level. College students should be better educated on the importance of a well-balanced breakfast.

111. Jentry Stephens  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

A Search for the Most Nutritious and Affordable Food Options Readily Available for University of Kentucky College Students  

The college atmosphere presents a struggle for many students to maintain a healthy weight and lifestyle. As a population in general, college students eat more foods high in calories, saturated fats and sugars than they did before coming to college. The goal of this study was (1.) to review if college diets are simply a reflection of the meal options available near campus and (2.) to provide an informative food selection guide for college students. An in-depth search of the restaurants surrounding the University of Kentucky’s campus was conducted to find the most nutritious and financially savvy meal at each locale. Seventeen restaurants surrounding the University of Kentucky’s campus were evaluated in this search. Seven of the seventeen popular restaurants did not have any published nutritional information. Most restaurants with nutrition information posted this information at their website, and had it available in the establishment. This study found that there are few nutrient-dense, low-calorie, low-sugar, and low-fat choices available. The healthiest meals available were evaluated, and among these, the average meal still contained over 500 calories and 22 grams of fat, with less than 6 grams of fiber (recommended daily intake—2,000 calories, 55 grams of fat, and 25 grams of fiber. This research offers support for the need for college-town restaurants to post nutrition information to allow college students the opportunity to make informed, healthy, selections to promote weight control and overall quality of life.

112. Tracey Thackston  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson  

The Effects of Sports Involvement on GPA in High School Students  

Over the last three decades, the prevalence of overweight in adolescents has quadrupled from 4 percent in 1971-74 to 17 percent in 2003-06. Schools can play a critical role in increasing
physical activity by offering quality, daily physical education. The relationships between levels of physical activity, involvement in organized sports teams, and participation in extra-curricular activities and GPAs was examined in 110 high school students ranging in age from 14-18 years old. The subjects were surveyed on how many days a week they are active and any extra-curricular/organized sports in which they participate. Fifty-nine percent of the surveyed students reported they were receiving the recommended 3 or more days of exercise. Also, the students reported their average activity level as 3.41 (on a scale from 0-5) with 78% of the students reporting a level of 3 or above (moderate-extremely active). Of those students who reported being moderately-extremely active, the average GPA was 3.22. Average GPA for those reporting an activity level from none-moderate was 2.8. The average GPAs of students participating in extra-curricular activities and not participating in extra-curricular activities was 2.99 and 3.22, respectively. Finally, the average GPA of students who reported being involved in an organized sports team and those who reported not being involved with a sports team was 3.23 and 3.32, respectively. Though this data shows that students who are active more days of the week on a moderate-extremely active level generally have higher GPAs, there seems to be no correlation between sports/extra-curricular involvement and a higher GPA. Thus, investing in quality physical education in all schools for all grades, especially grades 9-12, is a logical and important step toward improving the health and well-being of the next generation.

113. Justin West
Department of Nutrition and Food Science
Mentor: Tammy Stephenson

Microbial Resistance: A Snapshot of University of Kentucky Student Hygiene and Antibiotic Usage

Microbial resistance is an increasing issue within and throughout the world. Since the advent of antibiotics more and more populations of microorganisms are becoming resistant to them. The aim of this study was to determine if college students are increasing microbial resistance, or if they are conducting safe practices to pass on to future generations. Anonymous health surveys were handed out to (90) students at the University of Kentucky. The average age of the students who participated was 22. The average year in school, or class, was senior. Most participants were female and of these, most had fairly normal hand washing and hand sanitizer practices. The main goal of the research conducted in this study was to determine how many college students finish their course of antibiotics and whether or not their infection returned. It was found that of those who finished their antibiotic course, 83% had no return of infection. Of those who quit their antibiotic course early, 40% did have their infection return. While these results are intriguing, this research of course gives no rise to causality. Survey research does however notice trends, and in this case those who finished their course of antibiotics had a much lower probability of infection resurgence. There are limitations to this type of research. In many cases, patients have viral infections and not bacterial infections. Antibiotics are incapable of affecting viruses, as they do not have cell walls. Also, with survey research, there is the possibility that people are untruthful. Inaccurate responses can lead to skewed results with incorrect interpretations.
114. Jana Leigh White  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

**Caffeine Intake in College Students**

Finding efficient ways to stay awake, alert and focused are of major concern to college students, particularly those students also working part- to full-time. Research has shown caffeine to confer physiological effects that may maximize study and work habits. The relationship between number of job hours worked and caffeine consumption habits was investigated among 200 full-time (12+ current credit hours) college students at the University of Kentucky. Subjects included 102 males and 98 females ranging from 18 to 40 years of age (average 19.9 ± 2.2 years.) Ninety-five of the 200 students (47.5%) were employed at the time of investigation, with weekly work hours ranging from 2-40 (average: 16 ± 7.7) hours per week. Participants were selected at random and were administered an anonymous survey. Those students who worked 10-20 hours per week consumed caffeine on more days per week (average: 4.38 days/wk) than did those who were unemployed, worked <10 hours per week, or worked 20-40 hours per week (averages: 4.18, 4.11, and 4.26 days/wk respectively). Over 1/3 of employed males (34.8%) and 40.8% of employed females (37.9% of all employed subjects) reported consuming more caffeine on days that they work the longest hours. Over half (55%) of all subjects reported feeling more alert on days that caffeine is consumed than on days that it is not (48% and 62.2% of males and females respectively). The most common sources of caffeine were caffeinated sodas among males and coffee/tea among females (66.7% and 81.6% respectively). Over half (67.5%) of participants indicated that they experienced no side effects from caffeine consumption. Of those who did experience side-effects, over one third (36.3%) reported experiencing trouble sleeping. Overall, findings of this study reveal that the weight of one’s weekly load may not independently have a major impact on their caffeine consumption habits.

115. Natalie Wipperman  
Department of Nutrition and Food Science  
Mentor: Tammy Stephenson

**Alcohol Consumption and How it Compares with Fruit and Vegetable Intake in College Students**

Despite the benefits of eating adequate fruits and vegetables, only 25% of 18-25 year old students consume 5 or more servings of fruits and vegetables per day. Low intake of fruits and vegetables appears to be related to high-risk behaviors, specifically alcohol consumption. Reports show that only 11% of frequent alcohol bingers in college consume the recommended 3 servings of fruits and vegetables per day. To determine the relationship between alcohol intake and consumption of fruits and vegetables on the University of Kentucky campus, a survey was distributed to approximately 200 undergraduate students. Of the 200 surveys collected, 81 were males with ages ranging from 18-26 years (average 20.54 ± 2.19 years) and 119 were females with ages ranging from 18-39 years (average 20.69 ± 2.88 years). The students surveyed were
asked about their alcohol consumption, frequency, and type, as well as, if they eat fruits and vegetables, how many servings they consume daily and the main factor effecting their consumption. Ninety percent of males and 88% of females reported they have consumed alcohol since attending college. The average Body Mass Index (BMI) for those that drink alcohol was greater than those who do not drink alcohol (23.35 ± 4.102 kg/m² versus 24.05± 5.34 kg/m²).

Fruit and vegetable consumption was high in this group of college students; 79% reported eating fruits and 84% reported eating vegetables on a daily basis. Those who drink alcohol ate almost 3 servings of both fruits and vegetables per day, (Fruits: 2.56 ± .869 svg/day and Vegetables: 2.49 ± .922 svg/day). In comparison, fruit and vegetable intake was only 1 serving per day (Fruits: 2.181 ± .907 svg/day and Vegetables: 2.3 ± .978 svg/day) in those participants who did not consume alcohol. The results of this research warrant further examination to explore why those who do not drink alcohol are consuming so few daily servings of fruits and vegetables.

Physics and Astronomy

Department of Physics and Astronomy
Mentor: Chris Crawford

Calibration of CsI Detectors for the NPDG Experiment

The NPDGamma experiment at Oak Ridge National Lab will measure the asymmetry in gamma production in the reaction: neutron + proton -> deuteron + gamma. The parity violating component of this reaction is measured from the correlation of neutron spin and γ momentum. In order to detect this asymmetry, 48 cesium iodide scintillators are arranged in a cylinder around a liquid parahydrogen target in a beam of polarized neutrons. The detector efficiency was calibrated using a rotating Cs¹³⁷ source of known intensity. The output voltage output as a function of the rotation angle was fit using a Fourier series expansion plus a linear background term. The amplitude was the ratio of signal to energy deposited in V/MeV/s, essentially an efficiency for each detector. The calibration procedure will be presented, as well as the complete data analysis. Supported by NSF under grant PHY-0855584.

117. T.J. Flynn, Patrick Hunley
Department of Physics and Astronomy
Mentor: Doug Strachan

Fabrication and Electrical Measurement of Graphene Nanoribbons

Monatomic layers of graphite, known as graphene, are of peak interest in the field of condensed matter physics as well as many promising engineering applications. Graphene is a novel material, known to possess many outstanding properties including some impressive electrical attributes which make it an ideal material to supersede silicon in a variety of future technologies.
Our project involves measuring some of the many electrical characteristics of graphene - band gap, conductivity, carrier mobility - by fabricating long strips of graphene, called nanoribbons, and physically testing them. The properties of these nanoribbons are highly dependent on the fabrication process and the resulting edge structure symmetry. Our fabrication process involves mechanically exfoliating highly-ordered pyrolytic graphite films onto an Si/SiO₂ substrate and etching nanoribbons via catalytic hydrogenation using a chemical vapor deposition chamber. These samples are then analyzed for points of interest using a scanning electron microscope and an atomic force microscope. Using electron beam lithography followed by the evaporation of gold, electrical contacts are affixed to the graphene nanoribbons from which electrical measurements are taken.

Physiology

118. Allie Jarrells, Premi Shekar, Mihail Mitov, Leonardo Ferreira, Mark Bonnell
Department of Physiology
Mentor: Ken Campbell

Measurements of Power Output in Human Myocardium

Myocardial power output is an important determinant of ventricular function but few measurements of this parameter have been made using human tissue samples. Our group has been measuring force-velocity curves, and thus power output, in left ventricular samples obtained from patients undergoing cardiac surgery at the University of Kentucky. Multicellular preparations are prepared from previously-frozen tissue samples by mechanical homogenization and chemical permeabilization. They are then connected between a force transducer and a motor and maximally activated in a saturating [Ca²⁺] solution. Once force has reached steady-state, the samples are allowed to shorten against pre-set loads imposed using SLControl software. One of the goals of our ongoing study is to determine whether maximal power output in isolated left ventricular samples improves after patients are fitted with left ventricular assist devices. Our study will, to our knowledge, be the first to measure force-velocity and power output in preparations isolated from these patients.

119. Katelyn McNamara, Renee Donahue, Amanda Lisembee
Department of Physiology
Mentors: Jonathan Lifshitz and Bradley Taylor

Diffuse Traumatic Brain Injury Exacerbates Inflammatory Pain

The prevalence of traumatic brain injury (TBI) in the United States exceeds 1.5 million annually. The majority of TBIs involve diffuse mild to moderate brain injuries resulting from falls, motor vehicle accidents, and contact sport. TBI reduces quality of life as cognitive, emotional and sensory deficits manifest. Similar abnormal or adverse behavioral responses can be elicited in a rat model of diffuse mild to moderate TBI (McNamara, 2010). According to a review conducted...
by Nampiaparampil et al, chronic pain often accompanies TBI (Nampiaparampil, 2008). The purpose of the present study was to test the hypothesis that experimental brain injury increases behavioral signs of pain associated with cutaneous inflammation. Moderate fluid percussion injury (FPI) (1.9 atm), mild FPI (1.0 atm) or sham brain injured rats were evaluated bi-weekly for thermal hypersensitivity using cool (evaporative acetone applied to hind paw) and warm stimuli (Hargreaves’ paw withdrawal test) over a 10-week time course. At the 10th week, 0.5% carrageenan was injected intraplantar into the left hind paw to produce inflammatory pain. Withdrawal responses to cool and heat were tested one-three hours post-injection. To assess spontaneous pain at 2-3 hours post-injection, we recorded the duration of paw withdrawal in the absence of stimulation over 3 min. The results indicate that neither mild nor moderate brain injury changed thermal responses over the 10 week observation period. After the induction of inflammation, sham and TBI increased heat hypersensitivity to the same extent. Furthermore, both mild and moderate TBI dramatically increased behavioral signs of spontaneous pain at 1, 2 and 3 hours post-carrageenan. These results indicate that TBI does not change the sensitivity of tactile and thermal somatosensory pathways, but does increase the spontaneous pain associated with inflammation. Future histological investigation will determine the effects of brain injury on ascending and descending pain pathways.

120. Parvathi Nataraj, Jennifer Smith, Christie McBride
Department of Physiology
Mentor: Brian Delisle

Pharmacological Correction of Trafficking Deficient hERG Mutations Linked to Long QT Syndrome does not Require Protein Synthesis

Type 2 Long QT (LQT2) syndrome is an arrhythmogenic disorder caused by mutations in the human Ether-a-go-go Related Gene (hERG). This gene encodes the cardiac K+ channel Kv11.1. While most LQT2 missense mutations disrupt trafficking, the majority of these can be corrected by culturing cells in drugs that bind hERG (pharmacological correction). The hypothesis that pharmacological correction requires the synthesis of new proteins was tested using HEK293 cells stably expressing G601S-hERG missense mutations (trafficking mutations linked to LQT2). Western blot analysis was used to determine whether the corrected proteins were pre-existing or newly synthesized. Misfolded proteins are not transported to the Golgi for complex glycosylation, and thus show up as one band on a Western blot. If a pharmacological agent corrects the misfolding, the protein will proceed to the Golgi where complex glycosylation occurs, making the protein heavier. This heavier protein appears as the upper, heavier band on the Western blot. If a pharmacological agent corrects the misfolding, the protein will proceed to the Golgi where complex glycosylation occurs, making the protein heavier. This heavier protein appears as the upper, heavier band on the Western blot. If a pharmacological agent corrects the misfolding, the protein will proceed to the Golgi where complex glycosylation occurs, making the protein heavier.

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pharmacological correction. The data suggests that E-4031 corrects existing G601S-hERG missense mutations. Thus, it can be concluded that pharmacological correction does not require the synthesis of new proteins.

121. Justin Penny, Michail Mitov, Premi Shekar
Department of Physiology
Mentor: Kenneth Campbell

Myosin Heavy Chain Gel Electrophoresis

Myosin Heavy Chain (MHC) gels are made over a span of about a week. This process includes preparation of gels, isolation of muscle tissue sample, running of the gels, staining of the gels and visualization and quantification of myosin bands. The alpha and beta myosin protein bands are the particular bands of interest in this set of electrophoresis. It is believed that the ratio of alpha myosin to beta myosin has a physiological effect on the tissue. Quantification of this data can link structural integrity of tissue to function of the tissue.

122. Zaheen Rabbani, Elaine W. Patterson, Anne S. Wilson, Laura A. A. Gilliam, Jennifer S. Moylan, Jeffrey D. Smith
Department of Physiology
Mentor: Michael Reid

Catabolic Response of C2C12 Myotubes Following Doxorubicin Exposure

Doxorubicin, a commonly prescribed chemotherapeutic agent, causes skeletal muscle wasting in cancer patients undergoing chemotherapy. Doxorubicin increases oxidants and decreases skeletal muscle mass in vivo. The purpose of this study was to investigate the cellular response of doxorubicin in vitro. We hypothesized that doxorubicin causes a catabolic response in C2C12 myotubes, increasing ROS and promoting atrophy. Cultured myotubes were exposed to doxorubicin (0.2 µM, 2-48 hrs). Cytosolic oxidant activity was measured using the redox sensitive probe dichlorofluorescin. We used real time PCR and Western blot to measure mRNA and protein for ubiquitin ligases MAFbx/atrogen-1 and MuRF1, the caspase-3 protease, and myofibrillar proteins actin and myosin. Oxidant activity was elevated 13 ± 9 % (2 hrs, n=18, p<0.05). Following doxorubicin (48 hrs) actin (-49 ± 4 %, n=3, p<0.01) and myosin (-40 ± 9 %, n=11, p<0.05) proteins were decreased. Doxorubicin increased MAFbx/atrogen-1 mRNA 16 and 24 hrs (74 ± 8 %, n=3, p<0.01; 132 ± 8 %, n=3, p<0.01) following exposure, and elevated protein at 24 hrs (15 ± 4 %, n=13, p<0.05). Doxorubicin did not alter MuRF1 mRNA or protein (data not shown). Caspase-3 precursor and active form were elevated 6 hrs (precursor: 25 ± 7 %, n=3, p<0.05; active: 125 ± 35 %, n=3) and 24 hrs (precursor: 36 ± 6, n=3, p<0.01; active: 87 ± 12 %, n=3, p<0.01) following doxorubicin. Our data suggest that doxorubicin increases oxidants, leading to downstream catabolic signaling.
What Can Anthropoid Premaxillary Morphology Tell Us About Diet?

The only living group of primates known to be adapted for sclerocarp foraging are members of the new world monkey subfamily Pitheciinae. Sclerocarp foraging is a dietary adaptation where taxa preferentially exploit unripened fruit to obtain the nutritious high calorie fruit seed by using the canine dentition to mechanically fracture the hardened outer covering. Fruit is the preferred resource for many primates, although taxa differ considerably in their preferred fallback resources (Deane, 2007; 2009). When ripe fruit is not available, many primates will increase their reliance on foliviory, while others increasingly rely on less preferred, harder fruits and nuts and use their teeth as tools to break the thick outer coverings. Incisors play an important role in “pre-processing food items prior to mastication” (Deane, 2007; 2009). Frugivores use their incisors to extract pulp from fruit sclerocarps, whereas folivores primarily use their incisors to grip and tear leafy vegetation (Deane, 2007; 2009). Although Pitheciin incisor crown morphological correlates with sclerocarp foraging have been well established (Deane, 2007; 2009; in press), a similar treatment of the premaxillary morphology for this group is presently lacking. In this study, we analyzed Pitheciin craniodental measurements to establish a functional model of Pitheciin premaxillary morphology for comparison with non-Pitheciin new world monkeys, old world monkeys, apes and fossil primates. In particular, the results of this study will provide the comparative baseline for future analyses of the congeneric status of the fossil apes Afropithecus turkanensis and Morotopithecus bishopi. The objective of the study was to establish the functional morphotype of the sclerocarp foraging premaxilla in an effort to provide a comparative and functional model for future analyses of the congeneric status and dietary adaptations of A. turkanensis and M. bishop.

Most Long QT-linked Mutations at Conserved K⁺ Channels Residues Traffic

The human Ether-a-go-go Related Gene (hERG) codes for a cardiac K⁺ channel (Kv11.1) which regulates the repolarization phase of the cardiac action potential. Normal hERG K⁺ channels are made in the Endoplasmic Reticulum and are transported through the Golgi apparatus to the cell surface membrane where they function. Mutations within hERG are linked to Long QT Syndrome Type-2 (LQT2) which increases the risk for arrhythmias. About 90% of LQT2-linked hERG missense mutations generate Kv11.1 proteins that are retained in the Endoplasmic Reticulum (ER). Western blot analyses of cells expressing normal Kv11.1 shows two distinct Kv11.1 protein bands, one that corresponds to the Kv11.1 in the ER (135kDa) and the other corresponds to Kv11.1 that is terminally glycosylated in the Golgi apparatus (~155kDa). Western
blot analyses of “trafficking-deficient” LQT2 mutations show only a single protein band at 135kDa. I tested the hypothesis that several LQT2-linked missense mutations at amino acid residues that are highly conserved among different voltage-gated K+ channel families are trafficking-deficient. I generated the LQT2-linked mutations D460Y, D501H, R531Q, R531W, and R534L using site-directed mutagenesis; expressed these mutations in Human Embryonic Kidney cells; and examined their MW using Western blot analyses. The results demonstrated that all of these mutations (except R534L) showed the 135kDa and 155kDa similar to cells normal Kv11. This implies that most LQT2 missense mutations at highly conserved residues are not required for normal trafficking and may cause LQT2 by a different mechanism(s).

125. Natalie N. Snider, Mary L. Garcia-Cazarin
Department of Physiology
Mentor: Francisco Andrade

Rat Extraocular Muscles Use Lactate as Mitochondrial Substrate

Extraocular muscles (EOMs) have unique adaptations to match the demands imposed by constant activity. We previously showed that lactate is a potential energy source in EOMs, not metabolic waste. Here, we tested the hypothesis that EOM mitochondria can use lactate. We isolated mitochondria from EOMs of adult male Sprague Dawley rats to measure respiration (O₂ consumption) by polarography. State 2 respiration started with glutamate/malate, lactate/malate or lactate/malate plus NAD⁺. ADP initiated state 3 respiration. Oligomycin, an ATP synthase inhibitor, was used to estimate state 4. Uncoupled respiration, state 5, was determined by adding carbonyl cyanide-p-trifluoromethoxyphenylhydrazone (FCCP). A respiratory control ratio (state 3/state 4) ≥4 was evidence of viable mitochondria. We determined lactate dehydrogenase (LDH) content by western blot. Mitochondrial O₂ consumption with lactate/malate or lactate/malate/NAD⁺ was not significantly different when compared to glutamate/malate for states 2, 4 and 5. However, state 3 was significantly higher in mitochondria where glutamate/malate was used to initiate state 2 when compared to lactate/malate (p=0.004) and lactate/malate plus NAD⁺ (p=0.009). We conclude that rat EOMs can use lactate as a metabolic substrate. In addition, we found that LDH is present in EOM mitochondria, likely responsible for oxidation of lactate to pyruvate. Supported by R01 EY012998 to FHA

126. Greg R. Todd, Timothy J. Bradshaw
Department of Physiology
Mentor: Jeffrey Osborn

Hypothalamic AT₁ Receptor Expression Significantly Lower in SHRxBN Rats Raised on High Sodium Diet (4.0%)

Angiotensin II and salt intake play substantial roles in the regulation of arterial pressure, and are therefore major targets for the investigation and treatment of hypertension. This study examined the relationship between long-term high sodium chloride (NaCl) intake and the density of angiotensin type 1 receptor (AT1r) in hypothalamic, forebrain, and renal tissues from a unique
model of hypertension. A hypertensive female Spontaneously Hypertensive rat (SHR) and a
normotensive Brown Norway male (BN) were crossed. Hypertensive F1 offspring were sib/sib
crossed, yielding hypertensive experimental offspring. From weaning, experimental rats were
raised on either a normal (0.8%; NS) or high (4%; HS) NaCl diet. Previous studies show that HS
rats have a greater salt appetite, averaging 3.46 ± 0.899 mmol NaCl/day, compared to 1.54 ±
0.856 mmol NaCl/day ingested by NS rats. Using antibodies specific for At1r (Santa-Cruz;
Primary 1:200; Secondary 1:2,000), western blot analysis indicates that hypothalamic AT1
receptor density is significantly reduced in HS rats. These data suggest that F1 sib/sib rats raised
on HS have decreased ability to regulate their sodium balance, due in part to decreased
expression of hypothalamic AT1 receptors. To further elucidate the actions of AT1r in this
model of hypertension, future studies will examine the density of AT1r in forebrain and renal
tissues. This study will determine the relationship between elevated lifetime sodium chloride
intake and AT1r, which will further explore the impaired handling of sodium chloride in HS rats.

127. Chris Yun, Xiao Li Peng, Kathleen Franklin, Marilyn Duncan
Department of Physiology
Mentor: Sandra Legan

Do Wheel Induced Luteinizing Hormone (LH) Surges in Proestrous Syrian
Hamsters Depend on Running Activity?

In rodents, the preovulatory Luteinizing Hormone (LH) surge is timed by a circadian neural
signal from the hypothalamic suprachiasmatic nucleus (SCN). This signal is entrained by
photoperiod and occurs from zeitgeber time (ZT) 5-7 (ZT 12 = lights off) (Legan et al., 2009).
Exposure of female Syrian hamsters to a novel wheel, room, cage and constant darkness (DD) at
ZT 5 on proestrus delays the LH surge one day and phase advances it ~3 h (Legan et al., 2010).
Therefore, to test the hypothesis that wheel-induced delay of the LH surge depends on amount
of running, activity rhythms and estrous cyclicity were monitored in female hamsters housed under
a 14L:10D photoperiod. After 3 consecutive 4-day estrous cycles, each hamster was fitted with a
jugular cannula on diestrus 2 and was exposed to a novel wheel and constant darkness at the
beginning of ZT 5 on proestrus. Half of the hamsters received either a freely spinning wheel
(control), or the wheel was blocked from ZT 5 to ZT 9. Blood samples were obtained at ZT 5
and hourly thereafter until ZT 11 for 2 days. In 8/8 controls and 6/9 blocked wheel animals, the
LH surge was delayed by 1 day and was phase advanced by ~2 h. The circadian activity rhythm
was similarly phase advanced in all groups regardless of when the LH surge occurred (2.18 ±
0.39 h, n=9 controls; 1.34 ± 0.76 h, n=3, blocked day 1 surge; 1.39 ± 0.27 h, n=6, blocked day 2
surge, P=0.28). In conclusion, wheel-induced delay of the LH surge and phase advance in both
the LH surge and the circadian activity rhythm do not depend on the amount of running, i.e., are
independent of exercise. It remains to be determined whether increased arousal or some related
parameter causes these phase advances.
Plant and Soil Sciences

128. Alysha Lewis, H. Fukushige
Department of Plant and Soil Sciences
Mentor: David Hildebrand

Developing Renewable Lubricants

A very important component of our nation’s economic sustainability is the development of renewable supplies of our energy and material needs including motor oils. Petroleum demands are exhausting supplies and more of our nation’s oil must be imported. Moreover, petroleum base lubricants cause pollution when leaked, spilled, or improperly disposed. Innovative techniques show that plant oils can be genetically improved to function as renewable lubricants including engine motor oils. The overall goal of this project is to engineer plants to convert double bonds of unsaturated fatty acids that accumulate in seed oils into cyclopropyl groups and selectively transfer the moieties from membrane lipids to seed oil triacylglyceride (TAG). We are using cyclopropyl groups because they tend to have the needed low temperature fluidity and lubricity, as well as high oxidative stabilities needed for use in internal combustion engines. This process should produce a performance enhancing motor oil with high oxidative stability and good flow properties over a wide range of temperatures. An E. coli cyclopropyl fatty acid synthase (CFS) has been cloned and expressed in soybeans. The fatty acid composition of the second generation of seeds has been analyzed by GC and GC-MS. Results show soybean oil with more than 10% cyclopropyl fatty acids has been produced. In addition, we have cloned a plant CFS gene and tested in Nicotiana tabacum leaves and detected the activity. This is an important 1st step for development of a renewable motor oil with high oxidative stability and good flow properties over a wide range of temperatures.

129. Matthew Woodson, Tasios Karathanasis, Paul Bertsch
Department of Plant and Soil Sciences
Mentor: Nadine Kabengi

The Fate and Transport of Manufactured Silver Nanoparticles into Terrestrial Ecosystems: the Influence of the Mobile Colloidal Fraction

Silver nanoparticles (Ag-np) are increasingly being used in a wide variety of consumer products and can potentially enter the environment. Recent studies have delineated the application of biosolids from wastewater treatment plants to be the main pathway of Ag-np entry into terrestrial ecosystems, as it has been shown that biosolids retain between 80 and 99% of Ag-np. Water dispersible clays (WDC) are an indicator of leaching and runoff risk of soil colloids by water and can facilitate the transport of Ag-np from terrestrial to aquatic ecosystems. Therefore, the objectives of this study are to 1) examine the potential for Ag-np surface runoff through the WDC fraction collected from soils amended with Ag-BS, 2) evaluate the effect of wetting and drying (W/D) driven biogeochemical transformations on Ag-np movement and 3) compare the behavior of Ag-np as a function of particle size as referenced against aqueous Ag+.

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biosolids obtained from a wastewater treatment plant in Lexington, KY were spiked with 10 nm and 30-50 nm poly(\(\text{N}-\text{vinyl-2-pyrrolidone}\)) coated Ag-nps and aqueous AgNO\(_3\). These treatments underwent anaerobic incubation before being applied to soils with differing physiochemical characteristics. WDC fractions were collected and along with initial and residual soils were analyzed for Ag, carbon (total and dissolved), Nitrogen and Sulfur. WDC were characterized by X-ray diffraction, scanning and transmission electron microscopy. A differential centrifugation and ultrafiltration fractionation scheme was applied to WDC samples to determine the Ag-np distribution and associations within each size fraction. Preliminary results demonstrated that WDC fractions obtained are enriched with Ag for all treatments but there were no differences between Ag-np and aqueous ion. Amending soils with Ag-BS increases WDC Ag concentration as compared to soils directly spiked with Ag np. W/D cycles decreases the Ag concentration recovered in WDC. To explain these data, continuing work includes investigating the Ag-np transformations that may have occurred such as dissolution, reprecipitation, and redox phase changes. These results indicate a facilitated transport of Ag-np with the colloidal fraction and hence increased Ag-np mobility in terrestrial ecosystem.

130. Oksana I. Zhurbich, W. Aaron Shoults-Wilson, Paul M. Bertsch, Jason M. Unrine
Department of Plant and Soil Science
Mentor: Jason Unrine

*Behavioral Toxicity of Silver Nanoparticles in the Earthworm (EISENIA FETIDA)*

In recent years, silver nanoparticles (AgNPs) have become more common in consumer products and they may enter terrestrial ecosystems. Earthworms are an essential part of terrestrial ecosystems as they contribute to decomposing organic matter, altering soil structure and influencing nutrient dynamics. To observe the ecological impacts that these particles may have, we designed and carried out studies which specifically explored the behavioral avoidance of different particle sizes and surface coatings in earthworms (Eisenia fetida). The experiments we carried out were 48 hour behavioral studies which are rapid and ecologically relevant. The earthworms were exposed to three types of Ag in two types of soil. Polyvinyl pyrrolidone (PVP) coated AgNPs in two different sizes (10 nm and 30-50 nm) and oleic acid coated AgNPs in one size (30-50 nm). We compared these responses to the free Ag ion (AgNO\(_3\)). We compared two types of soil: natural sandy loam soil and artificial soil. The artificial soil was composed of 70% sand, 20% kaolin clay, 10% peat moss, and 0.115% of limestone. For the sandy loam soil, the results showed that there was an initial avoidance at a concentration of 9ppm for the Ag ions, but not for the AgNPs. After 48 hours (final avoidance), the earthworms avoided the Ag ions and the AgNPs. Initial avoidance was observed for both of the NPs and the Ag ions. There was no significant initial avoidance for the Ag ions or the AgNPs but there was final avoidance for the Ag ions in the artificial soil. In future studies, we will determine whether the pH is the reason why initial avoidance of Ag ions was observed in the sandy loam and not in the artificial soil and neither initial nor final avoidance was observed for AgNPs.
Political Science

131. Maria Bane
Department of Political Science
Mentor: Bryan Coutain

_The Subjugation of Women as a Tragedy of the Commons_

This study attempted to view the issues women face in the workplace, such as inequality of wages and fewer employment opportunities, through a political science lens. More specifically, the author drew on her knowledge of political economy, that is, the reciprocal relationship between wealth and power, and established implications about modern day society and possible solutions. Put simply, the obstacles faced by women in the workplace lead to a decrease in their economic stability and well-being, which may have translated into an explanation for the lack of powerful female political figures. Theoretically, this perpetuated the subjugation of women by decreasing the entire gender’s share of power. After a brief overview of women’s historical role as laborers in the United States, the author discussed the Feminist movement and its evolution to present day. Then, the issue of gender inequality in the workplace was presented as a Tragedy of the Commons in which women supplied the public good: childcare. Put basically, a Tragedy of the Commons situation arose when the actions of rational, self-interested individuals depleted a shared resource, although it was not in anybody’s best interest to do so. This study treated childcare as a shared resource that was primarily provided by women. The study then drew parallels between uncompensated childcare and economic inequality across genders, ultimately analyzing political outcomes. The research also pointed toward a gaping hole in preexisting political science literature, a field predominantly of white, male scholars. Thus, in an effort to address societal flaws, this project took a step toward analyzing gender inequality from a less common perspective.

132. Jared Flanery
Department of Political Science
Mentor: Ernest Yanarella

_Soft Landing for Coal_

Within the current political climate, Kentucky’s use of coal stands as both the center of the productive economy and at the margins of political discourse. Despite the poverty of the state, global climate change, and mounting research on the detrimental effects of the resource’s life cycle, our political leaders maintain the contours of both the extractive economy and its rhetoric. The people of Kentucky need to consider seriously the future of the state amid veritable threats. Dr. Yanarella and I sought to kindle consideration through the design and development of an alternate reality game called Soft Landing for Coal. Through our research of the relevant literature we found that alternate reality games seek to utilize social media and the internet as the space for a well-developed game. Participants “play” the game by completing creatively crafted
tasks that ultimately reveal a coherent narrative, and sometimes conclude with the input and collective discretion of the players. As such, in Soft Landing for Coal we are creating a narrative surrounding the policy decisions of a near-future governor. Online participants will follow the governor and her aide through a labyrinth of information on coal extraction and use in Kentucky, including the inevitable social consequences. Throughout the journey participants undergo a transformative play directed towards a concrete end goal, the adjudication of a “peak coal” post-extractive economy. We hope that through the inter-textual imagination of players and the structured guide of the alternate reality narrative, participants and observers will begin to appreciate and create the so-called Soft Landing for Coal.

133. Samuel R. Flynn
Department of Political Science
Mentor: Dennis Voss

*Oil, Diamonds, and Greed: A Story of Sub-Saharan Civil War*

This project was begun with the intention of enhancing the existing knowledge on the topic of African civil wars. Having great implications for future regional and world politics, research on the cause or causes of civil conflicts in Sub-Saharan Africa is vital to the study of political science. Prior scholarship in this area of political science is focused primarily on two key causes of civil war in African nations: 1) Political discord known as “Grievance” or 2) Economic opportunity otherwise known as “Greed.” The “Greed” variables used in previous scholarship were utilized in addition to new economic variables to analyze several case studies. The case studies used in this analysis were selected from Sub-Saharan African country-years during the period of 1985-present. Of the six case studies analyzed, three country-years were chosen randomly from a group of all country-years in which a civil war occurred. In addition, three were chosen from the group of country-years in which a civil war did not occur. Data from each country-year was analyzed within the economic model and alongside previous analyses. The results demonstrated that economic interests, especially the ability to loot, trade, and export natural resources, are driving factors in the formation of rebel groups in Sub-Sahara.

134. Cody Hollan
Department of Political Science
Mentor: Justin Wedeking

*The Role of Media Coverage on Supreme Court Confirmation Hearings*

The Supreme Court is a pivotal element of our government. Once a person is nominated to the Supreme Court they are dissected in a confirmation hearing. This is true because of the life appointment of each nominee. During these hearings a plethora of questions are asked to investigate the details of every nominee. Through recent research we have seen the importance of each nominee’s candor in the past. What has changed? Why does the evasiveness of nominees
no longer matter? This research project took an in-depth look at the relationship between television media coverage and the Supreme Court confirmation hearings. In 1981, many tuned in to watch the hearings of Sandra Day O’Connor. This marked the beginning of gavel-to-gavel television coverage of the Supreme Court confirmation hearings. From this point, we observed the implication that candor no longer has an effect on the way senators vote. Before 1981, the constituents were versed on each nominee through print. We examined that the implementation of television coverage has created an increase of interest in the confirmation hearings. This caused a demand for new information to be printed about the cases. I researched this phenomenon by sifting through New York Times articles, starting with John Harlan in 1955 through Elena Kagan in 2010. With the commencement of the television coverage, we see that senators have been influenced by partisanship and ideology. We hypothesize that this occurs because the constituents can now see how their senators adhere to the voting standards of their constituents. Elena Kagan stated that the modern day confirmation hearings have become a “vapid and hollow charade”. This implies that she believes that candor no longer is the issue and that ideology now governs the senator’s decision.

135. Megan Hughes
Department of Political Science
Mentor: Steve Voss

Constitutionality of Health Care Reform: And Then There Were Nine

American political parties today are so polarized that Democratic and Republican leaders see eye to eye on very little. One thing on which they have reached an agreement is that the health care system desperately needs reform. Now, how to go about such reform legislation has elicited much less agreement. The recent Patient Protection and Affordable Care Act (ACA) passed by a Democratic Congressional majority and signed into law by President Obama didn’t receive the support of any Congressional Republicans. The issue of how to approach reforming the health care system has the country more divided than ever. By reviewing Supreme Court cases regarding the Commerce Clause, one can apply precedent to the health care bill. This research essentially will resemble the analysis a Supreme Court clerk would perform if and when a case of constitutionality of health reform comes before the Court. An analysis of the five cases decided in Federal Court that have already considered the constitutionality of the legislation is also provided. Based on analysis of these cases, it is estimated that if the Court ultimately reviews the case, they will uphold the legislation. This research will contribute knowledge to individuals who wish to inquire into the history of the Commerce Clause and primarily whether Congress has the authority to make such law. Researching the constitutionality of health care legislation is a beneficial study in that each and every citizen of the United States could be affected if, ultimately, the legislation is upheld. The bill requires health insurance be purchased by all, inevitably impacting all citizens in America.
136. Chandler Jobson  
Department of Political Science  
Mentor: Steve Voss

*The Role of Religion in Government Stability in Sub-Saharan Africa*

My thesis looks at the relationship between religion and politics in sub-Saharan Africa. The narrower question I will attempt to answer is: What is the effect of a country’s religious identity on the stability of its government in sub-Saharan Africa? My methods include examining literature by other scholars on the topic and analyzing the survey results from the Afrobarometer, a research tool created through public surveys of African nations in order to gain an understanding of topics facing the continent. I have chosen six countries to examine in my research: Liberia, South Africa, Kenya, Nigeria, Malawi and Somalia and have drawn conclusions about the role of religion in the stability of these governments.

137. Deron Johnson  
Department of Political Science  
Mentor: David Wilke

*Jean-Francois Revel and Anti-Americanism: An Anti-Ideological View*

This project studied the writings of Jean-Francois Revel in which he critiqued the concept of anti-Americanism. A majority of the effort was spent in reconciling Revel’s solid leftist credentials with the commonly held perception that most international leftists hate America. What followed was the realization that Revel typifies a political philosophy that is best classified as anti-doctrinaire, in that though he might hold views that most would classify as socialist or promoting a welfare state, he still managed to passionately defend democracy, and more specifically, the American form of democracy. Further reading looked at other political philosophers (Christopher Hitchens, Paul Berman) who seem to share this unique perspective with Revel. All in all, this project examined the thinking processes of some political philosophers who buck ideological trends and describe issues merely as they see them, without allowing their thoughts to be convoluted by ideology or doctrine.

138. Ethan Rutledge  
Department of Political Science  
Mentor: Ernie Yanarella

*Kentucky Democratic Party Internship Studies*

As a Chellgren Student Fellow, I chose to go a different route than the traditional research project. Immensely intrigued by practical and applicable politics in the real world, I decided to take an internship at a major political party headquarters to see the day to day functions of party politics in a year when there are no presidential or mid-term elections. Having already interned
in a local race for the Lexington mayoral seat in 2010, I already know how a political campaign functions during campaign season. For this internship I was under the same supervisor, Matt Erwin, the Communications Director for the Kentucky Democratic Party. I quickly found out that there is no refractory period in the world of party politics. In the spring of 2011, the party has already begun to start raising money for the next election season. Much of Ethan’s work this spring involved keeping contributors up-to-date on how, why, and when, they can donate or raise money for the party. Luckily, for the Kentucky Democratic Party, this year there is a Governors election, which gives the Party an opportunity to keep in touch with its core volunteers and supporters until the next major election season. The Democratic Party wants to be seen as a “grass roots organization” and keeping in touch with volunteers is how in tries to accomplish this image. A major project of mine was to organize local volunteer meetings and be in contact with volunteers and local party leaders around the state. As the year progresses my work has been more focused on the Governor’s election as he participated in candidate research of the Governor’s opponent and contacted and created a database of statewide media outlets for the party to send all of its campaign related press releases.

Psychology

139. Carter Daniels, Jennifer Laude
Department of Psychology
Mentor: Thomas Zentall

Do (Pigeon) Gamblers Remember Their Wins but Not Their Losses

When pigeons are given a choice between two alternatives, one that 20% of the time provides a stimulus that always predicts food is coming but 80% of the time provides a stimulus that always predicts the absence of food and the other alternative that provides a stimulus that predicts food 50% of the time, the second alternative should be preferred but it is not (Stagner & Zentall, 2010). This analog of human gambling behavior can be attributed to the rarely occurring stimulus that is an excellent predictor of food – a conditioned reinforcer. But it requires that the stimulus that predicts the absence of food is not a conditioned inhibitor. To test this hypothesis we will train pigeons with the Stagner and Zentall design and then test them by asking how much they will peck at a compound stimulus consisting of the stimulus that always predicts food together with the stimulus that predicts the absence of food. If the stimulus that predicts the absence of food has not developed into a conditioned inhibitor, it should produce very little disruption in responding compared with the stimulus that always predicts food is coming when presented alone. Furthermore, we should see a negative correlation between choice of the 20% reinforcement alternative and the amount of response suppression produced by the stimulus compound. The relation of this procedure to human gambling will be discussed as well as the benefits that this project has had for the Chellgren Fellow.
140. Marjorie Grefer, Zachary Adams
Department of Psychology
Mentor: Richard Milich

*Relating Developmental Patterns of Adolescent Alcohol Use to Drinking-Related Outcomes in the First Year of College*

This study examined how adolescent drinking trajectories relate to personality, drinking motives, alcohol expectancies, and substance use in college. Drinking trajectories were formed using discrete mixture modeling based on student reports of their average weekly alcohol use from ages 13-18. Using data from a large sample of first-year college students (n = 221), three groups emerged: (i) abstainers/very light users (29.76%); (ii) late-onset, moderate drinkers (40.06%); and (iii) early-onset, heavy drinkers (30.18%). In general, heavy adolescent drinkers were more impulsive and reported more arousal-related expectancies for alcohol use than light users. Both adolescent drinking groups endorsed higher levels of sensation-seeking and marijuana use than abstainers/light users during the first year of college. Notably, individuals in the early-onset, heavy drinking group demonstrated more hazardous patterns of drinking in college, as well as reported higher overall delinquent behaviors than either of the other two groups. These findings support previous research in that earlier, more intense drinking patterns predict more substance related problems. The abstainer/low user group demonstrates lower rates of problematic behaviors concerning alcohol use. Future studies should follow students longitudinally to see how these relations change over time.

141. Jaime Miller, B. Lewis, J.M. Littleton
Department of Psychology
Mentor: Susan Barron

*Two Polyamine-sensitive NMDA Receptor Antagonists and their Effect on Drinking Behaviors in a Rodent Binge Model*

Addiction to alcohol is a complex behavioral disorder and while several FDA-approved medications exist, their effectiveness is limited. This makes the identification of compounds with the ability to reduce drinking behaviors and alcohol-associated damage a high priority. Disruptions in the glutamate system, and particularly hyperactivity of NMDA receptors (NMDAr), have been heavily implicated in alcohol abuse and dependence. Classic antagonists of the NMDAr have proven ineffective as treatments due to psychotomemetic effects and abuse potential, however NMDAr modulators may have more success. Polyamines are known to allosterically increase receptor activity, and are increased during alcohol withdrawal. Inhibiting polyamine activation reduces alcohol-associated cell death, reduces relapse-like behaviors and prevents stress-associated increases in drinking. CP 101,606 (Pfizer) and JR-220 are both thought to interact with receptors containing polyamine-sensitive subunits, reducing polyamine activation. In this study, both compounds were examined in a binge-like model of alcohol consumption in order to evaluate their efficacy as potential pharmacotherapies, and to further examine the involvement of NMDAr in this behavior. In a ‘Drinking in the Dark’ paradigm, 28
male C57BL/6J mice were given limited access to a 20% ethanol solution during their dark cycle 4 days/week. Unique to the DID model, animals drink to intoxication (BAC > 0.1) without reinforcement training, indicating binge-like behavior. Treatments were counterbalanced, using a latin-square design, such that each animal received all doses (5 mg/kg, 10mg/kg, and 20mg/kg, i.p.) of both drugs. There was a significant decrease in drinking behaviors following both CP-101,606 and JR-220 administration at all doses. These results further implicate polyamine-sensitive NMDArs in drinking behaviors, and suggest their potential as therapeutic targets for alcoholism. (Supported, in part, by AA12600 to JML)

142. **Kristen N. Snyder**, Jennifer N. Berry, Tracy R. Butler, Lynda J. Sharrett-Field, Anna R. Reynolds
Department of Psychology
Mentor: Mark Prendergast

*Development of an Organotypic Model to Study the Mesolimbic Dopamine Reward Pathway*

The mesolimbic dopamine reward pathway has been heavily implicated in drug addiction and natural rewards including the positive feeling associated with obtaining food, water or sex. Beginning in the ventral tegmental area (VTA), the pathway connects to the limbic system and the nucleus accumbens via the medial forebrain bundle and continues out to connect to the prefrontal cortex. The increased dopaminergic activity in this system contributes to the inability to control drug use along with the act of seeking and taking drugs even after experiencing undesirable consequences. To replicate this system, 8-day-old rat pup brains were aseptically removed and sliced to 400 μm thickness after separating the hemispheres. Intact slices of the midbrain and nucleus accumbens were then arranged on membrane inserts in 6-well plates to ensure that the ventral tegmental area and the nucleus accumbens were touching, mimicking in vivo conditions. The co-cultures were then incubated for 6 to 21 days and examined utilizing immunohistochemistry and high performance liquid chromatography (HPLC). Preliminary results showed the presence of significant amounts of extracellular dopamine and likely re-innervation across the ventral tegmental area/nucleus accumbens gap as evidenced by tyrosine-hydroxylase and myelin basic protein-positive axons spanning this gap. Additionally, autoradiographic data demonstrate dense and widespread distribution of the presynaptic dopamine transporter. As a whole, these findings demonstrate the re-establishment of an intact midbrain-ventral striatal reward pathway *ex vivo*. In the future, this model of the dopamine reward pathway can be used to better investigate stress hormone and drugs of abuse interactions, among many other things.
143. Grant Weherley  
Department of Psychology  
Mentor: Philipp Kraemer

The Effects of a Second Life Virtual Context on Conformity

The purpose of this experiment is to test conformity in a virtual environment called Second Life. In a world of ever-increasing gaming and virtual communication, it would be beneficial to determine whether established psychological principles still hold for virtual experiences. For example, subjects may or may not feel the urge to conform in the Second Life environment because of the more anonymous nature of virtual reality as compared to real life. The method used in this study was to have subjects participate as part of a virtual group; each member of the group created a Second Life avatar and engaged in a perceptual judgment task in which they had to express their judgments in the presence of other avatars. The key question was whether subjects would conform to the expressed judgment of other avatars, similar to what occurs in social conformity situations in real life. The results of this study are not yet complete.

Social Work

144. Jillian Harris  
Department of Social Work  
Mentor: Christopher Flaherty

Junior Mentoring Program: An Overview of a College Search and Application Program and Mentorship for Junior-Level High School Students

Junior Mentoring Program (JuMP) was a program developed to assist junior-level high school students with the college search and application process. This program has two parts: an informational discussion-style class and a one-on-one mentor. During the informational discussion, students would be introduced to the college search, application, and admissions process. To reinforce the information from the discussion group, one-on-one undergraduate mentors would work with the students. These mentors would provide individualized assistance in achieving goals and overcoming the obstacles of applying and being admitted to institutions of higher education.
145. Jenna McNeal  
Department of Social Work  
Mentor: Karen Badger  

Victim Substance Use & Legal Outcomes of Rape Cases

Victim credibility has significant influence on legal outcomes of sexual assault cases. When victims have participated in behavior that is perceived as “risky” by society (Lawyer, et al., 2010), such as alcohol or drug use, their perceived credibility suffers (Kingsnorth et al., 1999). In an effort to study this topic further, this research question was developed: “Are rape victims who pursue action against their perpetrators in the criminal justice system less likely to win a conviction of rape and/or sodomy if the victim had consumed alcohol and/or drugs at the time of the crime?” All closed cases charged with rape and/or sodomy submitted to a local county’s Commonwealth Attorney’s Office in the year 2004 were examined. By use of an extraction sheet, the author recorded details of each case, including whether victim substance use was a factor and the case’s outcome. The comparison group includes cases that displayed no evidence that victim substance use occurred around the immediate time of the crime. It was hypothesized that those rape victims who did consume alcohol and/or drugs prior to (within five hours of) the crime and/or were intoxicated during the crime, would receive inferior legal outcomes in the criminal justice system compared to victims who were sober. This hypothesis was supported by the data collected, which shows more convictions on charges of rape and/or sodomy for cases that did not involve substance use by the victim. The findings distinguished a trend between case outcomes and their relationship with victim substance use.

146. Brandi Bullock  
Department of Sociology  
Mentor: Jenny Mooney  

Engaging in Minority Subculture: Managing Stigma in the Gay

For the presentation, “Engaging in Sexual Minority Subculture: Experiences with the Lexington Gay Community”, Brandi Bullock participated in a sexual minority subculture that she would not ordinarily be a part of. She kept a journal of her activities, and afterwards, she was able to discuss issues of stigma management within the gay community. The purpose of her exploratory study was to display the stigmatism that comes with being a member of the sexual minority of homosexuality. She was able to use her personal connections and knowledge to become absorbed in this subculture. Brandi was able to gain access to environments that would normally be off limits to a straight female, in order to further study the repression this minority feels. This project was able to demonstrate the difficulty of accessing local resources, as well as prove how the sexual minority of homosexuality is viewed from within the social circles of Lexington, KY. Throughout the course of this project, Brandi was able to not only engage in a different subculture but also realize how little she knew about the effects of being a homosexual. This project was able to demonstrate the extreme oppression that even her closest homosexual friends
feel on a daily basis. At the conclusion of the project, Brandi was able to see where her services as a future social worker are needed within her community. While she was an advocate for gay rights before working on this project, she feels even more inspired at this point to share her findings with her fellow co-workers, peers, and educators. By immersing herself in the actual subculture of homosexuality, she was able to witness the absolute cruelty this minority faces on a daily basis.

147. Abby Kerins
Department of Sociology
Mentor: Dr. Joanna Badagliacco

In Her Words: Hearing the Voices of Harlan County Women in Alessandro Portelli’s Oral Histories

In his oral histories of Harlan County, Dr. Alessandro Portelli, a professor of American Literature at the University of Rome, strives not to “give a voice to the voiceless,” but instead to make the voice of the Harlan county natives more audible outside of their community. One such collective voice that becomes more audible through Dr. Portelli’s work is that of the women of Harlan County. In their interviews, these women share their perspectives on various aspects of the Appalachian lifestyle, including coal mining and the turmoil that has riddled the history of mining in Harlan County. In researching Dr. Portelli’s interviews, the involvement of women in coal mining was analyzed and commonalities were found among the women’s desires and goals for the mining town. While not part of the miners’ union themselves, women formed a union of their own to a degree, working together to strengthen their community through activism and support. After examining past activities of women in Harlan County, women’s sentiments towards the current situation of the United Mine Workers was compared to their sentiments in the years that preceded the strikes. The union’s situation in Harlan County, as seen through the eyes of the women of the community, was then briefly evaluated in terms of how it fits into the broader perspective of current national issues in regards to labor unions’ rights.

Surgery

Department of Surgery
Mentor: Andrew Bernard

Membrane y+ Cationic Amino Acid Transport of Arginine in Stored Packed Red Blood Cells

Transfusion of packed red blood cells (PRBCs) is associated with significant morbidity and mortality. The exact mechanisms are not fully understood. PRBCs deplete extracellular arginine
and possess transporters for arginine, an amino acid essential for normal immunity. We hypothesized that the membrane y+ amino acid transporter contributes to arginine depletion in PRBCs. PRBCs were titrated to a 10% hematocrit with PBS, red cell y+ transporters were blocked using n-ethylmaleamide (NEM) (0.2mM) and culture arginine and ornithine levels were measured using liquid chromatography/mass spectroscopy. Radiolabeled L-arginine [4,5-3H] (10 µmol/L) was added to the similar culture conditions and arginine uptake measured in counts per minute (CPM). 6-9 day and 1-4 week storage periods were examined. Unique donor demographics were correlated with arginine uptake. NEM blockade of y+ transporters impaired PRBC arginine depletion from the culture media (117.6±8.6µM vs. 76.9±5.8µM, p<0.001) and reduced intracellular L-arginine (7574±955 CPM vs. 18192±1376 CPM, p<0.01). Arginine storage depletion increased with storage duration in NEM solutions (one week vs. 6 weeks, p<0.0027). Six week old PRBCs preserved more culture arginine (p<0.008). 9 day storage duration increased L-arginine uptake compared to 6-8 day storage. (n=77, R=0.225, p<0.05). Individual donors varied in L-arginine uptake. Extracellular arginine depletion and extracellular ornithine synthesis varied among donors and correlated inversely (R=-0.5, p=0.01). Male donors trended toward greater intracellular arginine (74600±14500 CPM vs. 70700±15600 CPM, p=0.272). Aspirin users trended towards a lower arginine uptake (70700±14100 vs. 76400±15900, p=0.103). Membrane y+ transporters are responsible for arginine depletion by PRBCs. Membrane y+ activity increases with storage duration. Arginine uptake varies among unique donors. Female gender and aspirin use may reduce arginine uptake. Membrane biology of RBCs may play a role in the negative clinical effects associated with PRBC transfusion.

Theatre

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The Effect of Marijuana on Psychomotor and Cognitive Task Performance in Non-Daily Marijuana Users

Previous studies have reported adverse acute marijuana effects on psychomotor and cognitive behavior in chronic daily marijuana users, including decrements in components of memory and increases in errors on coordination tasks. However, less is known about the behavioral effect of marijuana in current, non-daily marijuana users. This ongoing study examines the effect of marijuana on behavior in participants who report using marijuana less than daily. Twenty-eight of forty young adult marijuana users have completed the study. Subjective, performance and cardiovascular measures are assessed on three separate days, as part of a larger study examining the behavioral effects of marijuana. During each day, subjects receive 8 uniform puffs from a cigarette containing THC (0, 1.75 or 3.5% w/w) and complete subjective, performance and cardiovascular measures before, immediately after, and at hourly intervals following drug administration. A preliminary analysis indicates that task performance varies as a function of THC concentration. For example, overall trial rate and correct responses on the Digit Symbol Substitution Task (DSST), and proportion correct on the Repeated Acquisition Task (RA)
decrease in a dose-dependent manner following THC administration. Heart rate increases as a function of THC concentration. In addition, several dose-related subjective effects are present. These findings indicate adverse behavioral consequences of acute marijuana use that may impair real-world task performance, such as driving a car or operating heavy machinery in non-daily marijuana users.

**Veterinary Science**

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*Interleukin-6: A Potential Biomarker of Aging and Health Status in the Horse*

Horses over 20 years of age constitute about 15% of the equine population, yet like the elderly population this number is ever increasing. Many of these aged horses main actively involved in equestrian sports and reproductive capacities as stallions and brood mares. Therefore, identification of a biomarker to determine how well these horses are aging is of interest. Advanced age in horses, as with other species, is eventually associated with a decline in body condition, muscle tone and immune function. A hallmark characteristic of the aged immune system is an increased production of pro-inflammatory cytokines, termed “inflamm-aging”. Thus, older individuals have 2-4-fold increases in plasma/serum levels of inflammatory cytokines, such as interleukin-6 (IL-6). This increase in inflammatory mediators predicts both increased mortality and morbidity in a variety of chronic diseases in humans. We have recently shown that horses 20 years of age and older exhibit similar “inflamm-aging” characteristics, however it remains to be determined if there is an age-related increase in serum levels of pro-inflammatory cytokine IL-6. Further, it remains to be determined if increased IL-6 protein levels correlate with age-related health conditions of the horse such as arthritis, equine cushing’s disease, etc. Therefore, the purpose of this study is to determine if serum IL-6 protein levels increase with age of the horse and/or age-related health conditions of the horse. Blood (serum) samples were collected from 118 horses age range from 6-36 years (6-10=20, 11-15=17, 16-19=14, 20-24=39, 25-29 =15, and 30-36=13). IL-6 protein levels in the serum will be determined using an equine-specific, enzyme-linked immunosorbert assay (ELISA). Blood was also analyzed for metabolic parameters including MSH, ACTH, fasting glucose and insulin. Health status data was collected from a survey (age, breed, sex, nutrition, exercise, body scoring, weight tape, medical history) and farm visit (body scoring, ultrasound fat thickness over various body regions, neck adiposity scoring, measurements for weight calculation, feed measurement, hay analysis). To determine if there is a relationship between IL-6, age and health status parameters, data will be modeled using simple linear regression techniques to correlated IL-6 and various health status parameters with age. In
addition, correlation between IL-6 and various health status parameters will be performed using the Pearson correlation test. A ‘P’ value of less than or equal to 0.05 will be considered significant. We expect there to be an age-related increase in serum levels of IL-6. Independent of age, we expect IL-6 levels to correlate with negative health status parameters such as arthritis. Thus, IL-6 could be a potential biomarker to determine if a horse is “aging healthy”.
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