THE SHOWCASE OF
UNDERGRADUATE SCHOLARS
MEMORIAL COLISEUM • UNIVERSITY OF KENTUCKY®
APRIL 27, 2016 • 3:00PM
Last Year’s Showcase of Undergraduate Scholars
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Tenth Annual Showcase of Undergraduate Scholars

Wednesday April 27, 2016
Memorial Coliseum
3:00-6:00 pm

Opening Remarks and Moderator
Jay Van Doorn, SPUR President

Welcome
Dr. Diane Snow, Director of the Office of Undergraduate Research

Presentation about the Undergraduate Research Abroad Scholarship (UGRAS)
Marcel Roman, 2015 Scholarship Recipient

Percussion Performance
Alex Smith, Percussion Performance Student

Presentation of Eighth Annual Faculty Mentor of the Year Awards
Society for the Promotion of Undergraduate Research (SPUR)

Keynote Speaker
Eseosa Ighodaro, MD/PhD Student in the UK College of Medicine

Reception, Poster Viewing (Floor) and Oral Presentations (Concourse A & B) Begin

Food Preparation: Catering by Donna
Welcome to the 2016 Showcase of Undergraduate Scholars!!

“Tell me, and I’ll forget
Show me, and I’ll remember
Involve me, and I’ll understand”

- Chinese proverb

The Office of Undergraduate Research and all supporting partners welcome you to the 10th Annual Showcase of Undergraduate Scholars (2016) to honor the remarkable achievements of our undergraduate researchers and the unswerving dedication of their UK mentors. Thank you for all you do each day to promote this valuable, high-impact enrichment opportunity!

With the rapid growth in the number of students engaging in undergraduate research, we needed to find a place to expand, and are very excited about our new location in Memorial Auditorium for this year’s Showcase. With UK’s tremendous success in 2014 of hosting The National Conference on Undergraduate Research (NCUR) in mind, we have developed a long-term goal to replicate this (a “mini-NCUR) on our campus annually by having all units on campus use the Showcase for their year-end research presentations. As in past years, in this forum, students, faculty, staff, and guests will have the honor of meeting UK’s undergraduate researchers, who will present the results of their scholarly research and creative activities in poster, table, and oral formats. Attendees will also hear from administrators associated with research campus-wide; enjoy a presentation from a former UK student and researcher, Ms. Eseosa Ighodoro, about the benefits of engaging in undergraduate research; learn about the 2016 Oswald Award winners (see www.uky.edu/UGResearch/Oswald); enjoy a special arts performance, and revel in the interactions with colleagues and friends. We are sure that you, like us, will be amazed and intrigued by the diversity, depth and breadth of research projects, by the professional accomplishments of our students, and by the superb mentorship provided by our devoted faculty and staff.

While the students are indeed dedicated and highly talented, their success is also dependent on other factors. First, 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, and who also work with the Office of Undergraduate Research to help to facilitate our many research programs. We appreciate you! Congratulations to this year’s recipients of the Excellent Undergraduate Research Mentor Awards, and to ALL mentors, who promote student success. Second, our students’ successes are indebted to the hard-working and talented staff of the 1st Generation Scholars Program, The Chellgren Center for Excellence, The Gaines Center, Office of Undergraduate Research, the Robinson Scholars Program, the UK Honors Program, and all others across the UK campus and beyond, who work tirelessly to promote undergraduates and their research endeavors. Our sincere appreciation for your efforts!

Please join me in welcoming and congratulating all the undergraduate student presenters at this year’s Showcase of Undergraduate Scholars, who will highlight for you what engaging in undergraduate research and scholarly activities is all about!

With admiration and appreciation,

Diane M. Snow, PhD
Director, Office of Undergraduate Research
Director (Interim), UK Honors Program
UK Professor of Neuroscience and Endowed Chair, Spinal Cord and Brain Injury Research Center; and Dept. of Anatomy and Neurobiology
Welcome from the Society for the Promotion of Undergraduate Research

Welcome to the 2016 Showcase of Undergraduate Scholars! We appreciate you taking the time to come out and support all the student researchers on campus. For the past decade, this Showcase has been an opportunity for undergraduates and other members of the community to present the results of their hard work. For the students at UK, it offers them a forum in which they may demonstrate their expertise on their subject and receive the acknowledgement they deserve. For the University of Kentucky, this event showcases the opportunity, curiosity, knowledge, and collaboration that makes UK a leading research university.

However, this Showcase would not be made possible without the diligent work of a great many wonderful people. First, I would like to thank all the student researchers for all the hours of thought, creativity, and research they put in this past year; without their dedication, none of us would be here today to celebrate their achievements. Second, I would like to thank the faculty mentors for all the guidance and advice they have provided to our undergraduate researchers. Finally, I would like to thank everyone who helped organize, arrange, and finance this Showcase, especially the Office of Undergraduate Research, the Chellgren Center, Student Government, and the Student Outreach Team.

I hope everyone attending tonight enjoys the evening, sees the posters, listens to the oral speakers, and most importantly learns something new. Take this opportunity to channel your curiosity, to experience something outside of your normal field, to continue to support all of our researchers this evening. Finally, I would encourage everyone to take the time to thank whoever it may be that lead you here, to this Showcase, either to present or to be presented to. We hope this will be among the first opportunities of many to enjoy such research and researchers that altogether leads to the betterment of the world.

Thank you,

Jay Van Doorn
President of SPUR
Keynote Speaker: Eseosa Ighodaro

Since childhood, I have always questioned the world around me as evident in a hand written note from my 8th grade English teacher on an essay assignment, “Always stay true to your inquisitive nature, and keep asking questions.” Throughout my academic training, I have participated in several biomedical research opportunities which have allowed me to continue investigating interesting questions.

During my undergraduate training at the University of Kentucky (2007-2011), I participated in numerous research projects spanning the disciplines of chemistry, biochemistry, developmental biology, and neuroimmunology. During the academic years, I spent 4 semesters in a biochemistry lab working with Robert Dickson, Ph.D., Professor of Biochemistry, studying iron restriction in yeasts with funding from the Appalachian & Minority Science, Technology, Engineering, and Mathematics Research Fellowship and Louis Stokes Alliance for Minority Participation Research Fellowship.

In addition, I spent my summers, conducting research at Stanford University and University de Lille (France) funded by fellowships from the Amgen Pharmaceutical Company and the National Institutes of Health respectively. During these lab experiences, I was trained in molecular laboratory techniques (i.e. western blotting, ELISA, high performance liquid chromatography) and was listed as a co-author on a publication in Molecular Microbiology in 2013. Moreover, I presented my research findings at several meeting including National Conference of Undergraduate Research (NCUR), Annual Biomedical Research Conference for Minority Students (ABRCMS), and the Annual Showcase of Undergraduate Scholars. With these positive enriching experiences, I decided to pursue a career as a physician-scientist in biomedical research.

After graduating summa cum laude with a B.S. in Biology, departmental honors, and honors in the Honors Program, I matriculated into the MD/PhD program at UK College of Medicine. After taking a medical neuroscience course, I was fascinated by the study of human neurological disorders thus gravitating toward the field of neuroscience. In August 2013, I joined the lab of Peter Nelson, M.D., Ph.D, Professor and Neuropathologist, to conduct studies on neurodegenerative/cerebrovascular diseases using large clinical human data sets and post-mortem human brain tissue samples. My thesis work focuses on elucidating subtypes, risk factors, and cognitive sequela of brain arteriolosclerosis, a term used to describe degenerative thickening of cerebral arterioles.

My undergraduate biomedical research training experiences laid the foundation for my career as a physician-scientist. I encourage all undergraduate students interested in biomedical research to take full advantage of the numerous opportunities offered to you at the University of Kentucky and beyond. If you have any questions about research and/or medicine, please send me an email (etigho2@uky.edu). Always keep asking questions and seeking answers!
Undergraduate Research Abroad Scholarship: Marcel Roman

Marcel Roman is a senior (Class of 2016) double majoring in Political Science and International Studies. He has conducted research with his mentor, Dr. Emily Beaulieu, for 5 semesters on ethnic politics and political violence. With the help of the Office of Undergraduate Research, he received a grant to conduct field, survey, and text analysis work in Fiji, where he studied the effect of inalienable land rights on ethnic politics and coups along with the sustainability of Fiji's post-authoritarian regime. Marcel will be attending a PhD program in political science after graduation.

The Undergraduate Research Abroad Scholarship (UGRAS) is a collaboration between the Office of Undergraduate Research (UGR) and Education Abroad (EA). This scholarship pays up to $5,000 to a University of Kentucky full-time undergraduate student to cover the costs of a well-defined, credit-bearing research project abroad during the summer term for approximately 8 weeks.

Percussion Performance: Alex Smith

Alexander Smith, from the Woodlands Texas, is currently studying Percussion Performance under the direction of James Campbell at the University of Kentucky. Alexander has performed in many ensembles over last few years including percussion ensembles, steel bands, orchestra, wind ensembles, and chamber groups, as well as developed a repertoire of solo percussion music. In 2013, Alexander went on the Drum Corps International tour with the Cadets Drum and Bugle Corps, where they won the High Percussion Award. He has also recently accepted a Teaching Assistantship at the University of Tennessee Knoxville where he will be pursuing a Master’s Degree in Music Performance, while continuing to develop his career in performing Modern Music.

"Bone Alphabet" (1991) written by British composer, Brian Ferneyhough, is a complex study of voicing, texture, theme, and rhythmic structure that challenges even the most virtuosic of performers. The intense rhythmic complexity of imbedded polyrhythms alone is enough to last the performer a lifetime of study and practice. To conquer this piece, I first spent an entire summer graphing out each measure of music on paper, calculating each rhythm to 7 decimal places. This allows for a visual representation of what the rhythms should sound like in relation to one another. Most of the rhythms are ratios, for example, 3:4. The challenge arises when these ratios become embedded, for example, a 5:2 and 7:1 within the 3:4. The biggest musical challenge that this piece presents is finding which of the voices to bring out as the main voice, and how to phrase measure that seem to be a black hole of notes. I believe that once each of these aspects of the piece is realized and accomplished, the piece will develop in the performer’s hands to be a work of art that is accessible to the listener.
2015 Faculty Mentor Award Recipients

Dr. Kristin Ashford, Nursing

As an associate professor, women’s health nurse practitioner and research mentor, I have had the opportunity to lead three NIH/CMMI research studies (>2.5 million in funding), all of which primarily recruited pregnant and postpartum women and included assessments for biological markers of tobacco use and preterm birth. My success in research is primarily due to my ability to implement and refine recruitment and retention strategies for pregnant and postpartum women, as well as develop and operationalize focused trimester-specific methodologies. I have expertise in measurement of nicotine-cotinine, and trimester-specific cytokines collected in multiple biological mediums. Throughout my tenure, I have also served as the lead PI for the Kentucky Giving Infants and Families Tobacco-free Starts (GIFTS) program, a prenatal tobacco treatment program that is currently being implemented across the state. I have received awards for my teaching contributions in obstetrical teaching and mentoring, including being awarded the 2012 University of Kentucky Great Teacher Award and 2014 University of Louisville Top Alumni Award. At UK College on Nursing, we encourage undergraduate to pursue research and offer a “hands-on” approach to mentoring via the Undergraduate Nursing Intern program. Over the past decade, I have directly mentored 25 undergraduate nursing and biology students, each presenting their research projects at local, regional and national venues as manuscripts and/or presentations, with over half presenting podium presentations at regional or national venues including NCUR, Council for the Advancement of Nursing Science, and Southern Nursing Research Conference.

Dr. Robin Cooper, Biology

Dr. Cooper obtained a double BS major in Chemistry and Zoology from Texas Tech University in 1983 and went on for a PhD in Physiology at Texas Tech Medical School in 1989. He continued postdoctoral training at the University of Basel, Biocenter in Switzerland for 3 years and a second postdoctoral fellowship at the University of Toronto, Dept. of Physiology in Canada for 4 years before joining the University of Kentucky as a faculty member in 1996. During his past 19 years, he has mentored 12 PhD students, 9 MS students and 156 undergraduates in his laboratory. The undergraduates have appeared as primary or co-authors on over 57 peer reviewed publications and over 300 abstracts. This is out of a total of 500 abstracts and 135 publications in his academic career. In addition, Dr. Cooper has mentored a number of high school students in his lab and started the 1st Central Kentucky Regional Intel affiliated Science Fair to be associated with the University of Kentucky which incorporated 33 counties in Kentucky. Dr. Cooper has been very active with educational grants with the PIMSER to train middle and high school science teachers throughout Kentucky. He has served in various academic roles locally and for the state (President of the KY Academy of Sciences, President and various roles for the Blue Grass Chapter of the Society for Neuroscience, Founder and president of the Kentucky Chapter for the American of Physiological Society, Chair of the Board for the State of KY Science and Engineering INTEL affiliated fair). In his spare time he completed a BSN in Nursing from UKY in 2012 and volunteers his time as a RN and organizing public health related projects.
Schedule of Oral Presentations

Concourse A

4:00  **John Cooksey and Syleena Schmitke**, Biology, Faculty Mentor: Florin Despa
*Effects of amylin dyshomeostasis on brain vasculature*

4:20  **Jonathan Elliott**, Economics, Faculty Mentor: Jenny Minier
*Education and the Resource Curse: Cross-Country Evidence*

4:40  **Rachel Lowney**, Biology, Faculty Mentor: James MacLeod
*Histological and Quantitative Analyses of Induced Chondrogenesis in Different Cell Types*

5:00  **Hayden Pike**, Computer Science, Faculty Mentor: Jerzy Jaromczyk
*Sonified Diagram Project: Providing Low-cost Audio and Tactile Access to Graphics for Blind and Vision Impaired Science Students*

5:20  **Abigail Boone**, Anthropology, Faculty Mentor: Juliana McDonald
*Otherkin: An Ethnographic Examination of the Spiritual, Social, and Psychological Aspects of Non-human Identity*

5:40  **Josephine (Joy) Kim**, Human Health Sciences, Faculty Mentor: Sylvie Garneau-Tsodikova
*Engineering Nonribosomal Peptide Synthetases: Enzymatic Evidence for a Revised Congocidine Biosynthetic Pathway*

Concourse B

4:00  **Richard (Ricky) Oden**, Anthropology, Faculty Mentor: Juliana McDonald
*Temperate Fruit Cultivation, Musical Instrument Production, and Cultural Identity in India's Spiti Valley: An Exploratory Study*

4:20  **Logan Hurley**, Modern and Classical Languages, Faculty Mentor: Ihsan Bagby
*Islam and Speech and Debate: An Exploration Into Why Muslims Leave the Forensics Community*

4:40  **Kendall Hitch**, Political Science, Faculty Mentor: Clayton Thyne
*Democratic versus Authoritarian Coups: The Influence of External Actors on a State’s Post-coup Political Trajectory*

5:00  **Alyssa Conley**, Biology, Faculty Mentor: Susan Thiel
*Connections: Understanding Alzheimer's Disease through Dance*

5:20  **Ethan Toney and Cody Barnes**, Computer Science, Faculty Mentor: Jerzy Jaromczyk
*Network Architecture Comparison for Solar Cars*

5:40  **Samantha Rogers**, Journalism, Faculty Mentor: Scoobie Ryan
*The Rise of the Advertorial: How Paid Content is Changing the Media World*
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    Food for Thought: The Effects of Nutrition on Brain Activity During Attention Tasks

4B  Ackley, Nick
    The Role of the Pox Neuro Gene in Reproductive Life Span of Drosophila Melanogaster

4C  Adams, Michael
    A Validation of a Dairy Cow Feeding Time Monitoring Technology by Human Observation

5A  Agarwal, Amal
    Effect of Individual Alpha Frequencies on Reaction Time improvement after Meditation

54C  Ahmed, Ashab
    Effect of Tylenol on Temptation to Cheat

54C  Akers, Jeffrey
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3C  Aldridge, Eve
    Developing a Freshman Chemistry Murder Mystery Laboratory: Using Redox Reactions to Identify DNA Nucleotides

30A  Allison, Daylynn
    FileLoader: A TraceLab Component

5B  Anders, Sarah
    Effect of Meditation Duration on Performance

5C  Anderson, Sloan
    Effects of Age on the Gastrointestinal Microbiome

8B  Antel, Matthew
    The dsERF Gene Modulates SMA Severity and SMN Protein Abundance in D. Melanogaster Disease Model

41B  Appleton, Ibrahim
    Development of Testing GUI for Radio Frequency Identification M6e

26A  Armbruster, Steven
    Supercritical Carbon Dioxide-Methanol Cosolvent Extraction of Isoflavones from Red Clover

6A  Arnold, Adrienne
    Use of White Pine Xylem to Produce Drinking Water: Effect of Cut-To-Use Timing

44B  Assef, Sara
    An Examination of the Misclassification Rates of Prenatal Smoking Behaviors throughout Each Trimester of Pregnancy.

49A  Athukorala, Ashami
    Measurements of Cough Responses to Inhaled Irritants in Awake Mice.

42C  Auger, Kyle
    Defining carbohydrate binding of glucan phosphatases via Affinity gel electrophoresis

53A  Ausmus, J.C.
    The Impact of Witness Demeanor on Jurors in an Adult Rape Case

6B  Auvil, Brittany
    Can Non-Dyslexics Fake Dyslexia's Brain?

26C  Baker, Annie
    Creation of Soluble FixAB Protein

18A  Banks, Riley
    Antibiotic Resistance and Microbiome Transfer Among Livestock and Wild Bird Populations

43B  Barksdale, Brianna
    How Does Music Tempo Affect Performance of a Mind-Controlled Attention Task?
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**Anthropology**

**Abigail Boone**
Mentor: Juliana McDonald

*Otherkin: An Ethnographic Examination of the Spiritual, Social, and Psychological Aspects of Non-human Identity*

The term “other-kin” refers to a human who identifies as a non-human being. Typically, this being is an animal or mythological creature, but in some circumstances may be a plant, fictional character, or other-worldly entity. Evidence supports that this form of self identification has existed for decades and suggests that similar phenomena existed throughout history. The emergence of the Internet and social media has allowed individuals with this uncommon form of self identification to form communities—something previously impossible due to geographic incompatibility and the need for secrecy. This presentation examines those communities, as well as the phenomenon of otherkin itself through folkloric and anthropological techniques, namely through the examining of ethnographic data collected through interview, survey, participant observation, archival history, and relevant literature. Findings currently being explored include: the process by which other-kin come to see themselves as having a non-human component to their identity and the spiritual/social mechanisms by which they attempt to explain that identity; the emic perspective of the term’s validity; otherkin hardships; and the relationship between other-kin, non-binary gender identity, and certain atypical psychological conditions. Additionally particular attention will be paid to the way in which the otherkin community legitimizes itself, i.e. what are and are not acceptable otherkin identities. With the rise of the Internet (particularly on the website Tubmlr), new groups claiming to be otherkin, but with traditionally unaccepted identities (e.g. the aforementioned fictional other-kin), have emerged. The way in which established communities have dealt with this new phenomenon as explained by my data will be explored, as well as the etic and emic perspectives of these two factions of the community.

**Richard Oden**
Mentor: Juliana McDonald

*Temperate Fruit Cultivation, Musical Instrument Production, and Cultural Identity in India's Spiti Valley: An Exploratory Study*

The people of India’s Spiti valley, an arid, high elevation region located within the Northwestern province of Himachal Pradesh, have been facing a problem with the preservation of traditional music for the past several decades. Traditional Spitian musical instruments, such as the kokpo (a guitar-like instrument similar to Tibet’s dramyen), have historically been carved from apricot wood. However, due to the ongoing processes of climate change and an increasing global demand for apples, apricots have largely been replaced by apples within Spiti’s fruit economy, significantly reducing the availability of apricot wood. Because of this, instrument makers are now forced to either utilize more expensive types of wood from neighboring districts, or ultimately abandon their occupation. At a time when Western attention is increasingly being placed upon Tibetan refugees in Northwestern India, it is my hypothesis that these circumstances may be resulting in a loss of cultural identity as many Spitians struggle to distinguish their culture from that of Tibet. This appears to be especially problematic among younger generations. Building upon field observations and informal interviews in Tabo, (a small town in the Spiti valley located 25 kilometers from the border of Tibet) as well as the use of email interviews, satellite imagery, and research of relevant publications, this study examines the roles of climate change and global demand involved in Northwestern India’s changing apple and apricot economies, and the effect these processes have on the production of traditional musical instruments and cultural identity in Spiti.
Oral Abstracts

Biochemistry

Josephine Kim  
Mentor: Sylvie Garneau-Tsodikova

*Engineering Nonribosomal Peptide Synthetases: Enzymatic Evidence for a Revised Congocidine Biosynthetic Pathway*

Nonribosomal peptides (NRP) are pharmaceutically valuable proteins that are processed in assembly-line fashion by nonribosomal peptide synthetases (NRPS), which are typically composed of adenylation (A), thiolation (T), and condensation (C) units. Auxiliary domains such as methyltransferase (M) may be strategically placed alongside or, more rarely, within an NRPS domain. Once the mechanisms of the NRPS pathway have been elucidated, the enzyme machinery can be engineered to produce NRPs with anticancer, antifungal, and antimicrobial properties. Our natural product biosynthesis investigation includes the development of two of these protein tools: CoA ligase and interrupted A domains. Our initial CoA ligase project resulted in the discovery of a revised pathway for the pyrrolamide congocidine, a NRP that confers anticancer activity. The focus was on biochemical characterization of four essential proteins in congocidine formation: the adenylation-thiolation (A-T) di-domain Cgc18(1-610) and its MbtH-like partner SAMR0548, the AMP-binding enzyme Cgc3*, and the T domain Cgc19. Enzymes were expressed in E. coli and were NHis6-tagged to facilitate purification via Ni2+-NTA affinity chromatography. Further testing of substrate specificities was accomplished through ATP-[32P]PPi exchange assay and assays using pyrrole analogues. Reverse-phase HPLC was utilized to investigate the mechanisms of the pathway. We report revised substrate specificities of Cgc18(1-610) and Cgc3*, biochemical evidence of the AMP-binding activity of Cgc3*, and loading of 4-acetamidopyrrole-2-carboxylic acid onto Cgc19. My current investigation on interrupted A domains is focused on the insertion of the M domain of KtzH into the A domain of TioR. By amplifying this infrequent but potentially powerful placement of an auxiliary domain within a traditional NRPS domain, a more efficient biological tool is engineered for drug discovery through natural product biosynthesis.

Computer Science

Haden Pike  
Mentor: Jerzy Jaromczyk

*Sonified Diagram Project: Providing Low-cost Audio and Tactile Access to Graphics for Blind and Vision Impaired Science Students*

In courses such as Physics or Circuit Design, diagrams are essential to understanding and solving problems, and accessible design of supporting tools for learning is critical to the success of blind and vision impaired science students. The Sonified Diagram Project consists of a mobile device application and the associated research platform. The application, which runs on the Android platform, is designed to convey the information contained in a scientific diagram using audio and vibration. The research platform, which is the focus of this presentation, involves the design, implementation, and integration of web tools for collecting and providing data into a single web site.
Oral Abstracts

Ethan Toney  
Other Authors: Cody Barnes  
Mentor: Jerzy Jeromczyk

*Network Architecture Comparison for Solar Cars*

When designing a Solar Car an important factor that plays a role in almost every part of the car is the network architecture. The network architecture is the framework for the communications on the car. For our purposes this is the means in which we transfer data from one device to another and the protocols that make this happen. Some limitations that must be taken into account when deciding on an architecture is power consumption, reliability, ease of use, and complexity. The systems (a system being all the components that make up an architecture) that this study will focus on are USB, Ethernet, and CAN. Each system will be implemented on the car. Implementation consists of writing the code for the Battery Protection System (BPS) and Raspberry Pi (the device collecting the data) in addition to adjusting the hardware to be compatible with the new system.

Economics

Jonathan Elliott  
Mentor: Jenny Minier

*Education and the Resource Curse: Cross-Country Evidence*

In a developing country heavily dependent on a specific commodity, an increase in the price of that commodity may have two competing effects on education: higher revenues may allow for more funding of education (a revenue effect), while higher returns to unskilled labor in the commodity sector may decrease demand for education (an opportunity cost effect). We examine these competing mechanisms in a panel of developing countries dependent on commodity exports to gauge the overall effect of a commodity price shock on education in a country reliant on exporting that commodity.

Journalism

Samantha Rogers  
Mentor: Scoobie Ryan

*The Rise of the Advertorial: How Paid Content is Changing the Media World*

As the media industry continues to transition from print newspapers and magazines to online news platforms, publications are beginning to search for other viable sources of income. Though once profitable, print advertisements are on the decline. Advertisers today are less likely to spend money on these, opting instead for the digital route. However, digital advertisements have not been quite as profitable as one might have expected. In response, the advertorial (also known as native advertising) has surfaced as one of the newest sources of revenue for the media world. Yet because it is paid content (stories designed to resemble news articles, but whose content is biased in order to benefit the advertiser), this system has been widely criticized. In an industry where credibility is king, advertorials (theoretically, at least) undermine a news outlet’s ability to accurately report the news to its readers. While the negative effects may vary based on the type of publication considered (corroborated in this paper by personal experiences and internships in the media world), they add up to negate the industry’s overall credibility with its audiences. Despite these reservations, in conducting research as to the history of the advertorial (confined to the print media), as well as consulting with industry experts at the local and regional levels as
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to the success of such a system, it appears as if paid content is on track to become the future of the media world. In addition, a survey was administered to several groups of undergraduate students (introductory journalism majors in JOU 101 this spring semester and a group of Lewis scholars) at the university to discover their familiarity with paid content. It is predicted that these men and women will not be able to identify a native advertising headline from an editorial one.

Modern and Classical Languages

Logan Hurley
Mentor: Ihsan Bagby

Islam and Speech and Debate: An Exploration Into Why Muslims Leave the Forensics Community

The world of collegiate speech and debate has a problem concerning their inclusion of Muslims. While the community's many institutions are implicitly and explicitly founded upon the ideal of inclusion and diversity, any nationally aligned competitor or coach could speak to the failure to meaningfully include Muslim competitors among the otherwise significant inclusion of different genders, races, and religions. Despite this concern, there exists no published research attempting to understand the perspectives of Muslims who have interacted with forensics. To remedy this, the researcher employed a methodology of asking a sample of former and active Muslim competitors about their perspectives on racism and Islamaphobia in the community, as well as other possible considerations suggested by other research. While the data set was limited, due to the nature of the project, significant breaks between familial-cultural values and the values of the forensics community, as well as a strong family-based motivation to engage in activities competing for the time which would be put into speech and debate preparation are implicated.

Pharmacology and Nutritional Science

John Cooksey
Other Authors: Syleena Schmitke
Mentor: Florin Despa

Effects of amylin dyshomeostasis on brain vasculature

We recently found that brain tissue from patients with type-2 diabetes (T2D) and cognitive impairment contains deposits of amylin, an amyloidogenic hormone synthesized and co-secreted with insulin by pancreatic Î²-cells. Amylin deposition is promoted by chronic hypersecretion of amylin (hyperamylinemia), which is common in humans with obesity or pre-diabetic insulin resistance. Human amylin oligomerizes quickly when oversecreted, which is toxic, induces inflammation in pancreatic islets and contributes to the development of T2D. Here, we tested the hypothesis that accumulation of oligomerized amylin in brain vasculature affects brain function. In contrast to amylin from humans, rodent amylin is neither amyloidogenic nor cytotoxic. We exploited this fact by comparing rats overexpressing human amylin in the pancreas (HIP rats) with their littermate rats which express only wild-type (WT) non-amyloidogenic rodent amylin. Amylin deposition in the brain vessels and capillaries was documented by immunohistochemistry and immunofluorescence. Compared to WT rats, HIP rats overexpressing human amylin in the pancreas (HIP rats) with their littermate rats which express only wild-type (WT) non-amyloidogenic rodent amylin. Amylin deposition in the brain vessels and capillaries was documented by immunohistochemistry and immunofluorescence. Compared to WT rats, HIP rats show reduced exploratory drive, impaired recognition memory, and no ability to improve the performance on the rotarod. The development of neurological deficits is associated with amylin accumulation in the brain vessels and capillaries. Accumulation of oligomerized amylin vessels and capillaries alters the brain structure at the molecular level. Immunohistochemistry analysis confirmed that amylin deposition in the brain vasculatures induces a neuroinflammatory response. Hyperamylinemia promotes accumulation of
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oligomerized amylin in the brain vasculatures leading to neurological deficits through an oligomerized amylin-mediated inflammatory response. Additional studies are needed to determine whether brain amylin accumulation may predispose to cognitive decline.

Political Science

Kendall Hitch
Mentor: Clayton Thyne

Democratic versus Authoritarian Coups: The Influence of External Actors on a State’s Post-coup Political Trajectory

Though once left aside as an artifact of history, research on coups has burgeoned in recent years. Most studies focus on the decision to stage a coup, considering factors like individual benefits, organizational interests of the military, and the legitimacy of the government. Thus far, far less work has considered what happens after a coup. The purpose of this paper is to consider the long-term political trajectory of states following a coup, focusing specifically on coups that overthrow authoritarian regimes. We argue that external reactions to coups play an important role in whether coup leaders keep power and move towards authoritarianism or yield power to civilian, democratic governance. When supported by external democratic actors, coup leaders have an incentive to push for elections to retain external support and consolidate domestic legitimacy. When condemned, however, coup leaders are apt to reach out to authoritarian states for support and consolidate power to assure their survival. We test our argument using newly-collected data on international responses to coups to better understand post-coup levels of democracy. Our preliminary findings support the idea that international actors play a key role in determining whether a coup results in authoritarianism or democracy.

Theater and Dance

Alyssa Conley
Mentor: Susan Thiel

Connections: Understanding Alzheimer's Disease through Dance

New scientific strides made every day by researchers are obscured by scientific jargon from the general population. A dance piece that will illustrate the scientific processes of Alzheimer’s disease and the human experience of these diseases will be created. The purpose of this dance performance is to educate audiences about both the scientific and emotional aspects of this disease. The research is inspired by Liz Lerman’s Dance Exchange, a dance company which performed Ferocious Beauty: Genome. This dance piece depicts genetic engineering combining didactic movement, projections, and voiceovers by professors to teach the audience about the subject matter. For the proposed project, the student choreographed a piece set in two sections to be performed by four dancers who know someone with Alzheimer’s disease. Section one will creatively present Alzheimer’s disease using dance performance, drawing inspiration from anatomy, images generated in a laboratory, and physiology of the nervous system. The second section will present the impacts of Alzheimer’s disease on people and emotions associated with the experience of the disease. The creative process for this piece is two-fold. First, dancers will emulate scientific mechanisms for physiological brain function and dysfunction to generate movement material to teach to my cast. Second, the dancers will receive creative writing prompts to journal about their individual experiences with Alzheimer’s disease to portray the personal side. This creative presentation of research will provide the audience with enhanced understanding of both scientific mechanisms and the human impact of research in this field. This will support the researcher’s assertion
that art can be used as both an educational medium for science and as an expressive medium for societal implications and emotions simultaneously to allow an audience to connect to subject matter.

**Veterinary Science**

**Rachael Lowney**

Mentor: James MacLeod

*Histological and Quantitative Analyses of Induced Chondrogenesis in Different Cell Types*

Articular cartilage provides biomechanical properties that enable joint movement. Due to its limited capacity for regeneration and repair, osteoarthritis degrades the articular surface causing pain and reduced joint mobility. Emergent cell-based therapies that utilize adult chondrocytes or adult mesenchymal cells have generated a high level of interest, but fail to fully restore articular cartilage. The repair tissue generated is a biomechanically and functionally inferior fibrocartilage. In an effort to improve cell based therapies we are studying embryonic cells that are the natural progenitors of articular cartilage and other synovial structures. In Axolotl salamanders, we have shown that these ‘interzone’ cells can fully repair large structural lesions of cartilage that involve the joint surface. The current study compared the capacity for chondrogenic differentiation among different equine cell lineages including adult adipose derived cells, adult bone marrow derived cells, embryonic interzone cells, and embryonic anlagen chondroblast cells. The cells were grown in three dimensional cell pellets under chondrogenic induction conditions for 21 days. The pellets were fixed, sectioned, and stained with Safranin O-Fast Green for proteoglycan assessment. Total RNA was extracted for gene expression analysis by RT-qPCR. The data demonstrated that embryonic anlagen chondroblasts produced the highest level of proteoglycan staining and matrix production when analyzed with a Redness Value determination. This finding, together with chondrocyte morphological features, was confirmed with a Bern Score assessment. Steady state aggrecan and collagen type II mRNA levels were used as biomarkers of chondrocyte gene expression and were quantified relative to normal articular cartilage tissue. The results demonstrate high expression of both aggrecan and collagen type II, supporting the chondrogenic differentiation potential of embryonic anlagen chondroblasts from the developing skeletal elements. This information will be used to improve cell based therapies for articular cartilage repair in both congenital and acquired articular cartilage defects in synovial joints.
Table Abstracts

Biology

Alec Strieter  
Other Authors: Kayla Smith, Andrew Stewart, Kyle Craig  
Mentor: Ashley Seifert, Thomas Gawriluk

*Appendage Regeneration in Manduca Sexta*

Regenerative ability is widespread across the animal kingdom but it is unevenly distributed. Most holometabolous insects (such as butterflies, moths, beetles, etc.) do not possess the ability to regenerate appendages as adults. Surprisingly, little is known about regenerative ability in these insects prior to metamorphosis. This study tested the regenerative ability of larval tobacco hornworms, Manduca sexta. Caterpillars of similar stage were housed in pairs and tested for regeneration in one of four appendages: 1) true leg, 2) proleg, 3) hind leg and 4) horn. A single appendage was amputated per individual and uninjured appendages served as controls. It appeared that the true legs regenerated fully. While the new leg was smaller in size compared to uninjured legs, it was functional. The proleg tended to regrow the distal claw structure; however, the proximal structures appeared to be absent. In contrast to the true legs and prolegs, the hind leg and horn appeared to have little to no regrowth. The question remains why some appendages appear to regenerate over others. The answer could vary from appendage importance and functionality, or gene expression and cell types present within the different appendages. Thus, Manduca sexta are exceptional in having the ability to regenerate true legs prior to pupation and can provide insight into regeneration.

Classics

Hayley Harlow  
Mentor: Robert Rabel

*Historic Preservation: Museums and Archives*

“History is not a burden on the memory but an illumination of the soul” -Lord Acton. Whether or not one agrees with this statement, one cannot deny the certainty of the latter half for those who have dedicated their lives to the preservation of history in its many forms. Recording history and the subsequent perpetuation of the knowledge that it provides is fundamental in how people form the context of their realities and approaches to the future. Thus, it is important to preserve the past in whatever tangible form one may find it. A material world exists, however, with decay and deterioration. Can one preserve the ideas, works, and discoveries of past generations forever? Museums and archives do their best to organize a host of historic items such as paper based documents, art, and artifacts within optimum environments that are not subject to chemical decay and minimize damage overall. What can be done to better the status quo, and to what extent is it possible? In order to gain insight into this issue and obtain results, this research examines a four week study in San Gemini, Italy, analyzing an established procedure for repairing paper-based documents almost entirely by hand. It explores the relationship between human capabilities and the role of technological innovation on both practical and theoretical levels. Technology advances our capabilities given the proper funding, but not without human direction based upon theory. A proper awareness of conservation methodology from personal experience and study must remain at the core of historic preservation. Every object is different, and while there are guidelines, every procedure is an experiment itself and a rediscovery; there are no perfectly clean categories. Historic preservation is as vital as it is uncontrollable, a conclusion imperative to advancing the museum and archival fields.
**Table Abstracts**

**Computer Science**

**Arthur Silveira**  
Other Authors: Darren Curry, Ethan Toney  
Mentor: Jerzy Jaromczyk

*Laser Projector*

The Laser Projector is a project that brings together computer science, electrical engineering and computer engineering. It utilizes rather simple geometry to manipulate the light emitted by a laser pointer - allowing us to project images onto almost any surfaces. This is achieved by two Galvanometers which redirect the laser beam, moving it on an X and Y-axis. These Galvanometers are controlled by drivers which are in turn controlled by an Arduino micro-controller. The Arduino is programmed using the arduino language which is just a dialect of the C programming language. Even though there was a lot of electrical and computer engineering involved in the construction of the Laser Projector, Computer Science is at the core of this project. By using programming we build various applications which control the components of the projector in different ways. These applications can be written in any language and simply call upon the C library we have built to perform the at tasks needed to render images with the projector. UK ACM members have worked together on building the Laser Projector and are currently trying come up with ways to improve its performance and Developing a design which can be used as an educational tool for younger Computer Science students.

**Bryce Tate**  
Mentor: Jerzy Jaromczyk, Neil Moore

*Entertainment at Your Fingertips: An Arduino Powered Home Theater*

Does your Netflix always freeze and buffer? Do you have too many remotes to control your television? I have a solution for you. This system that I have designed consists of a personal computer (PC), an Arduino microcontroller board, and some programming. The computer stores all your media locally on its hard drive. The Arduino is connected to the computer via a USB cable and is linked to Infrared (IR) transmitters, or LED's. The user can navigate an easy to use graphical user interface (GUI) to pick from a selection of media. The system can work with all your media center equipment- anything with a remote control. This is accomplished by sending infrared codes over the serial connection to the Arduino, which then the Arduino turns the codes into a pulse width modulation (PWM) signals for the Infrared transmitters on the front of the devices. The user only has to have the keyboard to control all of the devices. Any key on the keyboard can be programed to send any IR signal or even a sequence of IR signals. This system does not require a monthly fee, like Netflix does. The cost of the Arduino and Infrared transmitters is around fifty dollars, which is very affordable compared to existing universal remotes for a home theater or entertainment system. The project has been developed as a part of the mentoring program in the Computer Science Department of the University of Kentucky.
Table Abstracts

Marketing

Andrea Bomkamp
Mentor: John Peloza

To Err is Human: Consumer Perceptions of Service Quality

This research seeks to identify and examine factors that influence consumer responses to service failures. Given the service sector’s importance in the United States economy, it is imperative that firms are able to predict consumers’ reactions to inevitable employee mistakes and mitigate the negative effects of such failures. Although service recovery is well studied, the effect of recovery mechanisms such as employee excuses is relatively unknown. This study included 170 participants in an experiment featuring a 3 (Service Quality: good, poor without excuse, poor with excuse) by 2 (Server: attractive or unattractive) between subjects design. The study finds that tip percentage does not significantly differ when comparing a good service encounter and a bad one in which the server provides an excuse. However, when examining repeat purchase intentions across the server attractiveness conditions, the results show that consumers who receive poor service report higher repeat purchase intentions when they’ve been attended to by an unattractive server than an attractive server. This is surprising given that the literature of salesperson attractiveness would suggest the opposite. The underlying mechanism for this effect provides an avenue for further research.

Psychology

Miranda Cruse
Mentor: Susan Barron

Can DMXB-A Reduce the Damaging Effects of Prenatal Ethanol Exposure on Spatial Learning in Rats?

Fetal Alcohol Spectrum Disorders (FASD) can cause a range of behavioral and cognitive disabilities that have long-term effects for the individual, his or her family, and society at large. Studies have shown that choline, a precursor of acetylcholine (ACh) and an alpha-7 nicotinic ACh receptor (nAChR) agonist, can reduce some of the damaging effects of prenatal ethanol (ETOH) exposure. Choline plays a number of critical roles during early CNS development and so to better understand the possible mechanisms for its neuroprotective effects, the current study used a more specific alpha-7 nAChR agonist, 3-2,4 dimethoxybenzylidene anabaseine (DMXB-A). This study examined whether DMXB-A, could improve spatial learning and memory following ethanol (ETOH) exposure during the third trimester brain-growth spurt in a rodent model. ETOH was administered (6 g/kg/day) on postnatal days (PND) 1 through 7 and a DMXB-A dose (0 or 10 mg/kg) once on PND 8. Offspring were tested in a Hebb style water maze for acquisition and 24 hr retention during early adolescence. ETOH exposed male rats needed significantly more acquisition trials than the control to learn the task, but the group that received ETOH+DMXB-A did not differ from controls (p=.001). DMXB-A alone had little effect on acquisition. No treatment effects were displayed by females from these neonatal groups, nor in 24 hr retention for either males or females. These results support our hypothesis that DMXB-A reduces deficits in acquisition of a spatial task in male rats. Further research is ongoing to see if these results generalize to other behaviors. (Funding was contributed by a pilot grant program from University of Kentucky.)
Empowering Students to Perform at a Higher Standard, the Marching Arts and Lifelong Success

Arts in education has long been debated on the grounds of necessity for educational and professional success. Ten years, three programs, twenty-four different marching productions, and a world of experience have influenced a strong and personal advocacy for the arts in higher education, specifically the marching arts. The marching arts include: competitive high school marching band, athletic show band, parade band, Drum Corps International and Associates drum and bugle corps, Winter Guard International indoor percussion, guard, and winds, and college and university marching band. Creating challenging and logistically sound visual programs for high school and college age ensembles is key to empowering students to perform at a higher standard in every aspect of their lives. With funding for arts programs being cut across the nation, marching arts designers must support current programs through a well-designed and achievable visual package. This goal requires extensive knowledge of major design software, acoustics of sound and ensemble balance, limitations of the human body, and systematic judgment of group-specific needs. The presented five-minute visual package includes percussion, winds, color guard, and front ensemble and is a direct result of immersion in software usage and group dynamics. This final product is a culmination of independent and guided research, trial and error software experience, and preset large ensemble parameters. Building a marching arts program around a well-designed visual package allows students to focus on the lifelong lessons ingrained in the experience itself: teamwork, commitment to excellence, perseverance, and reward. These lessons spill over into character traits often desired by future employers, professors, and major universities thus setting marching arts students up for success in the post-secondary education and professional world.
**Poster Abstracts**

**Anatomy and Neurobiology**

**1A. Abigail Weber**  
Mentor: Andrew Deane

*Old World Monkey Incisor crown wedging and diet: The Cercopithecoids stand-alone*

Diet is one of the most basic and fundamental ecological parameters defining living primate species. Although field studies identify living primate diets, fossil primate diets must be inferred indirectly from dental morphology and wear. Any detailed understanding of the ecology and evolution of fossil primates relies on the accuracy of dietary reconstructions of fossil taxa. The more accurate the interpretations of a taxon’s diet and feeding adaptation, the greater will be the potential for that information to contribute answers to research questions about why these taxa evolved, what made them successful in some cases, and extinct in others, and the connection between diet and the origins of the lineages of living primates. Previous analyses of hominoid (ape) and platyrrhine (new world monkey) incisal wedging (i.e. the angle formed by the labial and lingual crown surfaces to form the biting surface of the tooth) demonstrate a positive correlation between narrower (i.e. smaller angled) incisal margins and folivory, however this has yet to be explored in cercopithecoids (old world monkeys). This research examines the maxillary central and lateral incisors from a sample of 86 cercopithecoid individuals representing 19 separate genera. All cercopithecoids were identified as being predominantly frugivorous (i.e consuming > 50% fruit annually) or predominantly folivorous (i.e. consuming > 50% foliage annually). Results failed to identify any statistically significant variation in the upper central incisor sample, although foliviore have slightly larger apex angles in the maxillary lateral incisors. This differs from study predictions and prior analyses of the hominoid and platyrrhine samples and is most likely a consequence of more restricted dietary variability among cercopithecoid primates relative to platyrrhines and hominoids (i.e. more overlap in dietary use of fruit and foliage). These results demonstrate that caution must be applied when using apex angle to reconstruct the diets of fossil anthropoids.

**1B. Sabita Dumre**  
Mentor: Luke Bradley

*Screening of a Peptide Library for a Neuroprotective Binding Target*

Emerging evidence has shown that the well-known glycolytic enzyme, glyceraldehyde-3-phosphate dehydrogenase (GAPDH), interacts with numerous binding partners in the cell to perform a wide range of functions, including the mediation of cell apoptosis. The subsequent identification of small molecules that inhibit apoptosis and provide neuroprotection in cell culture and animal models, through their binding interaction with GAPDH, suggests that this protein may be a potential target for the treatment of neurodegenerative disorders. With the emergence of combinatorial library design and screening strategies, peptides provide an attractive scaffold to select individual sequences in the laboratory with desired interactions with a defined target, from a large collection of candidate sequences. In this project, we utilized phage display to screen trillions of unique peptide sequences for interactions to GAPDH. Multiple rounds of biopanning and amplification enriched the library over 10 billion-fold for binders to GAPDH. Preliminary analysis of selected peptide sequences has identified members known to interact with GAPDH, as well as novel sequences which could elucidate other cellular interactions as well as possibly be considered candidates for future cellular neuroprotective studies.
Poster Abstracts

**Animal Science**

1C. Haley Reichenbach  
Mentor: Barbara Wadsworth, Jeffrey Bewley

*Comparison of DX613 Copper Sulfate Acidifier to a 5% Copper Sulfate Footbath for Prevention of Digital Dermatitis Lesions in Dairy Cattle*

The objective of this study was to compare a 2.2% copper sulfate footbath with 325.31 mL of DX613 Acidifier (treatment; GEA Farm Technologies, Naperville, IL) to a 5% copper sulfate footbath (positive control) on the frequency and severity of digital dermatitis (DD). Footbaths were delivered via a split footbath (Intra Care Foot Bath, Diamond Hoof Care LTD Alberta, Canada). A metal coil separated the two footbaths to prevent cross contamination of solutions and decrease organic matter contamination. The left side of the bath served as the positive control and the right side as the treatment. Baths were refreshed every two to three milkings, twice weekly. The study was conducted at the University of Kentucky Coldstream Dairy from November 11, 2015 to January 20, 2016. Holstein (n = 59) cows were housed in two freestall barns and balanced for parity and days in milk. The cows were exposed to the solutions upon leaving the parlor after morning and afternoon milkings, five times per week. The DD lesions were scored as active lesions or non-active lesions. A Chi-Square test calculated using the FREQUENCY procedure of SAS (SAS Institute, Inc., Cary, NC) indicated no-significant difference between the two solutions (chi-square = 1.18, P = 0.56). Eleven percent of treatment cows had active lesions and 9% of positive control cows had active lesions. A McNemar’s test indicated significant differences in the prevalence of lesions from the beginning to end of the study (treatment: P < 0.05, positive control: P < 0.01). This concludes a comparable effectiveness of both solutions. Given the potential for reduced environmental impact, the DX613 Acidifier may be a viable alternative for dairy producers.

**Anthropology**

2A. Elise McConnell  
Mentor: Sarah Lyon

*Community Development and Intercultural Understanding at the Shawneetown Community Garden: Exploring Garden Benefits, Sustainability Discourses, and Gardeners’ Feedback*

For years, anthropological and environmental researchers have studied the contributions of community gardens to education, health, community development, and sustainability; however, community gardens within institutional contexts such as universities are not as well understood (Andreatta 2015, Armstrong 2000, Ferris et al 2001, Glover 2003, Irvine et al 1999, Kingsley et al 2009, Twiss et al 2003). This paper explores the results of an ethnographic study of the Shawneetown Community Garden at the University of Kentucky, which investigated the social, cultural, and economic benefits of the garden. This community garden is particularly interesting given that it serves the residents of the Graduate and International Family Housing. Consequently, participating gardeners are multi-generational and culturally diverse. The primary research goal was to explore how the garden fostered community development and intercultural understanding. In addition, the study gathered gardeners’ thoughts about sustainability and suggestions for improving the garden. Information was collected through participant observation at garden-related events and open-ended, unstructured interviews with Shawneetown gardeners, who were selected through convenience sampling. Research results shed light on the role that community gardens can play in fostering intercultural understanding alongside community development, especially within institutional contexts.
Poster Abstracts

2B. Shauna Rust
Mentor: Erin Koch

Thoroughbred Trainers in Lexington, Kentucky

This project provides an ethnographical look at the community surrounding thoroughbred racehorses in the Lexington area. Thoroughbreds have a significant impact on the culture and economy in Kentucky, but the people involved in their care and performance are often overlooked. This project researches the background, experiences, and values of those who train racehorses in the area. By conducting field observations and interviews, and through the interaction with anthropologic literature, the author presents an in-depth view of the culture surrounding Thoroughbred trainers in Lexington. Using anthropologic research methods, the author engaged in participant observation at multiple field sites including breeding farms and training tracks. In addition, interviews with trainers and owners were conducted. Interview transcripts and field notes were then coded and integrated into a finished ethnography. Several completed anthropologic ethnographies were also consulted and their conclusions incorporated into this project. The result is a written ethnographical analysis of the community of trainers working with thoroughbreds in the Lexington area.

Architecture

2C. Kevin Bloomfield
Mentor: Nikiforos Stamatiadis

Qualitative GIS Mapping of Communities for planning and Implementation of Bicycle Route Facilities

The impact bicycle paths and other facilities have on a community is difficult to predict. Traditional methods rely on quantitative techniques that by their very nature produce raw numbers for interpretation. This methodology is incapable of addressing the human lived character of a community. For at least this reason the relative success of bicycle urban infrastructure, such as bike paths and bike racks among others, do not always coalesce with the communities they are meant to serve. Using Geospatial Information Systems, it is possible to map the physical community as a way of highlighting potential networks by activity. Network mapping alone produces little more than a quantitative foundation; however, overlaying qualitative information begins to illuminate relationships specific to the community’s needs. It becomes clear which routes are better, who uses them, and in what ways these discoveries relate to local organization development master plans. This research was focused on two concepts. The first was defining what network aspects of a community are required as a way to create parameters. Careful consideration was taken to identify physical urban conditions as well as the potential networks they create. The second was to define and interpret qualitative influence on those existing physical conditions. In conclusion this process was tested on Martin Luther King Blvd. as a case study street in Lexington, Kentucky. More importantly, this project establishes a new methodology for urban planners tasked with measuring the impact of incorporating bicycle transportation into a community’s urban fabric.
Poster Abstracts

3A. Sommer Cade  
Mentor: Jordan Hines, Stacie Williams

*Modeling History: A New 3-d System of Digitizing Architectural Archives*

The current system of digitizing archives attempts to cater to a wide range of users, but has not yet specified its system to researchers in the design field. The traditional system was not set up to access architectural drawings and has difficulties transferring architectural information to a wider audience. Traditional digitization uses a scanning process to produce an image file. This process allows researchers to see the material while still conserving the archive, but is not best for all subjects. With a new influx of architectural archives, the traditional system must be adapted to serve the design world. The goal is to connect the dots between archive, architecture, and historic preservation by catering a new digitization system; expanding the reach of archive to a new set of users. The current system of digitizing archives is a two-part process: accessing and scanning. However, an additional step would be best for architectural information, producing a 3-d digital model of the project. This digitization would allow all information from the traditional system to be packaged into one file, able to be adapted to a specific user. A case study is digitized to test the process of this new system of 3-d archive digitization, exposing the possibilities for information to be readily available and tailored to design students, historic preservationists, professors, and professionals. This new system produces a 3-d digital model, drawings (at any scale), and diagrams of the of the business model and thought process behind this system. This case study has enabled a discussion of new forms of archival systems that connect new user groups from a diverse range of fields to new forms of digitally driven 3-d archival modeling.

**Behavioral Science**

3B. Justin Cornett  
Mentor: Yang Jiang

*Effect of Induced Stress on Test Taking Performance and Brain Responses*

College exams are known for causing stress for nearly all students. Stressors such as exams may or may not decrease an individual’s multiple choice test taking skills. The brain uses executive functioning to process information. Executive functioning is controlled by the frontal lobe and helps an individual pay attention, remember details, and switch focus. The objective of this study is to test the hypothesis that induced stress will decrease an individual’s performance on a multiple choice test. To test the hypothesis, participants (University of Kentucky students) are asked to complete two multiple choice tests, under stress and no-stress conditions. The participants will have 10 minutes to complete Test A, before taking Test B (each having the same number of equally challenging questions). Brain activities (scalp EEG) are recorded for approximately 2 minutes during performance of Test A and Test B. To induce stress, participants are prompted verbally to imagine a stressful situation, e.g. Test B is of equivalence importance as The MCAT, DAT, ACT, etc. Immediately after induction, he/she will take Test B with a time constraint of 5 minutes. The data collection is underway. Both behavioral performance and brain activity results will be analyzed during induced stress condition and no stress control. The order of induced stress and no stress conditions are counterbalanced between human participants. We expect that under the induced stress state, the participants will have a decreased performance on the multiple choice test and altered brain responses.
**Poster Abstracts**

**Biochemistry**

3C. Eve Aldridge  
Other Authors: John Davis  
Mentor: Stephen Testa

*Developing a Freshman Chemistry Murder Mystery Laboratory: Using Redox Reactions to Identify DNA Nucleotides*

The transition metal manganese (Mn) can exist in wide variety of chemical states, which results in manganese-containing solutions turning a wide variety of colors. The individual colors can be correlated with the chemical states (oxidation states) of manganese when it interacts with other molecules. In fact, the ensuing color change can be used as a visual indicator of the chemical change of the interacting molecules. In last year’s STEMcats experience, the students in the Testa lab used this basic information to find reaction conditions whereby each of the four monomers in DNA (A, T, C, and G) become different colors when added to a potassium permanganate (KMnO4) solution. This information was used to improve a first semester, freshman general chemistry laboratory experiment at The University of Kentucky. This experiment uses the different oxidation states (and hence colors) of manganese interacting with the four DNA monomers to identify suspects in a simulated murder mystery. However, two major problems remained. First, some of the colors were hard to distinguish from each other. For example, the color of C is a shade of purple that is very close to the negative control (permanganate alone). In addition, the original protocol used dissimilar concentrations of the different nucleotides, which makes the lab more difficult to set up and to interpret. During this semester’s STEMcats experience, the purpose of our research project was to solve each of these problems, which we did by altering the buffer solutions, the pH of the reactions, and by using less potassium permanganate in each reaction. These changes will be incorporated into the freshman chemistry laboratory protocol for the fall 2016 semester.

**Biology**

4A. Sami Abul-Khoudoud  
Mentor: Yang Jiang

*Food for Thought: The Effects of Nutrition on Brain Activity During Attention Tasks*

As human beings, we are constantly striving to achieve our maximum potential. Through an understanding of what types of nutrients are necessary to heighten our cognitive capacity, we can approach this maximum potential to a greater degree. Although there have been extensive studies performed to determine the differential cognitive effects presented by the digestion of varying types of nutrients by an individual, a relatively small amount have focused on how these nutrients have affected the processing speed of an individual’s brain. This study aims to develop a relation between the type and amount of macronutrients ingested by an individual and their cognitive processing speed via the use of EEG action potential analysis and the Stroop Test. Participants were given a meal prior to the test consisting primarily of different macronutrients, with a group testing a sugar-heavy meal and a protein-heavy meal with a fasting group acting as the control. The participants were given a Stroop Test at ten minute intervals over the span of thirty minutes for three minutes each in order to measure if their cognitive speed has changed from an initial baseline test that they had taken in order to determine the effects of the food on their cognitive speed. Wireless EEG and behavior task performance data collection is in progress, and results are pending. We expect to find differential brain activity patterns under the two nutrition conditions. It is predicted that the sugar-meal participants will have the greatest success in the early portions of the test and decrease in speed over time and the protein individuals will have the most
Poster Abstracts

consistency in reaction speeds throughout the test. This will be indicated by differential response times and/or accuracies in the Stroop Test.

4B. Nick Ackley
Other Authors: Tyler Butsch
Mentor: Doug Harrison, Michelle Giedt

*The Role of the Pox Neuro Gene in Reproductive Life Span of Drosophila Melanogaster*

As animals age their reproductive abilities begin to slowly degenerate. Both genetic and environmental factors contribute to reproductive lifespan. To determine the genetic contributions, a genome-wide association study (GWAS) for male reproductive lifespan was performed on lines from the Drosophila Genetic Reference Panel (DGRP), a collection of inbred, wild-derived strains that have been fully sequenced. From this GWAS, a number of variants were found that may be associated with reproductive lifespan. One of the candidate variants is found in the Pox neuro (Poxn) gene. Poxn functions during development of genitalia and olfactory neuronal wiring, and influences courtship behavior. Effects on any of these traits might affect reproductive lifespan. To determine if Poxn is responsible for some of the variation in reproductive lifespan from our GWAS, we have counted chemosensory bristles from adult male flies, comparing between lines carrying the major and minor alleles at the candidate Poxn locus. Chemosensory bristles play a role in courtship by detecting pheromones produced by females. We believe having more chemosensory bristles has a positive effect on reproductive lifespan. Now we are focusing on RNAi induced reduction of Poxn expression to determine how reproductive lifespan is affected. Because RNAi reduction of Poxn expression will not be induced until adulthood, we will be able to determine if Poxn affects reproductive lifespan strictly during development, or if it plays a role in adulthood. We expect that flies expressing normal levels of Poxn will have longer reproductive lifespans than flies with reduced Poxn expression. Results of chemosensory bristle number counts and Poxn knock downs will be presented.

4C. Michael Adams
Mentor: Jeffrey Bewley, Karmella Dolecheck

*A Validation of a Dairy Cow Feeding Time Monitoring Technology by Human Observation*

Accurate feeding time data has the potential to increase dairy farm efficiency through improved dairy cow welfare and management. The objective of this experiment was to conduct a non-inferiority test between human observation of feeding time and feeding time data collected via an automated monitoring technology. It was hypothesized that data collected through an automated monitoring technology would be accurate and agreeable with the visual observations of feeding time. The study was conducted during March and April of 2016 at the University of Kentucky Coldstream Dairy Farm. Researchers used an ear mounted accelerometer to automatically measure and record the feeding time of approximately 30 lactating, Holstein dairy cows. Visual observations of feeding time were recorded by 11 observers who contributed 3 or 4, one-hour observations each. The data from human observation and the data collected by the automated monitoring technology will be compared using an excel correlation chart. It is predicted that the correlation between human observation and technology collected data will be positive, with an R2 between 0.7 and 0.8. If that holds true, automatically monitored feeding time is an accurate measure that can be used for dairy cow management decisions.
Poster Abstracts

5A. Amal Agarwal
Other Authors: Holly Grajera
Mentor: Bruce O'Hara

Effect of Individual Alpha Frequencies on Reaction Time improvement after Meditation

Previous studies have shown improvements in reaction time immediately following periods of meditation, which may be due to changes in the predominant brain rhythms, as assessed by the Electroencephalogram (EEG) which reflects neuronal activity in the cerebral cortex. The alpha rhythm consists of oscillations with frequencies in the range of 8-13 Hz. This alpha rhythm is predominant in the EEG power spectrum during restful meditation. Individual variation has been observed in alpha rhythms with a strong relationship between higher individual alpha peak frequencies and superior working memory performance and faster information processing. In a previous study, a short term performance boost was observed after meditation even in novice subjects. The aim of this study is to understand the neuronal activity in the cortex during meditation and its effect on subsequent performance. Subjects underwent 20 minute bouts of meditation while the EEG recordings were done, and reaction time performance was measured for 10 minutes using a psychomotor vigilance test (PVT) before and after this meditation bout. The hypothesis for the study is that individuals with higher alpha peak frequencies will have more improvement in reaction time performance after meditation. So far, EEG and PVT recordings have been done in 15 subjects and we are still in the process of analyzing the data. Results from data for all subjects with relevant statistical analyses will be presented.

5B. Sarah Anders
Other Authors: Rachel Harp, Nicholas Widrig, Robert Larson
Mentor: Bruce O'Hara

Effect of Meditation Duration on Performance

Focused attention (FA) meditation has been widely used across many cultures as a method of focusing the mind. Previous research has shown significant improvement in short term performance measures after meditation in both novice and experienced meditators. The use of electroencephalogram (EEG) while subjects are meditating allows monitoring of brainwave activity. The fact that meditative states are associated with high alpha and theta wave activity in the EEG has been well documented for several decades. However, what effect (if any) this has on performance is unknown. The aim of this study is to investigate the efficacy of meditation for longer (20 minutes) and shorter (5 minutes) durations in novice meditators. Meditation was done with eyes closed and focused breathing for 20 minutes, with EEG measurements to assess brain activity, depth of meditation, and any signs of sleep. All subjects were undergraduate students at the University of Kentucky. Psychomotor Vigilance Tests (PVT) were performed by all subjects before and after meditation. PVT involves the subject responding to a light or sound stimulus by clicking a button on a monitor. The results are recorded as reaction time (RT) in milliseconds (ms). All subjects were novice meditators with limited or no exposure to the practice. The hypothesis being tested here is that novice meditators have difficulty to maintain higher alpha power and may have better performance following shorter rather than longer meditation bouts. 9 subjects took part in the study and PVT recordings were done before and after 5 and 20 minutes of meditation. A significant improvement in Reaction Time measurements was seen for 5 minute meditation (p=0.03). A complete set of data and relevant statistical analysis will be presented.
5C. Sloan Anderson  
Mentor: Vincent Cassone, Jiffin Paulose  

*Effects of Age on the Gastrointestinal Microbiome*

Current research on the effects of aging on gene expression patterns showed that genes such as clock genes and inflammatory response genes are not affected by age, however, melatonin biosynthesis gene expression patterns are. This experiment looked at how age affects gene expression patterns in the gastrointestinal microbiome of mice as the relationship is not well documented. It is hypothesized that microbial expression rhythms of abundance within the gastrointestinal microbiome are decreased in aged mice. In order to test this hypothesis digested fecal samples for quantification of gut bacteria within mice were obtained from three different groups labeled Young, Middle, and Old based upon their age and replicated over five different groups placed in a diurnal environment, for the purposes of maintaining a regular circadian rhythm. Genomic DNA from the fecal samples were analyzed through the use of quantitative real-time PCR (qPCR) to quantify levels of 16s RNA copies within the samples. The results of the qPCR reactions were compared against each other to find any relationships of gut bacteria at different time periods between various ages of the host organism. Two-way Anova tests conducted on the data gathered from the qPCR reaction revealed a trend towards higher levels of 16s RNA in mice that were in the young category. The trend also showed a gradual decrease in amplification levels of 16s RNA as the age of the mice progressed from middle aged to old aged. Age-related decline of gastrointestinal function and/or increased incidence of gastroenteropathy may be, in part, due to decreased microbiome levels and/or changes in enteric microbial populations. Further characterization of enteric microbial populations in aged versus young mice is currently underway.

6A. Adrienne Arnold  
Mentor: Melody Danley  

*Use of White Pine Xylem to Produce Drinking Water: Effect of Cut-To-Use Timing*

The mortality rates associated with waterborne bacteria makes it the biggest environmental health threat in developing countries. To improve access to clean drinking water, the ideal method of water purification needs to be sustainable, inexpensive, and effective in the removal of pathogens. Recently, researchers suggested that gymnosperm xylem, such as that from the Eastern white pine (Pinus strobus), could be used to filter contaminated drinking water by using the pine’s xylem structures to remove common bacterial contaminants like E. coli. To determine if white pine xylem can be used as a robust and reliable method of water filtration, this experiment investigated if the time between when the white pine was cut to when it was used would effect its ability to (1) remove E. coli from contaminated water samples and (2) produce enough drinking water for one person for a day. To determine the effects of cut-to-use time, three different treatments were tested: immediate use (less than 2 hours), 6-hour delay, and 24-hour delay. The filtration effectiveness of each treatment was tested using E. coli contaminated water, in triplicate (n=3), and new branches. One additional treatment (immediate use, no E. coli water) was tested in triplicate and served as the control. It was predicted that longer the cut-to-use time, the more the xylem membranes of the white pine filter would deteriorate, increasing the amount of water filtered and allowing more bacteria to pass through. The volume of water filtered was highly variable and did not show the expected increase, perhaps suggesting that the filters are just as effective after 24 hours of storage as when used immediately. Significant contamination, however, was found in most of the filtrate, with no clear pattern relating contamination to cut-to-use time. The results indicate that changes are needed to make this filtration technique effective.
6B. Brittany Auvil
Mentor: Yang Jiang

*Can Non-Dyslexics Fake Dyslexia's Brain?*

Dyslexia is a condition that affects the brain processing of written and spoken languages. Individuals with dyslexia are mostly intelligent and creative despite reading difficulties. The purpose of this study is to experimentally whether there is a difference in the brain activity of dyslexic participants and non-dyslexic participants who are faking symptoms of dyslexia. Knowing when a patient is or is not faking any disorder is important in the medical field because this knowledge can potentially save time, money and resources when it comes to treating a patient who does not need treatment. The hypothesis is that there will be a difference in brain activity, specifically lower brain activity in patients with dyslexia than patients without dyslexia. To test this hypothesis, a wireless EEG headset will be used to record brain signals while each participant reads as many words as possible within 30 seconds on individual index cards. In addition, a page out of an intermediate level chapter book (Holes by Louis Sachar) will be read aloud by each participant. The control subjects will have both tasks of completing each activity as normal and as if they were faking dyslexia. Data collection is underway. We expect that dyslexic participants will have lower brain activity than the non-dyslexic participants, based on literature. Brain activity during faking conditions is likely due to effort. The proof of concept study will provide pilot results for future testing in larger sample sizes.

6C. Emma Brennan
Mentor: Melody Danley

*Response of Juvenile Red Swamp crayfish (Procambarus clarkii) to Environmental Burrowing Cues*

Red swamp crayfish (Procambarus clarkii) is known as a secondary burrower, building vertical tunnels down into the substrate to escape desiccation during the dry season. Although research is lacking, reports have indicated researchers have found female crayfish in the field that were incubating eggs or living together with newly hatched young in the burrow. Thus, it is generally assumed that when in burrows, newly hatched crayfish exist in burrows with the mother. Currently, little is known about the burrowing behavior of juvenile crayfish when the mother crayfish is not present. To understand the burrowing tendencies of juveniles, newly hatched crayfish were housed individually in 3-L tanks partially filled with soil and surface water (experiment 1). Juvenile crayfish were observed for basic burrowing behaviors when the surface water was present vs. removed. There did appear to be a statistically significant difference in the burrowing habits of crayfish housed in tanks with surface water present vs. removed. This indicates that crayfish have a direct burrowing response to the absence of surface water even as juveniles, supporting their classification as a secondary burrower. The presence of the mother crayfish also affected the interactions between juvenile crayfish. To better understand the effects of these interactions on the juveniles separated from the mothers, newly hatched crayfish were housed either in units of 1, 2, or 10 crayfish per tank in 3-L tanks partially filled with soil and surface water removed (experiment 2). Juvenile crayfish were observed for size (mass and length) and mortality rates. There did not appear to be any statistically significant difference in the sizes of the crayfish that survived vs. those that did not survive in the individually housed crayfish, paired crayfish, or those in tanks of 10. This suggests that size is not a key factor in the mortality rates of juveniles.
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7A. Trae Brooks
Mentor: Bruce O'Hara, Chanung Wang

A Comparative Study of Sleep and Circadian Rhythms between the House Mouse (Mus musculus) and African Spiny Mouse (Acomys cahirinus)

The study of circadian and sleep behavior of different organisms can provide invaluable insight towards understanding the behavioral, physiological, and environmental influences on these processes. For example, two species of African spiny mice, Acomys cahirinus (Cairo spiny mouse) and Acomys russatus (Golden spiny mouse) demonstrate differing patterns of circadian rhythm in areas where their habitats overlap. Both species display primarily nocturnal behavior under natural circumstances, but in areas of overlap A. cahirinus remain nocturnal while A. russatus transition to more diurnal behavior. Few studies are available that detail the circadian rhythms of these two species and little is known regarding their sleep behavior, which can be a significant influence on the diurnal behavior seen in A. russatus. For that reason, we have begun to investigate one of these species (A. cahirinus) alongside the well-studied house mouse (Mus musculus) using a well-validated, non-invasive, piezoelectric system, that is able to detect movement during wake as well as breathing patterns during sleep. Our results show that both A. cahirinus and M. musculus are predominantly nocturnal, but also demonstrate unique behavioral patterns specifically regarding their activity levels in the night time period. It is possible that the cause of this occurrence can be attributed to foraging disparities between the two species, or the poor ability of A. cahirinus to adapt to social isolation. Using IR cameras in conjunction with electroencephalogram (EEG) recordings, we were able to determine the approximate sleeping patterns of A. cahirinus experimentally. With single and group cage settings, we discovered that A. cahirinus demonstrates higher activity levels before the middle of the night than after. We confirmed this result using EEG recordings, as they show a higher percentage of time awake before the middle of the night than after, much more so than seen in M. musculus.

7B. Ethan Cardwell
Other Authors: Katie Barnes, Loren Ewing
Mentor: Rebecca Kellum

Role of Rapgap1 in SxlPe Activation

Sex-lethal (Sxl) is the master regulator of sex determination in Drosophila melanogaster, through its activity in regulating splicing of its own transcripts and those of downstream genes in the sex determination pathway. In individuals with an X chromosome to autosome (X:A) ratio of 1, Sxl is activate, resulting in female development. Sxl is inactive in individuals with an X:A ratio of 0.5 and male development occurs. The key component of this pathway is the activation of the Sxl early embryonic promoter (SxlPe), providing protein that initiates a female mode of splicing regulation. HP1 and HOAP are heterochromatin proteins that work together to form a repressive complex at SxlPe, reducing the sensitivity of the promoter to binding of X-linked and autosomal transcription factors that provide a readout of the X:A ratio. Mutations in the HOAP gene result in inappropriate activation of SxlPe in males and male-specific lethality due to defects in dosage compensation in males. Mutations in HP1, by contrast, result in the drastic reductions in SxlPe activation and female-specific lethality. RT-PCR assays of Sxl transcripts from HP1 mutants also indicate a repressive role for it. Our data are consistent with a repressive role for both HOAP and HP1 early in development, with a switch of HP1 to activation mode during SxlPe activation. This activation role for a heterochromatin protein is unusual. We have, therefore, used genetic screens to identify genes with mutant phenotypes similar to HP1 mutants to identify factors that may function in the switch of HP1 into activation mode. We have identified the
GTPase activator protein Rapgap1 in these screens and are using PCR assays to characterize the mutants before using RT-PCR assays to determine if maternal mutations in it cause defects in splicing of Sxl transcripts, providing an indicator that Rapgap1 is required to activate SxlPe.

7C. Cameron Colvard  
Mentor: Grace Jones  

The Role of Transcriptional Regulators in the Formation of Epidermal Cuticular Barrier in Drosophila melanogaster

Post-embryonic development of Drosophila melanogaster involves larval epidermal secretion and periodic shedding of the cuticular barrier. This process is hypothesized to be reliant on a methyl farnesoate (ligand) and ultraspireacle (nuclear receptor) axis that targets transcription factors regulating cuticle dynamics. The present study investigates aspects of ultraspireacle structure and its potential target regulatory network. Transgenic lines engineered with a mutation to the ultraspireacle receptor at a known phosphorylation site (serine-35 mutated to Alanine) were expressed with natural ultraspireacle promoter in a null background. These animals molted and shed the 1st instar cuticle and 2nd instar cuticle, but the 3rd instar epidermis did not produce correctly formed puparial cuticle. All animals subsequently died without emerging as adults. Another modification to the ultraspireacle receptor (Q288A L366A, that disrupts methyl farnesoate binding), when expressed in a null background prevented the larval epidermis from generating a puparial cuticle. qPCR studies of these QL mutants identified altered expression in 3rd instar epidermis of several targets of ultraspireacle, including the transcription factors DHR3 (=ROR) and Grainy Head (GRH recently implicated in certain skin cancers). When ultraspireacle encoding an HA tag on the C-terminus was expressed in a null background, the HA tagged ultraspireacle rescued the animal to attain its adult form. ChIP analysis using HA-tagged ultraspireacle confirmed that prior to formation of puparial cuticle, ultraspireacle is binding at the DHR3 gene. A GAL4-UAS system was used to target DHR3 RNAi and Grainy Head RNAi to the larval epidermis. Animals with disrupted DHR3 signaling generated a misformed puparial cuticle, while animals with disrupted Grainy Head signaling in the 2nd instar larvae failed to fully shed the 1st instar cuticle. These studies provide evidence that in the larval epidermis the receptor ultraspireacle targets a network of transcription factors that coordinate the generation of developmentally appropriate forms of larval cuticle.

8A. Emily Crutchfield  
Other Authors: Chase Chitwood, Lara Hadi  
Mentor: Julie Pendergast  

Daily Rhythms of Light Exposure in Undergraduate Students

Circadian rhythms are approximately 24-hour cycles of behavior, cognition, and physiology that are synchronized to the environment. The primary circadian clock in mammals is the suprachiasmatic nucleus (SCN). The SCN is synchronized to the light and dark cycle. In today’s world, organisms are exposed to more than just natural sunlight. Exposure to artificial light from electrical lights and computer and phone screens is part of the modern lifestyle. Studies in rodents have shown that exposure to light at the wrong time of the day alters circadian rhythms and causes health problems. The stereotypical lifestyle of an undergraduate student consists of late-night studying and socializing. In addition, the use of electronic devices such as computers and smartphones is widespread. Therefore, in this study we aimed to measure daily rhythms of light exposure in undergraduate students. We hypothesized that undergraduates experience the majority of their daily light exposure after sunset. We used two approaches to analyze temporal patterns of light exposure in undergraduate students. We first surveyed 123 undergraduate students and found that 19% slept with a light on (e.g. TV, computer) and 42% went out after 10:30pm.
nights a week. We next measured daily rhythms of activity and light exposure in 8 undergraduate subjects. Each student wore an actigraphy watch to measure light exposure, activity, and energy expenditure every minute for 2 weeks. The time of sleep was verified using sleep logs completed by the students. We found that average daily light exposure was 58,878 lux. Only 5.5% of light exposure occurred after sunset. However, since artificial light is less intense, light exposure at night was low. Next we will analyze the relationship between nighttime light exposure and chronotype, sleep duration, and social jetlag.

8B. Riley Cutler
Other Authors: Matthew Antel, Mason Johnson
Mentor: Brian Rymond, Swagata Ghosh

*The dSERF Gene Modulates SMA Severity and SMN Protein Abundance in D. Melanogaster Disease Model*

Diminished levels of the Survival of Motor Neuron (SMN) protein is the primary determinant of Spinal Muscular Atrophy (SMA), the leading genetic cause of death in infants. The number and types of genetic factors which might influence disease severity is unknown. The Human SERF1/H4F5 gene was identified in a comparative genomic study as a possible genetic modifier of SMA (Scharf et.al, 1998). Though SERF is phylogenetically conserved, its natural function is not known, and its impact on SMA has never been tested in any animal model. Our hypothesis is that the presence of SERF buffers some of the deleterious impact of SMN mutations. Using a Drosophila melanogaster (fruit fly) model we created dSERF deletion and cDNA overexpression alleles. We found that while dSERF is not required for viability, the loss of this gene inhibits adult climbing behavior independent of SMN status. Next we combined the dSERF cDNA over expression allele with a series of SMN mutants showing different levels of phenotypic severity. Our results indicate a subtle improvement of larval viability with overexpression of dSERF in less severe SMN mutants. Although dSERF overexpression could not rescue the larval lethality and impaired crawling of the severe SMN mutants, it significantly improved their impaired growth phenotype. Moreover, initial protein analysis suggests a partial restoration of SMN protein abundance upon dSERF overexpression in the Drosophila SMN mutants. Our data are support the previously untested hypothesis that SERF1 is a genetic modifier of SMA, thus identifying a potential therapeutic target for this disease.

8C. Clara de Castro
Mentor: Robin Cooper

*Maintaining the Drosophila Larval Heart in situ: Modulators and Stretch Activated Channels*

The Drosophila heart is of interest as a genetic and physiologic model for developmental studies, pharmacological screening, investigating the ionic bases for pacemaker activity as well as understanding the modulation of pacemaker activity. To study cardiac physiology in vivo, a suitable saline is necessary to maintain heart activity. Recently a modified HL3 saline has shown promise in maintaining the heart rate (HR) (de Castro et al., 2014). However, this minimal saline, which is pH stable, does not maintain the HR for long periods of time for electrophysiological or imaging studies. In the current study, a cocktail of octopamine (OA), dopamine (DA), acetylcholine (Ach) and serotonin (5-HT) maintains a stable HR for longer periods of time. Each of the modulator separately increases HR frequency. Even without the common hemolymph sugars (trehalose and sucrose), the HR is maintained. With the cocktail of modulators, the HR stays stable for 2 hours. Given that TRPA receptors (stretch-activated) are expressed in the heart, their role in maintaining HR was examined. An apparatus was developed to simulate body wall contraction and relaxation on the heart tube as well as with a saline profusion system. Profusion was
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less invasive than stretching the body, and promoted larval HR maintenance. Currently, we are investigating the effect of pharmacologically inhibiting stretch activated ion channels as well as using RNAi knockdown in the intact larvae.

9A. Christopher Dudley
Mentor: David Westneat

_Heterospecific Extra-Pair Fertilization in Vermivora chrysoptera and Vermivora cyanoptera: A Possible Mechanism of Maintaining Hybridization_

Despite the existence of social monogamy in many avian species, extra-pair fertilization (EPF), in which an offspring is sired by a different male, is common. Recently EPF has been hypothesized to maintain hybridizing systems if the extra pair male is of a different species. One possible case in North America occurs in overlapping populations of blue-winged (Vermivora cyanoptera) and golden-winged warblers (V. chrysoptera) where a surprisingly high number of individuals displaying hybrid phenotypes can be found despite the fact that heterospecific social monogamy rarely occurs. Here a panel of four microsatellite loci was used to genotype complete family groups and to determine how often EPF occurs. Blood samples were collected from 39 nest sites located in southwestern New York during the breeding seasons of 2008, 2009, and 2010. Blood samples were also taken from 40 extra males (potential sires) in the vicinity of the nests. The results indicate that EPF occurred in at least 21/39 family groups, with an average of 31% of the nestlings sired by an extra-pair male. Four additional microsatellite loci are currently being genotyped in these family groups to provide statistical power in determining potential sires. Results indicating a relatively high frequency of heterospecific EPF will shed light on the importance of EPF in driving hybridization. Understanding these mating systems is becoming increasingly important as climate and habitat change shift the native ranges of avian species and increase the chances of secondary contact.

9B. Morgan Duerr
Other Authors: Nicole Sivy, Harper Reid
Mentor: Julie Pendergast

_Daily Rhythms of Food Intake in Undergraduate Students_

Circadian rhythmicity is a fundamental process that governs daily rhythms of physiology, metabolism, and behavior. Studies have suggested that eating at the wrong time of day causes obesity. In this study we investigated daily rhythms of food intake in undergraduate students. We hypothesized that undergraduate students consume more food during the nighttime than during the day. In this study we used two approaches. We first surveyed 123 undergraduate students regarding their eating habits. Of those surveyed, 97.41% reported that they ate or drank after 8pm 5 nights per week. Since we found that nighttime eating was prevalent among undergraduate students, we next comprehensively measured daily rhythms of food intake, activity, and energy expenditure in 8 undergraduate students for 1 week. The students kept detailed food logs. Activity and energy expenditure were simultaneously measured with actigraphy watches. Social demands are strict on ‘work’ (or class) days, while the rhythms on ‘free’ (weekend) days may more accurately represent the endogenous rhythm of an individual. Thus we separately analyzed our data on work and free days. The average daily calorie intakes on work and free days were similar (work: 1,536 cals/day; free: 1,463 cals/day). On average, food consumption was spread out over 9.83 hours on work days and 10.72 hours on free days. The percent of total calories consumed after 8pm was 15.05% on work and 10% on free days. From the actigraphy data, we determined the time of mid-sleep on work (4:37 a.m.) and free days (5:07 a.m.). Mid-sleep is a marker of chronotype, or the
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relationship between an individual’s internal clock and the environment. Next we will determine if chronotype and daily rhythms of energy expenditure correlate with the timing of food intake.

9C. Connor English
Mentor: Robin Cooper

Cholinergic System Regulation of Behavior in Drosophila melanogaster Larvae

We investigated the role of acetylcholine in the Drosophila melanogaster larval CNS to identify how this neuromodulator regulates locomotion and feeding behaviors. We combined pharmacological and genetic approaches in order to deduce acute changes in behaviors upon altering the activity of the cholinergic system. Genomic screens have revealed that there are ten receptors in Drosophila that are very similar to the nicotinic acetylcholine receptors (nAchRs) of mammals. In Drosophila, acetylcholine is a neurotransmitter within the CNS and is the excitatory neurotransmitter for sensory neurons but not motor neurons, as in mammals. It has been found that this system is important in regulating specific behaviors including medial fiber escape response; however, the integration of cholinergic signaling within the CNS and regulation of motor output in this model organism is not well known. Thus, we investigated the role of cholinergic neuronal activity in regulating distinct motor behaviors. In addition, a distinctive advantage of Drosophila larvae is the short developmental time (~4 days) in which the development of the CNS can be investigated. Genetic and pharmacological techniques were employed, including temperature-sensitive silencing and activation of cholinergic neurons in transgenic flies and acute and long-term feeding of cholinergic agonists and antagonists in order to investigate activity based modulation of specific behaviors. Analysis has shown that silencing cholinergic neurons, genetically, increases body wall contractions significantly, reducing crawling speed. Preliminary pharmacological analysis shows that Drosophila larvae fed high concentrations of nicotine for 20 minute displayed a decrease in body wall contractions. Thus, it is evident that this system is integral in regulating two distinct motor behaviors. In addition, the proposed experimental design allows for a multitude of options for proof of concept experimentation in the future. This study will help to establish the role of acetylcholine in regulating simple motor behaviors.

10A. Madison Gaceta
Other Authors: Aaron Hoback,
Mentor: Dr. Pete Mirabito, Michelle Giedt

Varied Expression of the Target Gene, Tout-velu (ttv), and Its Effects on Reproductive Life Span in Drosophila Flies

For the study, genetically engineered male flies were created in order to show that varied expression of the target gene, tout-velu (ttv) through the use of RU486 and GFP, affects reproductive life span. Tout-velu is a protein coding gene, and its molecular role is to modify the protein through the addition of sugars. The biological role tout-velu carries is to help with axon guidance and germ cell migration. The objective of this study is to target a gene, specifically tout-velu (ttv). According to other research, scientists believe that there may be a connection between reproductive life span and tout-velu. To test the reproductive life span of the study, we tested male flies to see when they became sterile which would show reproductive life span. This was through the use of RU486, an analog to progesterone, which would decrease the reproductive assay in the study. The mRNA levels were measured to determine whether or not tout-velu has altered expression. If in fact this study shows that the male flies lacking the expression of tout-velu show a significant decrease in viable offspring and life span, we can conclude correlation and begin to establish causation. If male flies that misexpress tout-velu display a significant increase in reproductive life span along with the former condition, this can be used to support tout-velu’s
involvement in aging. If our results show a significance in the decrease of life span for those
misexpressing tout-velu and in the increase of life span for those over-expressing tout-velu, over vice a
versus. With this one can conclude that TTV is in strong correlation with reproductive aging.

10B. Slavina Goleva
Mentor: Jeffrey Osborn

Renal Specific Downregulation of OXPHOS Transcription Factors and Mitochondrial Respiratory
Dysfunction in Spontaneously Hypertensive Nonhuman Primates

The African Green Monkey (Chlorocebus aethiops sabaecus; AGM) exhibits heritable, spontaneous
hypertension and shares a closely related genome and phylogeny with humans. Thus, the AGM is a novel,
translational model for the study of human essential hypertension. We previously determined that gene
expression of SDH, a nuclear oxidative phosphorylation (OXPHOS)-encoding gene, was upregulated 2-
fold in the renal outer medulla (OM) of hypertensive (HT) compared with normotensive (NT) AGM, but
was not different in the inner medulla (IM) and cortex. Nuclear OXPHOS-encoding gene COX4 was
downregulated 2-fold in renal OM and IM of HT AGM, but was not different in cortex. We hypothesize
that gene expression of nuclear transcription factors TFAM (which regulates the expression of nuclear
OXPHOS genes) and NRF2 (which regulates transcription of TFAM and anti-oxidant proteins) are
altered in renal OM and IM of HT AGM. Taken together, this may elicit renal respiratory mitochondrial
dysfunction in HT AGM. AGM were phenotyped as NT (systolic blood pressure <120 mmHg; SBP) or
HT (SBP > 140 mmHg). Gene expression was determined using semi-quantitative RT-PCR using kidney
cortical, OM, and IM RNA extracted from 18 HT (SBP=166±7 mmHg) and 18 NT (SBP=98±3 mmHg)
AGM. TFAM gene expression was downregulated 3-fold in renal OM (p<0.05) but unchanged in IM and
cortex of HT vs. NT AGM. NRF2 gene expression was downregulated 2-fold in renal OM (p<0.05) and
3-fold in IM (p<0.05) of HT AGM, but was not different in cortex. Thus, OXPHOS dysfunction in AGM
and increased oxidative stress in kidneys of HT AGM may occur due to a diminished presence of anti-
oxidant proteins and OXPHOS-encoding genes. To assess OXPHOS dysfunction in HT vs. NT AGM,
frozen renal cortex and OM were sectioned from HT (SBP=185±11 mmHg; n=4) and NT (SBP=99±4
mmHg; n=4) AGM and mitochondrial respiratory function was visualized using COX/SDH double-
labeling histochemistry. A novel program (SpectrumAnalyst) was developed to semi-quantitate the
relative mitochondrial dysfunction in each tissue section image as a percentage of the total tissue area.
Preliminary SDH/COX analysis shows that HT AGM have greater mitochondrial respiratory dysfunction
(17±3.7%) relative to NT AGM (7±2.4%) in renal cortex, but there is no difference in mitochondrial
respiratory function between NT and HT AGM in renal OM. Taken together, gene expression differences
of nuclear OXPHOS-encoding genes in renal OM of HT AGM may be masked by post-translational
protein modifications that preserve mitochondrial respiratory function. SDH/COX staining indicates that
OXPHOS dysfunction may be present in renal cortex of HT AGM, and RT-qPCR results suggest that this
is not due to OXPHOS-encoding gene expression differences. Rather, renal cortical OXPHOS
dysfunction may be due to post-translational modifications in HT AGM (e.g. increased oxidative stress)
that ultimately alter long-term control of renal function and blood pressure.

10C. Vincent Gouge
Mentor: Ann Morris

Analysis of hairy-related 9 (her9) during vertebrate ocular development

The hairy-related 9 (her9) gene—belonging to the hairy/enhancer of split (hes) superfamily of Basic-
Helix-Loop-Helix-Orange (BHLH-O) transcription factors which are involved in many developmental
processes—is expressed during vertebrate embryonic retinal development and in the regenerating adult
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retina. Her9 was found to be upregulated in the retina of a transgenic line of zebrafish that exhibits constitutive rod photoreceptor specific degeneration and regeneration. Her9 is expressed throughout the developing central nervous system of the zebrafish, including the retina. Fluorescent in situ hybridization (FISH) experiments were conducted in a transgenic line of zebrafish that expresses the GFP reporter in vascular endothelial cells. We found that her9 expression co-localizes with markers for retinal vasculature. Pharmacological manipulation of several signaling pathways starting during the appearance of the primordial eye field revealed that her9 expression in the retina is sensitive to the Retinoic Acid (RA) signaling pathway. To investigate the function of her9, we generated her9 mutant fish lines using the CRISPR/Cas9 system. A guide RNA specific to her9 developed in our lab was co-injected with Cas9 mRNA into 1-cell stage zebrafish embryos. These founders were crossed to generate F1 embryos that, upon sequencing, were found to have an insertion or deletion causing a frameshift mutation and no gene product. If our experiments confirm that her9 plays a role in vasculogenesis, this may lead to key therapeutic treatments for eye diseases involving defects in retinal vasculature such as age-related macular degeneration (AMD), diabetic retinopathy (DR), and retinitis pigmentosa (RP).

11A. Richard Grewelle
Mentor: David Weisrock

Phylogenetic Species Delimitation in Mexican Ambystomid Salamander (Ambystoma rosaceum) Revealed By Multi-Locus Data Set

In this study, parallel-tagged amplicon sequencing is used to elucidate species boundaries in a poorly resolved clade of ambystomid salamanders endemic to the Sierra Madre Occidentales in northwest Mexico. Ninety-five unlinked, conserved loci in twenty individuals across the range of Ambystoma rosaceum are sampled to describe patterns of potential allopatry within the range. Ambystoma rosaceum is a species described as a sister lineage in the tiger salamander complex (Ambystoma tigrinum). The tiger salamander complex is widely distributed throughout North America and is composed of over seven species and subspecies (H. B. Shaffer et al.1984). Previous studies attempting to delimit these species have done so broadly or techniques used to do so are outdated (e.g. allozyme, morphological, mitochondrial analyses). This study seeks to closely evaluate species and population level relationships in the A. rosaceum sister species of the A. tigrinum complex.

11B. Malik Guidry
Mentor: Ashley Seifert, Thomas Gawriluk

Regeneration in African Spiny Mouse

The capacity to regenerate is a phenomenon that is typically unachievable for mammals. There is one mammal; in particular, that demonstrates the regeneration of tissues specific to the ear and dorsal skin in response to a wound stimulus. African spiny mice (Acomys) seem to exhibit some of the same intrinsic properties that are characteristic of expert regenerators such as salamanders. These mice reside within “kopjes”, or structures of layered rock, in rural areas of Kenya, Africa. Mousetraps accommodated by peanut butter and oats were set around the perimeter of the copies in order to live-trap the mice. A comparative analysis of regenerative ability between Acomys and other local rodents was done to determine whether or not the regenerative ability of Acomys was significant. Both Acomys and the other species of mice were wounded by a 8mm hole punch within the ear and the progression of closure was measured over time. The ears of the mice were cut off and placed into ethanol as a source of data representative of the different time points assessed in days. Subsequently, images were taken of the wounded ears representative of these specific time points to keep track of the progression. The other ear was dedicated to histology in order to examine and compare the underlying physiology of the ears.
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belonging to the different species. The results showed that Acomys exhibited rapid and complete regeneration of hair follicles, sebaceous glands, dermis, and cartilage without fibrosis; compared to the others, which showed signs of scarring, prolonged inflammation, and failure to seal the wound. If the mechanisms of regeneration are unveiled within a mammalian model then implications involving humans and other mammals could potentially be a result.

11C. Stephanie Hacker
Mentor: Phil Crowley

Burrowing with Procambarus Clarkii: Linking Ecosystem Engineering to Regeneration

Ecosystem engineering is the direct or indirect physical modulation of the biotic or abiotic environment, in turn modifying, maintaining and/or creating habitats. Organisms that burrow within freshwater ecosystems, such as crayfish, are of interest because, due to the closed nature of these systems, physical changes in these environments are magnified. Moreover, crayfish can autotomize or self-amputate and then regenerate their appendages, adding a layer of complexity to this system. Previously, appendage loss has only been connected to survival, competition, and resource acquisition but never to ecosystem engineering. Therefore, we examined the effect of regeneration on burrowing activity using the red swamp crayfish (Procambarus clarkii). The experimental design depends on regeneration status (1 claw or 2 claws present). We built a crayfish burrowing chamber to measure burrowing behavior until chimney completion (over a two day period). Videos were analyzed for time to burrow completion and presence/absence of a chimney. We anticipated that regenerating crayfish would take longer to burrow and/or build less developed burrows (e.g. absence of chimney). This prediction has been supported in our preliminary trials (regenerating crayfishes only burrowed into a superficial hole without producing a chimney, whereas two-clawed crayfishes produced a large chimney). We expect our main experiment to confirm those preliminary results. This experiment will demonstrate the impact of regeneration on the ecosystem engineering processes provided by crayfish, which has important consequences for freshwater conservation.

12A. Dwight Harris
Other Authors: Aman Patel, Molly King
Mentor: Elizabeth Debski

Characterization of Axolotl Neurons Using the Golgi Technique

Mammals are not able to repair their central nervous systems following injury. However, the axolotl salamander, Ambystoma mexicanum, is able to do so. We are examining the morphology of individual neurons in this animal after injury and during the repair process. We have evaluated several different variations of the Golgi-Cox technique to determine which works best to stain retinal and brain neurons in their entirety in our preparation. Classic Golgi-Cox staining protocols call for incubation of tissue in a staining solution for 1-3 months. We first investigated published variations of this protocol that used temperature manipulations to dramatically decrease tissue incubation times. These were unsuccessful in the retina. We also investigated a two week protocol that resulted only in the faint staining of cell bodies and processes in the brain. Using a classic protocol, we then determined how long our tissue had to be in the Golgi solution to achieve complete fills of our neurons. Incubation in this solution for 6 weeks was partially successful in that more processes of brain neurons were evident. However, optic tectal cells lacked the complexity of those reported in other amphibians, suggesting that our fills were incomplete. We found that increasing the Golgi solution incubation time to 14 weeks appears to achieve complete fills of brain and retinal neurons. Elimination of sucrose storage and clearing in xylene are also necessary to optimally visualize neuronal morphology in our 200-300 micron tissue sections. We are now working out
methodologies for classifying retinal, optic tectum, and olfactory bulb neurons based on their branching patterns and arbor areas. These classification categories will be used to follow the fate of individual cell types during the degeneration and regeneration phases that follow central nervous system damage.

**12B. Maddisson Hatton**  
Mentor: D. Nicholas McLetchie

*The Far-Red Light District: Sex Expression in Marchantia Inflexa*

Plants use light to drive photosynthesis and to perceive and respond to environmental conditions, such as detecting seasonal changes to induce sexual reproduction. Seasonal reproduction in Marchantia inflexa staggered across nearby populations in a tropical forest. The stimulus for this seasonal response remained elusive until incandescent light was observed to promote reproduction. This study was designed to test M. inflexa’s sexual reproductive response via exposure to wavelengths dominant in incandescent light (red and far-red) and to test if the responses differed among genotypes. From stock genotypes, four males and females representing the fastest and slowest individuals to express sex were selected, grown in four light conditions (Greenhouse, and growth chambers dominated by fluorescent, red or far-red conditions), then surveyed once per week for 2 weeks and every three days thereafter for over 40 days. The experiment was repeated once by changing the light conditions in each chamber. Sex expression occurred only in the far-red treatment. The mean timing of sex expression differed among genotypes and ranged from 18 days (a male) to 28 days (a female). This reproductive response to far-red light suggests that photoreversible phytochromes are involved in perceiving the light environment. Phytochromes have been linked to a plant’s ability to detect seasonal changes (photoperiodism). Our results suggest that M. inflexa is a short day plant, contrary to other species in the genus. The staggering of sex expression across populations might be due to genetic differences. Future experiments are needed to field verify the relationship between light quality and sexual reproduction. In addition, genetic variation observed here could be used to further understand variation in sexual reproduction within a species.

**12C. Tori Hickey**  
Mentor: Robin Cooper

Proprioception is an important sensory modality to detect limbs positions in reference to the body. The proprioceptive neurons monitor the direction, velocity of movement and static positions of body parts. We report on the development of an experimental module to understand how raising the extracellular concentration of K+ ions can alter proprioceptive responses. In addition, the exercises relates to authentic health issues and future research endeavors related to hyperkalimia as well as the effects of deep tissue injury (DTI) which indirectly affects neuronal function. We use the chordotonal organ in the most distal joint of the walking leg in the blue crab (propodite-dactylopodite, PD organ) and the muscle receptor organ (MRO) of the crayfish abdomen as the two experimental models. Raising [K+] in incremental steps (from 20 to 60 mM) as well as diluted skeletal muscle homogenates with estimated concentration of K+, we noted the response are impaired around 20 mM K and neural activity is silenced at 30 mM. Thus, a DTI of a large skeletal muscle in an intact organism could have an impact on non-injured neighboring neurons. This could relate to altered sensory-motor neuronal function to non-injured bodily parts in the presence of a DTI. The MRO preparation is a standard neurophysiology protocol for teaching how to record extracellular neural activity and to explore sensory physiology; whereas the PD organ is not as widely used but is very amenable for student driven neurophysiology courses. Other species of crabs can also be used for the same protocol. University level student observations and comments are reported.
**Poster Abstracts**

**13A. Angela Hinchie**  
Mentor: Melody Danley  

*The Effect of Turbidity and Sand Filtration on a Pinus strobus Xylem Water Filter.*

A lack of clean drinking water in large portions of the developing world is a leading cause of disease and a major health threat in these underdeveloped countries. A lack of an affordable and accessible filtration method means that people within these countries are unable to in any way clean or sanitize their drinking water. As such, it has become imperative to devise a filter advanced enough to filter out bacteria, but simple enough to be made from materials easily obtainable in these areas. Researchers from MIT have recently suggested that xylem from pine trees could be used for this filtration. In our experimentation, a sand filter was used in conjunction with a xylem filter to filter E. coli contaminated water. The purpose of this experimentation was to test if pre-filtration of turbid water would make the xylem filter more effective. We tested three different conditions of the filter, (1) with only the xylem filter and no water contamination or turbidity, (2) with only the xylem filter with turbidity and contamination, and (3) with the xylem and sand filter with turbidity and contamination. There was no difference in the results with respect to contamination, however the rate of water filtration varied significantly among the three conditions. The plant xylem filter could be developed further with more experimentation. With further experimentation, it would be important to test the types of types of bacteria in the filtered water, in order to determine if they are the same bacteria as in the unfiltered water. In the future, the rated of filtration with pre-filtration applied could be more closely studied.

**13B. Raven Hudson**  
Other Authors: Gabrielle Salamone  
Mentor: Julie Pendergast  

*Circadian Rhythms in Undergraduate Students*

Circadian rhythms are 24-hour cycles that are controlled by internal clocks. These clocks are important because they synchronize behavior and physiology with environmental cycles. When circadian rhythms are disrupted, such as occurs during shift work, people are at high risk for health problems such as obesity, cancer, cardiovascular disease, and cognitive deficits. Social jetlag occurs when internal clocks are not synchronized with social demands. Undergraduate students face many social demands such as early class times, many hours of studying, and socializing. We therefore aimed to determine how the lifestyle of undergraduate students relates to their social jetlag. We surveyed 123 undergraduate students (62% female; mean age: 18.92 years). We collected demographic and lifestyle information. The students also completed the Munich Chronotype Questionnaire (MCTQ). In the MCTQ, students reported their wake and sleep times on work and free days. From the MCTQ, we calculated the chronotype as the mid-sleep corrected for sleep debt. The mean chronotype was 5:27 a.m. (range 0.96-9.32 a.m.). We also calculated social jetlag as the difference between mid-sleep on work days and mid-sleep on free days. We found that 96% of students had social jetlag. The mean social jetlag was 1.99 hours (range: 0.25-5.50 hours). Next we will determine if lifestyle factors such as major, sleep duration, going out at night, nighttime eating, and start time of class affect social jetlag.
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13C. Melanie Hurst  
Mentor: Catherine Linnen

*Morphometric Analysis of Ovipositor Structure in Three Sympatric Populations of the Red-headed Pine Sawfly, Neodiprion lecontei*

During host-shift speciation, adaptation to novel host plants leads to the evolution of reproductive barriers between populations. One group in which host-shift speciation is predicted to occur is Neodiprion sawflies. Like many plant-feeding insects, sawflies are intimately associated with their hosts throughout their life cycle. The red-headed pine sawfly, N. lecontei, is found on 14 different host plants, each of which varies in needle architecture. As sawflies embed their eggs into the needle tissue of their hosts, we predict there will be strong divergent selection on oviposition strategies between populations of N. lecontei on different hosts. To test this prediction, we examined ovipositors from three sympatric N. lecontei populations utilizing hosts that differ significantly in needle width for evidence of morphological differentiation. We found significant differences in ovipositor morphology between some, but not all populations.

14A. Merissa Joseph  
Mentor: Steven Price

*Temporal and interspecific variation in anuran calling activity: Implications for monitoring frogs in western Kentucky*

Anurans (frogs and toads) rely on vocalization for most communication, thus populations are often monitored using the detection of species-specific calls. Yet, anuran calling activity may vary temporally within the breeding season and be strongly influenced by environmental and habitat conditions. In this study, we used automated recording devices (i.e., frogloggers) to compare calling activity of the crawfish frog (Lithobates areolatus), southern leopard frog (L. sphenocephalus) and upland chorus frog (Pseudacris feriarum) at several wetlands on the West Kentucky Wildlife Management Area (McCracken Co., KY). We documented interspecific variation in calling activity; in particular, we found that crawfish frogs and leopard frogs called more frequently during night surveys, whereas chorus frogs called during morning and night surveys. In addition, length of calling season and intensity of choruses varied among the study sites, presumably reflecting differences in population sizes, microclimatic conditions and/or habitat characteristics of the wetlands. Understanding temporal and interspecific variation in calling activity can be used to develop more effective monitoring programs.

14B. Clifton Kouns  
Mentor: Yang Jiang, Sabrina Mcilwrath

*Altered Brain Responses Associated with Cognitive Functions in Combat Veterans with Mild Brain Injury*

Combat related mild traumatic brain injury (mTBI) are key injuries in veterans from the conflicts in Iraq. Here we investigated brain responses during a cognitive task as potential biomarkers for improved diagnoses. Twenty-two combat veterans were diagnosed at the Lexington VAMC using multiple neuropsychological tests and grouped into of mTBI only (mTBI-o; n=6), combined history of mTBI and current Post Traumatic Stress Disorder (PTSD) (mTBI & PTSD Combination; n=6), or controls (Control; n=10). A delayed-match-to-sample visual memory task was performed while neuroimaging data were collected using a 3T Siemens scanner at the University of Kentucky. Event-related functional magnetic resonance imaging (fMRI) data were correlated with neuropsychological test results related to attention, memory, executive functioning, and information processing efficiency. Analysis of fMRI data showed the
Control group had the strongest responses in the right frontal BA10, right caudate nucleus, and left visual cortex BA17 during memory recognition of visual images, compared to patients with PTSD-o, mTBI-o, and Combination groups (p<0.05 uncorrected). No group differences were detected on contralateral sides. A positive correlation between verbal fluency test response scores and brain activity in left BA17, right BA10 and right caudate was significant (r=0.58, p<0.05 uncorrected). Our findings revealed that reduced cortical responses in persons with TBI during cognitive performance. Additionally, the neuropsychological verbal fluency test reflects levels of brain responses subserving visual attention and memory and mental processing speed.

14C. Meenu Krishnasamy
Mentor: Vincent Cassone, Jiffin Paulose

Investigating Mechanisms of Circadian Rhythmicity in Enterobacter aerogenes

It has been widely researched that circadian clocks are responsible for the regulation of physiological systems, including the human gastrointestinal system. The disruption of circadian regulation in the gut results in many pathological conditions such as abdominal pain, diarrhea and irritable bowel syndrome. Previous research has established that a human gut bacterium, Enterobacter aerogenes, expresses endogenous circadian patterns of motility and swarming in the presence of the hormone melatonin. Here, we attempt to identify the specific mechanisms and genes involved in circadian regulation within the human gastrointestinal system. The manganese transporter gene mntH is suspected to be involved in the underlying mechanism of the circadian clock. Mnth: lux, a lux reporter under the control of the mntH promoter, was introduced to E. aerogenes via electroporation. We predict that the E. aerogenes transformed with mntH will exhibit patterns of swarming and motility after entrainment with melatonin. The E. aerogenes genome was edited using the CRISPR-Cas9 system to functionally knock out mntH. This knockout is hypothesized to result in an inability to express melatonin-induced swarming. Through these experiments, we hope to demonstrate the role of the manganese transporter mntH in bacterial response to melatonin. This investigation on the mechanisms underlying the microbiome circadian clock can lead to more insight on the human microbiome’s ability to synchronize to its host, and may have therapeutic implications.

15A. Brooke Kuerzi
Other Authors: Bradford Hull
Mentor: Doug Harrison

Manipulation of Polar and Border Cells in Micropyle Formation of Drosophila eggs.

In Drosophila melanogaster, the formation of the egg is controlled by several different cell types, including follicle cells, nurse cells, and polar and border cells. Border cells and polar cells are believed to work together in the formation of the micropyle, a projection from the anterior of the oocyte that allows the entry of sperm into the egg for fertilization. The migration of the border and polar cells to the anterior of the oocyte is essential for the correct structure of the micropyle. The polar cells send migratory signals to the border cells and form an extension that projects into the micropyle to create the channel for sperm entry. To study the formation of the micropyle, we misexpressed genes specific to cell death and cell adhesion in order to target polar cells for apoptosis and disrupt migration and adhesion of the border and polar cells. We hypothesized that by killing the polar cells we would be able to affect the projections entering the micropyle, and by inhibiting the migration of the border cells, we would be able to observe significant changes to the micropyle itself. Neither the manipulation of apoptotic genes nor the use of diphtheria toxin was successful in killing the polar cells or affecting their projections after up to 5 days of expression. Manipulation of cell adhesion molecules such as cadherin showed a lack of effect on polar
cell projections or micropyle channel formation. Other adhesion molecules such as integrin still need to be investigated. Likewise, genetic methods will be pursued for impairing the polar cell projections from forming, rather than just killing the cells outright.

15B. Nicolette Lawrence  
Mentor: David Weisrock

*Species Delimitation in Madagascar's Mouse Lemurs*

Bayesian statistical analysis has become increasingly useful in the determination of speciation in genetic studies. The mouse lemur of Madagascar (belonging to genus Microcebus) contains over 20 recognized species. Much of the mouse lemur taxonomy has been resolved thanks to numerous morphologic, phylogenetic, and mtDNA speciation studies. Through a multi-locus analysis of nuclear DNA from individuals representing a wide geographic range across the island of Madagascar, this research project presents a Bayesian statistical analysis of species delimitation in mouse lemurs. Validation tests for this analysis include tests with a guide tree (reverse-jump Markov chain Monte Carlo sampling) and tests without a guide tree (a Bayes factor delimitation test). Each group of tests are duplicated under randomized conditions to ensure a high degree of sensitivity. The results of this project indicate a delimitation of two species of mouse lemur, as well as elucidate mouse lemur taxonomy.

15C. Conner Lay  
Other Authors: Morgan Sindall  
Mentor: Nicholas McLetchie

*What Quality of Light Will Induce Germination in the Asexual Offspring of the Plant Marchantia inflexa?*

Asexually produced offspring are very important for population persistence, but the sensitivity of these offspring to environmental stimuli is rarely tested. Here we test the germination ability of asexually produced offspring (gemmae) of the plant Marchantia inflexa in response to light. To test for a light requirement, gemmae were subjected to three light conditions: 24 hour white light, a 12 hour cycle between white light and darkness, or a 24 hour dark cycle. Germination was indicated by the production of rhizoids and observed using blue methylene. We then tested for different qualities of light to determine what wavelength of light will cause germination. Gemmae were placed in five different qualities of light (far red, red, green, blue and white) on a 12 hour light/dark cycle. Gemmae in the white light (constant and 12h L/D cycle) germinated (98.5% - 100% germination). Those in constant darkness were not able to germinate (0% - 1.8% germination). White light (control), blue light and red light all induced germination in approximately the same percentage of gemmae (58.2%-68.4% germination), while green and far red had lower levels of germination (0.8%-5.4% germination). These experiments allowed us to isolate the components of white light that are able to trigger germination in M. inflexa gemmae. Because far red and green light indicate shaded conditions, this response may limit germination to higher light conditions where these wavelengths are proportionally high. Chance movement of gemmae by water flow or rain drops might allow these ungerminated gemmae to be moved to higher light areas where blue and red wavelengths are proportionally high. Further research may be aimed at determining the signal transduction pathway utilized by these qualities of light and how it leads to germination.
16A. Amanda Martinez  
Other Authors: Gregory Rummel, Jacob Rose, Quincy Penn, Corey Smith  
Mentor: Kay Shenoy

The Importance of Sperm Availability

We hypothesized that female guppy mating behavior is related to sperm depletion in male guppies (Poecilia reticulata). Females, carrying the eggs, have costs associated with the choice of male mates. Males, however, do not require much energy for their production of sperm, making it of little cost. In this study, it was predicted that females have the ability to detect sperm depletion in males. We hypothesized that females would have a stronger attraction to non-sperm depleted males. This hypothesis was tested by placing a sperm depleted male on one side of a fish tank behind a transparent perforated divider; a non-sperm depleted male was placed on the opposite side behind a similar divider. A female in between the dividers of the tank was allowed to choose between the males. Females were significantly more attracted to the non-sperm depleted males. We then tested if this was based on odor cues by using the same setup but with non-transparent dividers. Again, females significantly preferred the non-sperm depleted males over the sperm-depleted males. We then tested if visual cues were also a factor by segregating males behind a clear sealed separator. Females can detect odor cues in males that have been sperm depleted. Experiments to test whether this detection is based on visual cues are still underway. Detecting sperm depletion allows the females to maximize fertilization opportunities.

16B. Matthew Mattingly  
Mentor: Robin Cooper

The Effect of CO2, Intracellular and Extracellular pH on Mechanosensory Proprioceptor Responses in Crayfish and Crab

We present experimental models and paradigms for students in a neurophysiology teaching lab to explore the effect of CO2 and relationship of intra/extracellular pH on neuronal function. The basic concepts of lab have a physiological relationship with human disorders, chronic obstructive pulmonary disease (COPD), sudden infant death syndrome (SIDS), and are active areas of neurobiological research. In furthering our understanding in basic cellular responses to pH/CO2 is fundamental in addressing physiological and pathological processes. The models used are the proprioceptors of blue crab walking leg joints and crayfish muscle receptor organ. The paradigm monitors electrical activity associated with the nerves during activation while exposing the preparations to CO2 bubbled saline, pH 5 saline, and 20mM propionic acid saline. The results demonstrate extracellular pH 5 did not greatly alter activity; CO2 bubbled saline and propionic acid caused activity to cease. We suggest a drop in intracellular pH is either blocking stretch activated mechanosensory channels or ion channels associated with production of action potential. Future studies with intracellular recordings will examine if graded depolarizations and action potentials can be induced by electrical stimulation. Either stretch activated channels or voltage gated Na+ channels are targeted for the effect of intracellular pH. These findings are relevant as some mechanosensory ion channels belong to degenerin/epithelium sodium channels and a group of these are acid-sensing ion channels and activated by low extracellular pH. Furthering our understanding in basic cellular responses to pH/CO2 is fundamental in addressing physiological and pathological processes related to all animals.
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**16C. Mallory McCain**  
Other Authors: Kiyana Hinton, Deja Bowen  
Mentor: Doug Harrison, Pete Mirabito

*The Effect of Pipe on the Reproductive Lifespan of Drosophila melanogaster*

The reproductive lifespan of a fruit fly, Drosophila melanogaster, is determined through genetic and environmental factors. Variants in pipe have been found to be associated with differences in reproductive lifespan. Previous work used a genome-wide association study to look at two million variants to determine if there is statistical correlation of specific variants to differences in reproductive lifespan. In the current project pipe activity was tested to analyze whether its functionality contributes to these differences. Pipe is an enzyme that is a predicted modifier of proteoglycan. Pipe has a primary role in the pathway that establishes, during oogenesis, dorsal ventral patterning in the Drosophila embryo. To determine whether pipe regulates male reproductive lifespan we specifically knocked down activity using inducible RNA interference. RNAi uses double stranded RNA sequence to direct destruction of target mRNA. Double stranded RNA for pipe was expressed using inducible ubiquitous GAL4 activated by RU486. RU486 was added to the food consumed by adult males as they were mated with adult female virgins. Males were repeatedly mated to new female virgins every two days until sterile. The reproductive lifespan was defined as the time it took for the male to reach sterility. To control for effects of the genetic background on reproductive lifespan, males were tested through the same process with the absence of RU486 inhibiting GAL4. Males with GFP RNAi, an unrelated double stranded RNA, were used to compare RNAi induction to those that had pipe. We hypothesize the pipe activity will enhance male reproductive lifespan. Pipe may have this effect by modifying extracellular matrix proteins to alter cell signaling needed for maintenance of reproductive viability. Maintenance of reproduction in males would be a previously unrecognized role for pipe in Drosophila.

**17A. Cydney McCoy**  
Other Authors: Daniel Mullen, Logan VanWay  
Mentor: Bruce O'Hara

*Time of Day Effects on Reaction Time Performance following Meditation*

Previous research has supported multiple effects of meditation on brain activity including both short term and longer term changes. Additional studies have found improvements in reaction time immediately following meditation. In these studies, reaction time and alertness were measured using a Psychomotor Vigilance Test (PVT), which is done by requiring the subject to push a button at the moment they see an LED screen begin to count time. PVT performance is known to be sensitive to sleepiness, which is influenced both by prior sleep and by time of day (circadian factors). Therefore, in this study, we have investigated whether the post-meditation improvement in PVT may also be influenced by time of day by testing subjects at three different times (morning, afternoon, and evening). Meditation was done with eyes closed and focused breathing for 20 minutes, with EEG measurements to assess brain activity, depth of meditation, and any signs of sleep. All subjects were undergraduate students at the University of Kentucky. The study was conducted in two phases. In the first phase, a total of 12 subjects took part in the study with 4 subjects at each time of day. Results for PVT performance before and after meditation were compared at each time. In the second phase of the study that is currently underway, within subject recordings for PVT and EEG are being conducted in 3 subjects in morning, afternoon and evening. EEG recordings will be assessed for short bursts of delta waves, which are associated with sleep. These short bursts of sleep or microsleeps, can often result in sleep inertia and slower reaction time. Because sleep inertia is undesirable, the most beneficial forms of meditation will not contain delta waves, and have high levels of alpha waves with or without theta wave bursts. The hypothesis we plan to test in this study is that the times of day that correspond to increased sleepiness (mid-afternoon) will be less effective times...
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for meditation, consistent with the observation that most individuals prefer to meditate in the morning or evening as opposed to midday. All results from both phases of the study will be presented.

17B. Gregory Milburn
Other Authors: Kayla Cannon, Kylie Carbaugh, Joshua Keum, Kelli Lutes
Mentor: Kay Shenoy

**Bright Fish, Dull Fish, Large Fish, Small Fish**

In a promiscuous mating system with high levels of male-male competition (as in guppies, Poecilia reticulata), males might minimize costs associated with competition by associating with potential mates whose quality matches theirs. We predicted that when in a group of multiple males and females, a bright male guppy will pursue a large female and a dull male guppy will pursue a smaller female. We also predicted that the dull male will spend more time with neither female than the bright male. A trial consisted of two males--one bright and one dull--and two females--one large and one small, all placed in the same tank. We recorded how much time each male spent with either female or with no female. The bright male spent significantly more time with both the large and small female than the dull male. Neither male spent a statistically different amount of time away from both females. Based on the results, we believe that the costs of competition were not high enough in guppies to lead to assortative mating. It would be interesting to test whether increasing the costs of competition can lead to assortative mating in this species.

17C. Garret Oien
Mentor: Shani Bardach

**The Effect of Daytime Sleepiness on Cognitive Decline in Aging Adults**

Changes in sleep patterns often occur as people grow older, including sleep fragmentation, a decrease in total duration of sleep, less time spent in rapid eye movement (REM) sleep, and daytime sleepiness. The sleep-wake cycle is pivotal in the consolidation of memories, the maintenance of concentration, remembering, learning, and the removal of metabolic waste that accumulates in the brain during wakefulness. Sleep problems, then, may correlate to a decline in cognitive function. The goal of this research is to examine the effects of daytime sleepiness on cognitive decline in aging adults. Participants (n=373) in the Sanders-Brown Healthy Aging cohort, spanning the cognitive continuum, completed the Epworth Sleepiness Scale. Sleepiness was then compared between normal and cognitively impaired groups using standard descriptive statistics. The participants were categorized as being normal, having a mild cognitive impairment (MCI), or being demented. Various cognitive measures, such as the MMSE, CDR, verbal fluency tests, and executive functioning tests, were administered to each participant. It was found that there were no significant differences in levels of sleepiness when comparing normal participants to MCI participants or when comparing MCI participants to demented participants. However, there was a significant difference in sleepiness levels found when comparing normal participants to demented participants. In addition, sleepiness was not correlated with cognitive measures in normal or MCI participants. Sleepiness was, however, correlated with cognitive measures in demented participants, excluding the executive functioning cognitive tests. Thus, it can be determined that there is a correlation between sleepiness and cognition in demented participants and no correlation in normal and MCI participants. This may be due, in part, to the brain’s ability to process information more effectively in normal or MCI individuals than in those with dementia. This research has implications in further understanding the factors that contribute to cognitive decline.
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18A. Norma Patel
Other Authors: Haley Fluharty, Riley Banks, Cassidy Brown, Biwei Chen, Jordan Harra, Ne'Shell Neal, Weston Owen, Jonathan Rickett, Nicole Sagl, Maria Topmiller
Mentor: Vincent Cassone

*Antibiotic Resistance and Microbiome Transfer Among Livestock and Wild Bird Populations*

Agricultural use of antibiotics is a controversial subject. In many cases, antibiotics are administered on a case by case basis to treat a particular disease. Often, farmers may treat the entire herd to prevent the spread of the disease. In addition, antibiotics may be administered in the feed to prevent possible conditions, such as mastitis and pneumonia during puberty, or to induce growth. There are many concerns about these practices. Among these is that low dose antibiotic treatment may increase the numbers of antibiotic resistant bacteria. If so, we hypothesize that these antibiotic resistant bacteria might spread from farm to farm through birds who forage in the feces of the cattle. This study was designed to test whether antibiotic resistant bacteria could be identified in the feces of cattle and of house sparrows, *Passer domesticus*. Fecal samples were collected at The University of Kentucky Dairy and Horse farms from 3 cattle, 2 horses and 15 house sparrows. Samples were incubated on agar plates in the presence or absence of several antibiotics. Resistant strains were isolated for DNA extraction. Polymerase Chain Reaction (PCR) was utilized to verify the presence of antibiotic resistant genes. Some, but not all samples were verified. Currently, resistant strains are being further analyzed for similarity by sequencing and strain-specific fingerprinting.

18B. John Pina
Other Authors: Zoe Dapore, Craig Redden, Thomas Elder
Mentor: David Weisrock

*A Comparative Assessment of Prokaryotic Diversity among Alpine Stream Environments within Grand Teton National Park, Wyoming*

Above treeline in the alpine biome, there are many forms of life, and much of this biodiversity is linked to large, permanent bodies of glacial ice and snow. The role of glaciers in driving the evolution of diverse and specialized taxa has recently garnered recognition. However, a fundamental understanding of microbial diversity associated with glaciers has remained underexplored, particularly within alpine stream ecosystems. Further explorations of alpine stream microbial ecology are particularly pressing given the ongoing recession of glaciers (and their associated meltwater streams) on a global scale. Within North America, estimates predict complete loss of glaciers in certain mountain ranges as early as 2050. In this project, we expanded our understanding of glacially-tied microbial ecology by investigating microbial diversity of alpine environments in Grand Teton National Park, Wyoming. Specifically, we utilized 16S rRNA sequencing to characterize microbial diversity and community composition of six alpine stream catchments that were primarily driven by either glacier, permanent snow or ice, or a groundwater-fed spring. Within each catchment, we sampled three microhabitats: source ice or snow (when applicable), streamwater, and biofilms (i.e., the microbial communities growing on stream rocks). Based on previous studies in the Swiss Alps, we expect to find significant differences in prokaryotic diversity among microhabitats. Furthermore, we explored variation among mountain ranges by putting our data into a larger framework that included the same experimental design to assess microbial diversity of alpine stream habitats in Glacier National Park, Montana. Here, we expect to find greater similarity in prokaryotic diversity within a microhabitat between mountain ranges.
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18C. Rachel Potter  
Mentor: Robin Cooper

*Role of cAMP in Synaptic Vesicle Recruitment to Synapses at High and Low Output Neuromuscular Junctions*

Synaptic efficacy among neurons communicating to other neurons or to targets, such as skeletal muscle, is a dynamic process throughout development and for established synapses. The ability of synaptic function to increase or decrease in regulating the appropriate range of synaptic transmission is important in maintaining correct neural responses. Subtle changes in synaptic modulation can have pronounced acute and chronic effects. Vesicles are distributed inside a nerve terminal as a readily releasable pool (RRP) and a reserve pool (RP). The ability to mobilize the RP is known to be regulated by various second messengers (i.e. cAMP, IP3, PKA) depending on the type of preparation. Few studies have examined the differences in mobilizing the RP by cAMP following synaptic depression induced by high frequency stimulation; the same goes for synapses which are deemed high or low in synaptic efficacy. The hypotheses being tested at the crayfish and larval Drosophila neuromuscular junctions (NMJs) are: (1) Low output synapses will show a greater degree of synaptic enhancement due to activation of cAMP as compared to high output synapses; (2) after induction of high frequency evoked depression, little recruitment of RP vesicle will occur in either synapse type; and (3) enhancing the cAMP production will lead to enhanced synaptic depression in the low output synapses as compared to high output synapses. Activation of cAMP by application of forskolin, an activator of adenylate cyclase, was used. Low output NMJs increased by 127.8% with prior 1hr incubation and only 36.16% without incubation of forskolin (N=5, P< 0.05). A 56.29% (n = 5) increase occurred after depression without incubation. Studies are underway with high output crayfish and Drosophila NMJs. These studies are significant as the results will prove which types of synapses may be modulated by pharmacological agents for therapeutic targets.

19A. Samuel Potter  
Other Authors: Rachel Potter, Jacob Sifers, Emily Yocom  
Mentor: Robin Cooper

*Acute and Chronic Effects of Inhibiting mTOR by Rapamycin on Development, Behavior, and Physiology in Larval Drosophila*

Rapamycin is a compound that can specifically block mTOR signaling and is therefore used in experimental biology. It is being utilized clinically as an immunomodulator after transplantation procedures and treatment for some forms of cancer. Due to its many possible effects on different molecular pathways, it could have any number of impacts on synaptic transmission. This issue has not, however, been addressed in a developing system. We hope to address it by feeding second and third instar Drosophila larvae varying concentrations of rapamycin and monitoring larval stages, pupation, and survival. Typical larval behavioral assays being examined are mouth hook movement while eating and body wall movement while crawling on apple juice agar plates. Behaviors in the adults fed rapamycin include climbing, righting response, and movement assays. The results to date suggest 2nd instar larvae are more susceptible to rapamycin as compared to 3rd instar, based on a higher death rate. Adults fed rapamycin climb less over time and tend to fall off the wall when climbing. Dose-response studies are being established. This study is significant as we are starting to address the acute and long-term action of inhibiting the mTOR pathway on neuronal function and potential mechanisms to account for altered physiological function.
19B. Mackenzie Samson  
Mentor: Jeramiah Smith  

*Characterizing Programmed Genome Rearrangement in the Sea Lamprey*

The sea lamprey, Petromyzon marinus, diverged from the vertebrate lineage around 500 million years ago. It is one of the few vertebrates known to undergo programmed genome rearrangement (PGR), eliminating ~20% of their genome in somatic cells. This process occurs during the midblastula development stage. While some aspects of PGR are understood, the mechanism by which this process occurs remains largely unknown. Understanding the mechanism behind PGR may shed critical light on vertebrate genome biology and evolution. To elucidate features of the mechanism behind PGR, we inhibited methyltransferase with 5-Azacytidine and 5-Aza-2′-deoxycytidine. Methyltransferase is an enzyme known to mark DNA for elimination in other systems with PGR. Once marked for elimination, somatic cells of the lamprey package the portion to be deleted into micronuclei, small nuclei that form when chromosomal fragments are not incorporated into daughter nuclei during cell division. To observe the inhibitor effects on the number and methylation of these micronuclei, we performed immunofluorescent staining and PACT Clarity techniques. The results of exposure to the inhibitors showed a significant effect, decreasing the survival rate from fertilization to the midblastula stage. In addition, the inhibitor increased the number of micronuclei in each trial indicating methylation impacts PGR. Altered PACT Clarity techniques enabled visualization of whole mounted embryos, increasing the accuracy of the manual micronuclei counts. Nuclei in the anaphase stage of mitosis revealed the presence of lagging chromosomes. Further experimentation will be done to determine if lagging chromosomes form micronuclei. Observing the effects of inhibiting methyltransferase in the sea lamprey will help characterize PGR and provide insight into the mechanism controlling the elimination. This study has important implications for vertebrate genome biology and evolution.

19C. Connor Sears  
Mentor: Catherine Linnen  

*The Relationship Between Melanin Content and Cuticle Strength in Two Species of Conifer Sawfly (Hymenoptera: Diprionidae)*

The pigment melanin has been studied across a diverse group of invertebrates in the past, and the function of this pigment differs tremendously between taxa. In invertebrates, it has been hypothesized that melanized cuticles are more difficult to penetrate than their non-melanized counterparts. While this assertion has been made many times in topical literature, a quantitative assessment of cuticle strength in relation to melanin content has not yet been produced. This study aims to test the hypothesis that melanin content is correlated with cuticle strength. An assay was developed to test cuticle strength in spotted and non-spotted areas of cuticle in several populations of two species of conifer sawflies, Neodiprion lecontei and Diprion similis. In both freshly-sacrificed and ethanol-preserved larvae, melanized areas of cuticle require significantly more force to penetrate than non-melanized areas. Given the significant difference between the cuticle strength of melanized and non-melanized areas, it is possible that melanized areas in sawfly cuticles may serve as a mechanical defense against parasitism or predation.
20A. Chia-Hsuan Shen  
Other Authors: Isaac Davis-Peterson, Kathryn Price, Adrienne Watts  
Mentor: David Weisrock

*A comparative assessment of prokaryotic diversity among alpine stream environments within Glacier National Park, Montana*

Glacier National Park (GNP), located in northwestern Montana, contains many diverse landscapes and ecosystems ranging from glaciated alpine habitat above treeline to forests and valleys. Recently, climate change has greatly affected GNP, most notably as a driver of major decline in glacial and permanent snowfield mass. Shrinking glaciers seriously impact alpine habitats due to the increase of glacial melt and the opening of new habitat once covered by ice. This changing environment also affects the biodiversity of alpine ecosystems. While the effects on wildlife, as well as stream macroinvertebrate taxa, have been well-studied, little attention has been paid to the microbiota of alpine ecosystems on a global scale. This is particularly true for alpine streams emanating from permanent glacial and snowfield masses where the most significant environmental change can be expected to occur. The purpose of this study was to analyze the prokaryotic diversity of alpine stream ecosystems in GNP. Specifically, we utilized 16S rRNA sequencing to characterize microbial diversity and community composition of six alpine stream catchments that were primarily driven by either glacier, permanent snow or ice, or a groundwater-fed spring. Within each catchment, we sampled three microhabitats: source ice or snow (when applicable), streamwater, and biofilms (i.e., the microbial communities growing on stream rocks). Based on previous studies in the Swiss Alps, we expect to find significant differences in prokaryotic diversity among microhabitats. Furthermore, we explored variation among mountain ranges by putting our data into a larger framework that included the same experimental design to assess prokaryotic diversity of alpine stream habitats in Grand Teton National Park, Wyoming. Here, we expect to find greater similarity in prokaryotic diversity within a microhabitat between mountain ranges.

20B. Eashwar Somasundaram  
Mentor: Robin Cooper

*Modulatory action of acetylcholine in somatosensory processing in Drosophila melanogaster: behavior, development, and sensory-motor circuit physiology*

The model organism, Drosophila melanogaster uses many of the same neurotransmitters as mammals and other organisms. Acetylcholine (ACh) is one of these neurotransmitters. In this model, ACh is the primary transmitter used in peripheral sensory neurons projecting to the Central Nervous System (CNS) and is the primary excitatory transmitter within the CNS. A number of stereotyped sensorimotor responses have been confirmed to be regulated by cholinergic sensory input in Drosophila, each of which is mediated by distinct circuits guided by individual neuronal populations within the peripheral nervous system. One such subset of sensory neurons is the Class IV multidendritic (md) sensory neurons that are known to be integral in mediating response to tactile touch. Here, we have utilized the Gal4/UAS system to differentially express a temperature sensitive mutant shibire allele and thermosensitive TrpA1 channels to suppress and activate cholinergic neurons, respectively, and observed the acute, activity-dependent modulation of response to tactile touch. We utilized a well-characterized assay to assess the response of 3rd instar Drosophila larvae to a 20mN tactile stimulus upon alteration of activity. Preliminary results have shown that global silencing and activation of cholinergic neuronal activity diminished motor response to the touch stimulus, suggesting ACh modulates this sensorimotor circuit. Additional work to assess the role of activity of individual subsets of cholinergic neurons, including Class IV md neurons, in modulating this response is underway. The ability to temporally alter activity of subsets of neurons at various developmental stages allows for additional questions to be evaluated. This sensorimotor circuit
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can be utilized to assess the role of activity in formation and maintenance of a defined neural circuit. The significance of this research is that behavioral, morphological and electrophysiological assessments can be utilized after long-term, chronic alteration of these subsets of neurons to identify persistent changes in neural circuit function.

20C. Amanda Spence
Mentor: Robin Cooper

Middle and High School Distance Learning with College Student Mentors: Online Blogging and Video Communication

Novel approaches have been developed for science classes in grades 6-12 in public and private schools within Kentucky. This is being done to engage in scientific dialogue with undergraduate and graduate science students as well as faculty at the University of Kentucky. This research promotes dialogue of scientific research and content with middle and high school science teachers as well as their students. The goal is to help foster effective scientific critical thinking, analysis, presentation, and discussion skills for these students and university science majors by exploring various topics across the science disciplines. The program is designed to supplement on-going education in the curricula content area the grades 6-12 teachers are covering in their respective classes with supportive collaboration and dialogue with higher education. College students work in interdisciplinary pairs mentoring 5 to 6 middle/high school students as a mini-class; dialogue is weekly via blog and/or video streams. The online Acclaim account allows participants to annotate posted audio and video clips generated via mini-classes promoting easy and effective feedback, discussion, and collaboration as well as documentation of the activities. University students make presentations on their mentored students’ activities and progress using multimedia to expand science content knowledge and foster collaboration within the university setting. The results to date have been outstanding with weekly interactions among the grades 6-12 and college students and faculty. The barrier of using multimedia, communicating fears, and exposing weakness in knowledge in science have been eradicated in the grade 6-12 participants mentored to date. Assessments in the effectiveness of the program are being tabulated with university IRB approval. The hope is to grow this program across our campus and this outreaching approach to university credited courses nation and worldwide.

21A. Stephanie Strothkamp
Mentor: Yang Jiang

The Daily Grind: Combined Effects of Sugar and Caffeine on Brain Activity

Caffeine is one of the most commonly consumed stimulants around the world, often coming in the form of caffeinated beverages such as soda, tea, and coffee. It is most commonly used to improve alertness, but it can also be used in combination with painkillers for simple headaches and migraines. Many studies have been done on the effects of caffeine on cognition. Generally, research has shown general improvement in information processing efficiency after the consumption of caffeine (Lorist 2003). One study even found that coffee and not caffeine had positive effects on cognition in aged individuals (Shukitt-Hale 2013). However, little research has been done on the effects of caffeine when combined with sugar, as it is most commonly consumed. Sugar could possibly dull, or enhance, the improvement in processing efficiency provided by caffeine. In this study, electroencephalograph (EEG) was utilized to study brain activity while participants performed a memory span task after consuming coffee with either zero calorie sweetener or granulated sugar. To counterbalance the trials, participants were either given the zero calorie sweetener first, followed by the granulated sugar, or the sugar first followed by sweetener. In order to control the amount of caffeine given to each participant, 200mg caffeine pills were dissolved into
decaf coffee. This study was designed to test the hypothesis that while caffeine by itself can increase memory span, caffeine combined with sugar reduces memory span. Results are predicted to show different EEG results for caffeine with sugar versus caffeine with no sugar, as well as different results for the memory span task.

21B. Tessa Teardo  
Other Authors: Hunter Prince, Ndeye Thiaw, Dawson Godby  
Mentor: Bruce O'Hara

Effect of Meditation on Reaction Time Performance

For centuries now, Yogis from India, Buddhists monks from Indo-china, and many other spiritual practitioners from across the world, have reported the beneficial effects of meditation. The stress relieving and relaxational properties have already been documented by many workers, especially those studying the effects of Transcendental meditation on meditators as opposed to non-meditators. But the area of interaction between meditation and objective performance is largely untouched, despite the many claimed benefits for almost all forms of meditation. The aim of this study is to study the effect of meditation on short term performance. Psychomotor Vigilance Task (PVT) recordings were done on subjects (n=15) before and after 20 minute bouts of focused attention meditation with closed eyes. All subjects were undergraduate students at University of Kentucky. PVT involves the subject responding to a light or sound stimulus by clicking a button on a monitor. PVT-192 monitors manufactured by Ambulatory Monitoring Inc. were used in this study. The results are recorded as reaction time (RT) in milliseconds (ms). All subjects were novice meditators with limited or no exposure to the practice. Statistical comparison of mean Reaction times before and after meditation yielded significant results in terms of performance improvement (p<0.05). This study investigates the hypothesis that meditation improves PVT performance, perhaps by allowing the brain to reset and refocus on new tasks. Results from all the subjects will be presented along with statistical analysis.

21C. Sarah Vain  
Mentor: Melody Danley

The Effect of Gymnosperm Xylem on the Filtration of Contaminated Water

A lack of clean drinking water is a problem that many people in the world face. Previous research has shown that xylem tissue harvested from white pine (Pinus strobus) successfully filtered the pathogen Escherichia coli (E. coli) from contaminated water. Other gymnosperm species may also show such promise, allowing this technique to be used more universally. Ideal species should contain Torus-margo pit membranes between the fluid conducting cells in their xylem tissue, since this is the point of filtration. Based on these criteria, two candidate gymnosperm species were investigated: common juniper (Juniperus communis) and ginkgo (Ginkgo biloba). The current experiment tested whether gingko, common juniper, and white pine could (1) remove all E. coli from contaminated water and (2) produce enough filtered water to meet the needs of a single person for a day. To test this, carbon-filtered tap water was contaminated with 103 CFU/L of the nonpathogenic K12 strain of E. coli. Contaminated water was filtered through the appropriate xylem tissue for 72 hours, before the total volume produced was measured and a subsample was plated, in duplicate. Control water samples were also filtered and plated, in duplicate. Results showed the filtrate collected from each species tested positive for bacteria contaminants, both in the control and experimental filtrates. While the contamination of the filtrates was not optimal, results showed white pine had the highest filtering efficiency of the three species (averaging 235.5 ± 253.5L) for the 72-hour filtering period). Based on the results of the current experiment, it was concluded that even under sterile conditions, it is difficult to remove all pathogens from contaminated
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water. Further development should be completed to make this technique effective for the production of safe drinking water.

22A. Jay Van Doorn
Mentor: Robin Cooper

Examining Neuromuscular Junctions in Drosophila by Optogenetics

The advantage of examining synaptic function at the Drosophila neuromuscular junction is that the sites of synaptic contact can be studied directly with ease. The neuromuscular preparations in the larval Drosophila offer many advantages as compared to vertebrate neuromuscular junctions (NMJs), since one to a few excitatory motor neurons innervate a muscle, and the neurons are identifiable from preparation to preparation. In addition, the excitatory neurotransmitter is glutamate and the excitatory postsynaptic potentials (EPSP) are graded; thus, the biophysical properties of graded events are analogous to the dendrites of neurons within the CNS of vertebrates. However the quantal currents can be monitored directly at the postsynaptic sites. This study employs the use of optogenetics on a genetic line of Drosophila that allows the activation of the NMJ in response to blue light after being fed all-trans retinol. Light regiments of varying times will illuminate neuromuscular interactions in Drosophila after continued stimulation over 24 hours. By this, more accurate animal models can be employed when studying NMJs and future studies into the Drosophila synapse will be made possible.

22B. Alexis Welch
Mentor: Randal Voss

Dorsomorphin and DMH1 Promote Dorsal Ventral Tail Growth During Salamander Tail Regeneration

The Mexican axolotl (Ambystoma mexicanum) is an excellent model to investigate mechanisms of regeneration. In this study, we tested two small chemical compounds: Dorsomorphin and DMH1 for an effect on axolotl embryo tail regeneration. Dorsomorphin is a potent 5' AMP-activated protein kinase (AMPK) inhibitor that also blocks type 1 BMP receptor activity (Alk2, Alk3, and Alk6), while DMH1 is thought to specifically inhibit ALK2. Embryos were anesthetized, administered tail amputations, and placed in microtiter plates containing different concentrations of Dorsomorphin and DMH1. After 6 days of tail regeneration, embryos treated with 10 or 20 uM Dorsomorphin had significantly shorter body lengths and significantly wider tails than non-treated embryos. Embryos treated with 10 uM DMH1 also exhibited significantly wider tails than non-treated embryos, but body lengths were not significantly different. To explore how Dorsomorphin affects transcription during regeneration, microarray analysis was performed using RNA isolated from 1 mm of distal tail tissue sampled from treated and non-treated embryos at 48 hours post amputation. The differentially expressed genes that were identified between treated and non-treated embryos significantly enriched gene ontologies associated with cholesterol biosynthesis. Our results suggest that Dorsomorphin, and possibly also DMH1, affect regenerative growth by inhibiting AMPK, which is known to regulate cellular energy homeostasis.
22C. Robyn Blood  
Other Authors: Stephanie Cisek, Taylor Decker, Anne Lasher, Brandi Pratt  
Mentor: Ren Xu

*Microenvironmental Cues in Early Breast Cancer Development*

Breast cancer is a common, widespread problem affected by women across the world. This cancer can spread from the breasts across the body to other organ systems. This metastasis is caused by the cancer itself and the microenvironment in and around the cancer. This lab focused on the micro-environmental cues in breast cancer development in the extracellular matrix (ECM). The specific protein that was studied in the extracellular matrix was collagen. This lab specifically focused on the PLOD2 gene. To study this gene, reverse transcription polymerase chain reaction was used. An mRNA primer first had to be produced. To do so, a sequence was isolated from the NCBI gene base and sent to a lab, which produced the primer. The qualitative PCR solution was comprised of a DNA template, pair of primers, nucleotides, DNA polymerase, and a buffer solution. The PCR was run on two types of solutions. After the PCR was run, electrophoresis was ran on the new solution to compare a standard to the experimental solution to test if the solution was created and ran correctly. If no DNA were made during PCR, this experiment would show it. Electrophoresis uses an electric current to move molecules towards a positive charge based on size. This study will hopefully someday show what specific environmental factors have the most direct impact on cancer growth and development.

23A. Chad Davidson  
Other Authors: Autumn Conger  
Mentor: Douglas Harrison, Michelle Giedt

*Effect of Negative Regulators of the JAK/STAT Pathway on Reproductive Lifespan*

The onset of reproductive senescence is a part of life that most organisms are faced with at some point. Many studies have shown that the older an organism becomes, the more likely they are to become sterile. A genome wide association study (GWAS) from previous experiments unbiasedly revealed genetic variants that influence reproductive lifespan. There were several genes that were identified as good candidates that affect reproductive lifespan. This research focused on genes that regulate JAK/STAT signaling. The goal of this lab is to find out if reduction of negative regulators of this pathway, that came up in the GWAS, will increase the reproductive lifespan of fruit flies. It is hypothesized that a reduction in expression of the negative regulators will increase reproductive lifespan. Some candidate genes are known to affect other biological pathways such as MAP kinase signaling (Socs36E and Ptp61F), but one is thought to only regulate JAK/STAT signaling (Lat). Another major candidate gene was GFP RNAi. The expression of candidate genes will be controlled using RNA interference (RNAi) and a gene switches. RNAi inhibits gene expression. When we inhibit a negative regulator of the JAK/STAT pathway, it allows the JAK/STAT pathway function to increase. Gene switches will essentially turn on and off the the JAK/STAT pathway. This experiment also used a hormone, mifepristone, to induce the formation of a double stranded RNA complex and cause the inhibition of messenger RNA. A reproductive lifespan assay was used to determine the effect of the candidate genes. This involves mating male fruit flies with new females every two days until they reach sterility. The results from this experiment should show that decreasing expression of candidate genes will have a positive effect on JAK/STAT signaling causing an increase in male fruit fly fertility.
Use of White Pine Xylem to Produce Drinking Water: Effect of Stem Diameter

The mortality rates associated with waterborne bacteria makes it the biggest environmental health threat in developing countries. To improve access to clean drinking water, the ideal method of water purification needs to be sustainable, inexpensive, and effective in the removal of pathogens. Recently, researchers suggested that gymnosperm xylem, such as that from the Eastern white pine (Pinus strobus), could be used to filter contaminated drinking water by using the pine’s xylem structures to remove common bacterial contaminants like E. coli. To determine the use of white pine xylem as a robust and reliable method of water filtration, I investigated if different diameters of the white pine’s xylem could effectively (1) remove E. coli from contaminated water samples and (2) produce enough drinking water for one person for a day. Three different stem diameters were tested: 0.64 cm, 0.96 cm, and 1.59 cm. Each treatment diameter was tested in triplicate, with E. coli contaminated water or without (control). At the end of the 72-hour filtration period, the total volume of filtrate produced was measured, and four 100-mliter samples of filtrate were plated on LB agar for detection of E.coli. The preliminary results have generated more questions than they have answered. Most of the filtered water samples were still contaminated with bacteria, indicating additional changes may be needed to make the filtration technique effective. As predicted, the larger diameter filter produced a larger volume of filtrate, but a maximum diameter was not yet determined. Ideally, a range of diameters that yield a high filtrate volume while still effectively removing bacterial contaminants should be identified.

Optogenetic and Pharmacological Alteration in the GABAergic System Within Drosophila melanogaster Affects Development, Feeding Behavior and Locomotion.

Drosophila melanogaster is a model system due to a relative simple nervous system and the ability to make modifications genetically for studies on identifiable neurons within the live animal. Key questions in understanding the function of the central nervous system (CNS) in physiologic and pathologic conditions can be addressed in this system quickly and cheaply to develop a foundation which can be followed up in mammalian systems. Neuromodulators and neurotransmitters play a significant role in the activity of the CNS. Many studies address the effects of enhanced activity on synapse formation and axon growth but few address the effects of reducing activity or the effects of GABA, an inhibitor modulator in the brain. The central research question is on the role of GABA, on the development and maintenance of neural circuits and in relation to animal behavior. The effects of administering varying levels of GABA to the organisms through tests on development, behaviors, olfaction, survival and physiology were studied. The developmental time to pupation and to eclosion as well as behavioral tests were also investigated. The larval development is slowed in a dose-dependent manner with feeding GABA. Locomotive behavior is not as sensitive as mouth hook movements in the third instar larvae to low concentrations of food tainted with GABA. The optogenetic stimulation of GABA neurons in larvae produces locomotive alterations. We are now addressing the role of various GABAergic receptor subtypes in larval CNS related to development of neural circuits and behavioral changes. This study may help to address the roles GABAergic transmission throughout all animals.
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24A. Aya Omar
Mentor: Robin Cooper

*Pharmacological Identification of Cholinergic Receptor Subtypes in Modulation of a Drosophila melanogaster Sensory-Motor Circuit.*

Acetylcholine (ACh) is an abundant neurotransmitter found in many species across various taxa. In mammals, it is known to be integral in modulating neural circuits underlying important processes such as learning, memory, and reward processing. In Drosophila melanogaster, ACh and the components mediating cholinergic signaling, exhibit comparable importance. It is the neurotransmitter used in peripheral sensory neurons and is the primary excitatory neurotransmitter within the CNS. The receptors that facilitate synaptic transmission at cholinergic synapses are divided into two broad subtypes: the ionotropic nicotinic acetylcholine receptors (nAChRs) and the metabotropic muscarinic acetylcholine receptors (mAChRs). This receptor classification is shared in both mammals and insects; however, both the pharmacological and functional characterization of these receptors within the Drosophila nervous system has lagged behind its mammalian model counterparts. In order to further classification of these receptors in the nervous system of a model organism that has become vital to neuroscientists across the globe, we have used a combined behavioral and electrophysiological approach to identify important cholinergic receptor subtypes within the Drosophila CNS that may be crucial in modulating defined neural circuits. We have exposed intact Drosophila 3rd instar larvae to various concentrations of ACh agonists and antagonists by way of feeding to observe modulation of locomotion. In addition, we have utilized a well-characterized electrophysiological approach to assess the efficacy of a defined sensory-CNS-motor circuit in the presence of cholinergic agonists and antagonists exposed directly to the CNS of a semi-intact larval preparation. Preliminary results suggest that exposing the CNS directly to ACh agonists, nicotine and muscarine, enhances electrical activity of a sensory-CNS-motor circuit. Conversely, acute feeding of nicotine and acetylcholine suppresses locomotion. These results suggest both nAChRs and mAChRs within the CNS may act to modulate a motor circuit which mediates general locomotion in larval Drosophila.

24B. Stephanie Pappas
Other Authors: Jennifer Nguyen, Ja'Niya White
Mentor: Sanjay Singh

*Genome-Wide Identification and Expression Analysis of MicroRNAs in the Medicinal Plant, Catharanthus roseus (Madagascar Periwinkle)*

MicroRNAs (miRNAs) are a group of small, endogenous non-coding RNA, usually 21-24 nucleotide long, in animals and plants. miRNAs are implicated in numerous biological processes in plants including growth and development, as well as biosynthesis of specialized metabolites that protect plants under adverse conditions. Many of these metabolites are also beneficial to human health. Terpenoid indole alkaloids (TIAs) are a group of specialized metabolites produced by a limited number of plant families. Catharanthus roseus (Madagascar periwinkle) of the family Apocynaceae, produces hundreds of TIAs including the anticancer drugs, vincristine and vinblastine. In addition, TIAs, such as ajmalicine and serpentine, are used for the treatment of hypertension and other illnesses. Biosynthesis of TIAs is highly complex, involving various cellular compartments and more than twenty different enzymes. Over the past decade, a number of genes encoding key enzymes and regulatory proteins in TIA pathway have been isolated and characterized. However, the molecular mechanisms governing the regulation of TIA pathway genes are not well understood. Moreover, Catharanthus miRNAs and their possible involvement in the regulation of TIA pathway in have not been thoroughly studied. The major focus of this project was to utilize the available genomic resources and bioinformatics tools to identify both conserved and novel
miRNA sequences in Catharanthus. We identified 148 conserved miRNA belong to 36 families in the Catharanthus genome. We used quantitative real-time PCR (qRT-PCR) to examine the expression of selected miRNAs in Catharanthus seedlings. Identification and expression analysis miRNAs in Catharanthus provide a starting point for elucidating the roles of regulatory RNAs in biosynthesis of medicinal compounds in Catharanthus.

24C. Avery Williams
Other Authors: Cassidy Lim, Morgan Blair
Mentor: Doug Harrison, Michelle Giedt

Terribly Reduced Optic Lobe Gene Expression’s Influence over Reproductive Lifespan in Male Drosophila melanogaster

Despite being one of the most widely researched organisms, little is known about the genes contributing to male reproductive lifespan in Drosophila melanogaster. Recent research conducted by the University of Kentucky narrowed down which genes could have played a role in the reproductive lifespan of Drosophila melanogaster. The research focused on one such gene: terribly reduced optic lobes (trol). To investigate the effect of this gene on reproductive lifespan, comparisons were made with a strain of Drosophila with a decreased expression of the trol gene products. RU486 was used to activate the GAL4 protein necessary for the RNAi transgene. In each case a male was crossed with two new virgin females every 2 to 3 days. Determining whether altering trol activity actually affected the reproductive lifespan which lead to having controls that would give results and evidence throughout the experiment. A control strain of flies with normal trol gene expression was set on food with and without RU486 to eliminate variation due to environmental conditions or other genetic background. Another control strain of flies containing the mutation for increased expression of trol construct was set with normal food to see the effect of RU486. They were kept in vials that had food at the bottom. Each cross was monitored to determine if offspring were produced. It was discovered that reproductive lifespan did not vary widely among the control lines with each male averaging (x) crosses before encountering infertility or death. However, a mutant male exposed to RU486 had an average reproductive lifespan lasting (y) days before having two negative crosses, supporting our hypothesis.

Biomedical Engineering

25A. Curtis Bethel
Mentor: David Puleo

Improved Controlled Drug Release via the Degradation of Poly(B-amino ester) Polymerized Hydrogels

Current drug delivery methods are unable to achieve an ideal drug release rate. Injections release a bolus of drug at high concentration while oral doses are subject to first-pass metabolism, greatly reducing the concentration. Biodegradable hydrogels are an appealing alternative for controlling drug release into a specific location. Poly(B-amino esters) (PBAEs), in particular, were used in this study for their ease of synthesis and range of beneficial properties. PBAEs were synthesized into small circular samples of two different composition ratios and loaded with simvastatin: an osteogenic, angiogenic, and anti-inflammatory drug. Because of these properties, implanted PBAEs loaded with simvastatin are useful for bone tissue regeneration. The samples were then placed in a phosphate-buffered saline (PBS) solution to emulate the environment of the body. Over a period of time the samples are submerged in PBS solutions of three different pHs and examined for their drug release rate properties by studying the resulting supernatant through high performance liquid chromatography (HPLC). The present study allows for a better understanding of how variation in hydrogel composition and pH affects release profiles.
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Cardiovascular Research Center

25B. Julia Vandra
Mentor: J. Anthony Brandon, Susan Smyth

The Role of Adipose-Derived Autotaxin on Inflammation Associated with Cardiovascular Disease

Obesity is an established risk factor for cardiovascular disease (CVD) and the cardiovascular complications of obesity are a leading cause of potentially preventable death. Recent evidence suggests that increased cardiovascular mortality in patients with obesity may not be fully explained by associated risk factors such as dyslipidemia, hyperglycemia, insulin resistance and hypertension. In addition to contributing to traditional CVD risk factors, obesity is also characterized by a chronic sub-acute inflammatory state termed “metainflammation” involving increased circulating inflammatory cytokines. Autotaxin (ATX), encoded by the ecto-nucleotide pyrophosphatase/phosphodiesterase 2 (ENPP2) gene, is a potent cell motility-stimulating factor that is secreted by adipose tissue. The two main objectives of this study were to investigate if ATX may be involved in metainflammation and to explore whether adipose ATX contributes to systemic inflammatory responses. We established two animal models with reduced ATX expression: MX-1 Cre-mediated deletion of the gene encoding ATX to generate a global loss and Adipoq-Cre mediated loss of ATX expression in adipocytes. Mice were fed a high fat diet for up to 20 weeks. RNA and proteins were extracted, qPCR and western blots were performed for ATX and inflammatory cytokines; MCP, TNF-α and IFN-γ. Furthermore, LPS was used to provoke a systemic response in mice that had been on a HFD for 10 weeks. Six hours after LPS injection, RNA was extracted and qPCR performed for IL-6, IL-1β and IFN-γ. Results showed MX1-Δ and AdipoQ-Δ mice had a reduced level of inflammatory cytokines in adipose tissue. In response to a LPS challenge, AdipoQ-Δ mice showed a reduced inflammatory response. The data generated from these experiments will provide important insight into potential mechanisms of how ATX and adipose tissue influence obesity induced inflammation and results from this and future projects may identify potential therapeutic targets to prevent and treat obesity induced inflammation.

Chemical & Materials Engineering

25C. Fox Thorpe
Mentor: Dibakar Bhattacharyya

Advanced Nanofiltration Membranes for Water Desalination

Nanofiltration (NF) is an effective, low cost, and versatile way to separate ions from a solution. NF membranes are used in food production, medical equipment, and water purification. Effluent organic matter (EfOM) has been shown to cause membrane fouling which reduces the performance and lifespan of nanofiltration membranes. This research seeks to prevent or reduce biofouling by modifying nanofiltration membranes with Graphene Quantum Dots (GQDs). GQDs’ extreme hydrophilic nature inhibits binding of biofoulants, modeled in this study by the biopolymer bovine serum albumin (BSA), to the surface of the membrane. GQDs were bound to amine groups on the membrane surface through simple EDC/NHS coupling. Zeta potential and IR tests were conducted to confirm binding of GQDs to the membrane surface. The effect of these modifications on flux and salt rejection is determined by comparing modified membrane performance to the baselines determined for unmodified membranes experimentally and in literature. Those results are also compared to unmodified membranes subjected to biofouling in order to analyze the effect of the modification. Successful yielding of antifouling properties can lead to more effective and efficient water purification and reclamation.
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Chemical Engineering

26A. Steven Armbruster
Other Authors: Kwabenah Darkwah
Mentor: Barbara Knutson, Michael Flythe

Supercritical Carbon Dioxide-Methanol Cosolvent Extraction of Isoflavones from Red Clover

Red Clover (Trifolium pratense) is a common forage plant that is rich in antimicrobial secondary isoflavones (mainly Biochanin A and Formononetin at 0.1 - 0.9 % in the dry forage). Red clover extracts and Biochanin A have been shown to inhibit the growth of the hyper ammonia-producing bacteria, Clostridium(C.) sticklandii SR, largely responsible for the unwanted breakdown of amino acids in the rumen of bovines. Isoflavones are typically extracted from red clover using conventional extraction methods at high temperatures (around 90 °C) with large quantities of organic solvents. Supercritical fluids (SCF) are fluids above the critical temperature and pressure and exhibit a liquid-like density with viscosity and diffusivity between that of gases and liquids. The solvent strength and selectivity of supercritical carbon dioxide (SC-CO2) can be tuned to a desired level by modifying the temperature, pressure or both. For the extraction of compounds that dissolve more readily in polar solvents, a cosolvent is added to aid in the extraction process since CO2 is non-polar. This study investigates the extraction of the isoflavones in red clover with SC-CO2 at different extraction conditions (temperatures: 35 - 45 °C, pressures: 900 - 2500 psi and cosolvent concentrations of 1 - 5 mol % methanol). Preliminary results of a 5 mol % methanol assisted SC-CO2 extract used in bioassays to assess the antimicrobial activity of the extract against C. sticklandii SR will be compared to the bioassays of pure Biochanin A. Additionally, TiO2 functionalized mesoporous silica nano particles used to adsorb pure Biochanin A are used in antimicrobial bioassays to demonstrate the future application of the nano particles with the SC-CO2 extraction process (at the extraction conditions specified above) to capture the extracts. Isoflavones extracted at moderate temperatures with cosolvent assisted SC-CO2 will significantly reduce the amount of organic solvents used in the extraction process.

26B. Szofia Komaromy-Hiller
Mentor: Kimberly Anderson

The Role of CD151 and β1 Proteins in MDA-MB-231 Cell Adhesion

Cell adhesion is a critical step in cancer metastasis and spread of the primary tumor. The role of CD151 and β1 integrin proteins on the adhesion of tumor cells was investigated in an Ibidi µ-slide VI^0.4 chip flow apparatus. The chip was placed under an inverted microscope camera (Axiovert 35, Zeiss), which was used to count the cancer cells that remained attached to endothelial cells. The flow channels in the Ibidi chip were coated with a monolayer of HUVEC endothelial cells and after activation of the adhesion receptors with TNF-α, each channel was exposed to one out of three different cancer cell lines. These cancer cell lines consisted of unaltered MDA-MB-231 cancer cells, CD151 knockdown (kd) cancer cells, and β1 integrin removed, respectively. After a 30-minute incubation period, the number of cancer cells attached to the endothelial cell monolayer was counted. Then EGM-2 cell culture media was pumped through the channel at 2 dyne/cm3 to simulate normal blood flow. The number of cancer cells still attached to the endothelial cell monolayer was counted at the 1-minute and 10-minute marks. While the number of attached cancer cells decreased over time, ANOVA statistical analysis showed no statistically significant difference between the three cancer cell lines. This indicates that neither CD151 protein nor β1 integrin alone determines the adhesion of cancer cells to the endothelial cell adhesion receptors at the
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experimental flow rate used. The process of cell adhesion may be affected by a combination of multiple proteins and/or fluid flow rate.

Chemistry

26C. Annie Baker
Mentor: Anne-Frances Miller

Creation of Soluble FixAB Protein

We are studying the proteins used in bacteria to enable photosynthetic electron transfer reactions to drive nitrogen fixation. Nitrogen fixation is one of the most energy intensive processes mankind undertakes, consuming 10% of the energy produced by man each year. In photosynthetic algae and plants, a set of four 'Fix' proteins called FixABCX accept electron equivalents produced by light-driven electron transfer and upgrade the energy content of half of them so that they are able to power nitrogen fixation. As a first step towards understanding how, we want to be able to produce each of the four Fix proteins in quantity. Therefore I worked to engineer genes for FixA and FixB to permit production of soluble stable proteins. The fixa and fixb genes had been designed to bear TEV tags linking the proteins to their 6-His repeats used for protein purification. I hypothesized that the TEV tags were causing FixAB to be insoluble. Therefore I used PCR to modify the genes of two versions of each of FixA and FixB to remove the TEV tag. The resulting proteins were produced in good quantity, but nonetheless remained largely insoluble. Future efforts will replace hydrophobic residues on the surface of FixAB with more hydrophilic ones, in a continuing effort to increase the solubility and stability of FixAB.

27A. Sarah Coulson
Mentor: Tom Dziubla

Synthesis and Physical Properties of Cystamine-containing PBAE Hydrogels

As humans breathe in, the natural aerobic respiration and metabolism of oxygen yields Reactive Oxygen Species, or ROS. These ROS are harmful to the body if they are not effectively neutralized by endogenous antioxidants. Within a healthy cell, there is a balance between the amount of ROS produced and the antioxidants' ability to neutralize them. If this balance is thrown off, ROS build up. This unhealthy state is known as oxidative stress, and can cause cancer, alzheimers, Parkinson's disease, and aging effects in general. The best way to combat oxidative stress is through antioxidants, which can be found naturally in the body and in certain types of foods. However, these levels are often inadequate and can be supplemented through medication. This line of research examines a solution to safely and effectively delivering antioxidants to the body through Cystamine-containing PBAE hydrogels.

27B. Corrine Elliott
Mentor: Susan Odom

Computational Pre-Screening of Organic Materials for Optimization of Energy Storage Systems

Lithium-ion batteries (LIBs) are a preferred power source for portable electronics, while redox flow batteries (RFBs) present an opportunity for large-scale stationary energy storage. Materials optimization has brought about substantial improvements in both systems, but there remain limitations to the efficiency and safety of these devices. LIBs suffer from overcharge a harmful condition which limits battery lifetimes and can lead to increased internal pressure and thermal runaway, thence to smoking and/or fire. The aqueous, all-vanadium RFB system is the most advanced yet under consideration, but the voltage
window is limited and components are often extremely corrosive. Organic aromatic compounds may constitute a solution to both of the above limitations as redox shuttles to protect against overcharge in LIBs and as electrolyte materials in non-aqueous RFBs. This research utilizes computational and experimental pre-screening/design techniques to identify promising compounds for use in LIBs and RFBs, thereby reducing the amount of time and money lost in synthesizing and cycling incompatible compounds. It furthermore encompasses the synthesis and incorporation of said compounds into battery systems to determine the validity of the aforementioned pre-screening techniques, as well as the performance of each compound in real-life systems.

27C. Emily Furnish  
Mentor: Chris Richards  

*The Application of Nanoarrays Coupled with Microfluidics for Single Molecule Imaging of the Epidermal Growth Factor Receptor*

The study of single molecules in biology and chemistry provides important information about the properties of individual molecules, such as the behavior of specific receptors or ion channels within a cell. Single-molecule fluorescence spectroscopy is a method that is useful for imaging and analyzing such single-molecule properties. Nanofabricated devices such as zero-mode waveguides can be used for these applications. In this research, membranes with nanopores that were 200 nm in diameter and evenly spaced were coupled with microfluidics to isolate single membrane receptors in cells. The microchannels in microfluidic devices, connected to the outside by piercings of inputs and outputs, allow for isolation of single cells and the controlled delivery of reagents to these isolated areas. The microfluidic devices were used to image and then analyze binding correlation of EGF (Epidermal Growth Factor) to EGFR-GFP (Epidermal Growth Factor Receptor-Green Fluorescent Protein) in N2a cells (mouse neuroblastoma cell line) with laser spectroscopy. Because EGFR cannot be purified outside of the cell membrane, it is necessary to transf ect cells with the protein in order to image the functions of EGFR. So far, we have already seen that binding correlation occurs in 1 micron nanopores (wells) as well as some 200 nm wells. Recently, we have also been able to record binding events of EGF to EGFR-GFP in 200 nm nanopores in real time in order to further study the properties of the receptor.

28A. Karl Hempel  
Other Authors: Zachary Griffith  
Mentor: Anne-Frances Miller  

*Producing Reactive Intermediates via Photodriven Electron Transfer*

Flavoenzymes are essential to all forms of life and make up a large portion of genomes, e.g. 0.25% Homo sapiens and 1.8% Escherichia coli. Flavoproteins are proteins that contain a flavin that may be covalently or non-covalently bound. Flavins are redox-active prosthetic groups; flavin adenine dinucleotide (FAD) or flavin mononucleotide (FMN), which are Vitamin B2 derivatives. The flavoprotein name reflects the fact that flavoenzymes are an intense yellow color because the flavin absorbs blue light. Understanding the mechanism by which flavin cofactors are photoexcited and transfer electrons is essential in harnessing flavoproteins for organic electronic applications, e.g. functionalized electrodes. After the initial photoexcitation of flavin, the fluorescence lifetime can be anywhere from 1 femtosecond to 100 nanoseconds until the excited state is quenched by electron transfer. Therefore, femtosecond transient absorption spectroscopy (TAS) was needed to study these extremely short lived excited states. To optimize the yield of electron transfer intermediates, a donor was needed to supply an electron to the vacancy that was formed by exciting the initial flavin group. With this electron hole filled, the flavin adopted an excited semiquinone state. We used fluorescence quenching to measure the efficiency of
electron transfer to photoexcited flavins and screened an array of candidate electron donors to identify those with optimal efficiency and favourable dissociation constants. We learned temperature has a significant effect on fluorescence emission intensity in our systems of study. With a reliable way to produce flavin semiquinone, TAS can be utilized to understand the formation and decay of the semiquinone state.

28B. Courtney McKelphin
Mentor: Mark Crocker

*Optimization of Algal Extracts for the Production of Fuels*

The use of algae to sequester CO2 from coal-fired power plants constitutes an interesting solution to the necessary innovation in the field of carbon capture and utilization, particularly because algae can intermediate the conversion of these emissions into valuable fuels and chemicals. Our previous research has shown that this approach is feasible from a technical standpoint, current work being focused on cost reduction. Past work has shown that oil can be extracted from algae and converted to hydrocarbon fuels that are fully compatible with existing infrastructure. To date, efficient extraction of the oil has required that the algae are first subjected to an energy intensive and costly drying step. To improve the economics of the extraction process, we have investigated the extraction of oil from wet algae grown using the flue gas of a coal-fired power plant. The research conducted in this project tested the extraction efficiency of sonication, mechanical disruption (milling), suspension in supercritical hexanes, and several modifications of a CHCl3/CH3OH/H2O solvent system. From these studies, it is concluded that the optimal methods in terms of the oil yield and required energy input are suspension in supercritical hexanes and the modified Bligh-Dyer method. The lipid profile and elemental analysis of the oils extracted using these methods provide valuable insights regarding the effect of the extraction method on the composition of the oil obtained.

28C. Lauren Neill
Other Authors: Megan Coffinbargar, Caroline Thornbury, Joseph Oaks, Michael DeLetter, Lauren Fielder, Marissa Galang, Christoph Kositzke, Rhyezin Larimer, Martha Mortell, Dealla Samadi, Elizabeth Sewell
Mentor: David Atwood

*Properties of B9: A Heavy Metal Remover*

Heavy metals, such as mercury, iron, copper and lead, have been found in various water systems throughout the nation posing a significant health risk to the public. Benzenediamidoethanethiol (BTDH2 also known as B9) offers a possible solution to this public safety issue: through its ability to extract various metals from water, B9 could be introduced to the water supply to remove the hazardous elements from drinking water. Through lab techniques, various properties of B9 were tested to determine the efficiency of the compound. After testing, the assumption can be made that B9 could be applied to situations such as the Flint, Michigan water crisis to decrease the lead levels in the public water supply.
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29A. Megan Yeley
Other Authors: Olivia Tholt, Sydney Frederick, Noah Dixon
Mentor: Alan Fryar

*Testing Water Quality in the Wolf Run Basin*

Much of downtown Lexington, including part of the University of Kentucky’s campus, is located within the Wolf Run basin. Water quality is impacted by microorganisms, sediments, nutrients, and other chemicals such as metals, salts, and hydrocarbons. By monitoring water quality in the Wolf Run Basin, we can find the sources, amounts, and types of pollutants. Our team has monitored a rain garden behind the Gluck Equine Center and the Blue Hole spring at McConnell Springs Park every 1 to 2 weeks since January 14. We measure air and water temperature, specific conductance (SC), dissolved oxygen (DO), and pH at both sites. We also test for anions, metals, total coliforms and E. coli. Anions are analyzed in the UK Soil Chemistry Laboratory, metals at the Kentucky Geological Survey, and bacteria at the UK Environmental Research and Training Laboratory. We have also logged temperature continuously (every 15 minutes) at the Blue Hole since January 28. Water temperature at the Blue Hole remained fairly constant at around 12-14 °C except after a storm on February 15-16, when the temperature dropped to 6.9 °C. However, other storms did not appear to cause pronounced changes in the spring’s temperature.

Water temperature at the rain garden fluctuated more with the air temperature. Compared to the same period last year, pH has been less variable at the rain garden and more variable at the Blue Hole. DO tended to be higher at the rain garden than at the Blue Hole. At both locations, SC peaks appeared to result from runoff of salt applied to snow and ice. Total coliform and E. coli concentrations were usually higher at the Blue Hole both years, perhaps because it receives fecal contamination from a larger area.

29B. Sarah Davis
Other Authors: Erika Grisell
Mentor: Jane Kleinert

*The Effectiveness of Augmentative and Alternative Communication on Social Interactions in a Child with Cerebral Palsy*

Cerebral Palsy is defined as a disorder of movement, muscle tone or posture that is caused by an insult to the immature, developing brain, most often before birth (Mayo Clinic, 2016). Cerebral Palsy can affect a variety of abilities including the development of speech. (Mayo Clinic, 2016). Luckily, over the past 30 years, the development and use of augmentative and alternative communication (AAC) has increased dramatically. The American Speech-Language and Hearing Association explains that individuals who present severe speech/language deficits can now rely on AAC to supplement existing speech or replace speech that is not functional (ASHA, 2016.) Extensive evidence indicates the effectiveness of AAC, however recent research by Kearns et al (2011) indicates that 50% or less of students with significant disabilities in the U.S. public schools that need AAC actually have AAC in place. Indeed even when students are provided with AAC in an inclusive classroom they may remain socially isolated from their classmates (Chung & Carter, 2013, p. 94). Emerging AAC strategies to combat these problems include the use of aided language modeling in the classroom and CORE vocabulary designs to improve communication interactions of students who use AAC. The purpose of this project was to evaluate the effectiveness of AAC and aided language modeling on the social interactions of a child with Cerebral Palsy and minimal oral speech. Strategies employed included: the use of AAC and aided modeling of AAC, by both adults and peers, within an inclusive classroom setting.
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Computer Science

30A. Daylynn Allison
Mentor: Jane Hayes

FileLoader: A TraceLab Component

In software development, the term traceability is used to describe the ability to connect and understand the relationships between the various artifacts of a software project such as stakeholder's requirements, design, code, test cases; these relationships are referred to as trace links. By capturing and maintaining trace links for a particular project, developers can more easily maintain code, ensure that specifications are met, analyze test case coverage, and more accurately estimate the time required to make changes or add functionality to the project. In practice, trace links are not often captured, or are not captured at the right level of detail, or are captured but then not kept up to date. TraceLab is an instrument developed under NSF's Major Research Instrumentation (MRI) program to enable researchers to experiment with and to evaluate various traceability techniques. TraceLab is similar to other tools such as Weka, MatLab, and RapidMiner in that it uses a precedence graph as its main interface and allows users to drag and drop components to compose experiments thus allowing researchers to share aspects of their work â€“ components and datasets. This structure allows for development across multiple operating systems, and in many programming languages. TraceLab differs from the aforementioned tools in that it specifically supports traceability experiments; its latest instantiation is more broadly focused on software engineering experiments in general. TraceLab specifically facilitates replication of experiment results. More generally it supports experimental software engineering, a growing field to ensure validation of software engineering research. A meta-research project has been undertaken to automatically evaluate whether an experiment described in a paper can be replicated. This project demonstrates a TraceLab component, FileLoader, for loading files that was developed to be used with the aforementioned larger project, supporting the classification of research paper types.

30C. Cory Siler
Mentor: Judy Goldsmith, Graduate Assistant: Thomas Allen

Learning Tree CP-nets

One of the benefits of artificial intelligence is the ability to create systems that customize themselves according to people's preferences. Consider an assistive "smart home" environment for a user whose disability makes it difficult for them to make decisions or communicate their choices. The quality of service depends on the precision with which the user's preferences can be represented the accuracy and expressiveness of the system's formal computational models for reasoning about the user. A model should take into account that preferences can be conditional; for instance, the smart-home resident's preference may not simply be "I prefer the house to be warm", but rather, "I prefer the house to be warm during the daytime, but cool at night". Conditional preference networks, or CP-nets, are a popular model that takes into account those dependencies between factors. However, many reasoning tasks with CP-nets are computationally complex, including learning a CP-net by observing a user's choices, and determining whether one given item or situation is preferred to another according to a given CP-net. We address the former task with an approach that encodes CP-nets as vectors of integers, focusing on a class of CP-nets for which the latter task can be done efficiently. This encoding lets us use local search algorithms similar to those popularly applied to problems like Boolean satisfiability. We describe such an algorithm and test it on generated data to show its effectiveness at learning a tree CP-net that explains the data.
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30B. James Lewis
Mentor: Jerzy Jaromczyk, Neil Moore

Internet and Multimedia Support for a Hands-On Bioinformatics Workshop

The Essentials of Next Generation Sequencing (NGS) Workshop is a hands-on Bioinformatics workshop offered collaboratively by the Plant Pathology and Computer Science departments at the University of Kentucky. NGS aims to train faculty and graduate students from interdisciplinary areas to analyze genomic sequence data, a skill set in great demand. The workshop serves to build a common language between students and faculty of computer science and the life sciences, providing a mutually educational experience for all participants. In this work, we present our contributions in developing the computer science component of the workshop, which naturally meshes with the life sciences part due to the interdisciplinary nature of the endeavor. Our presentation will focus on our methods to multiply the impact of educational processes with the use of multimedia and Internet resources: specifically, online video lectures and a web site for building bioinformatics community. First of all, we filmed, produced, and edited videos of the lectures, which we made available to attendees after the workshop. This enables participants to refer to the lectures both to refresh their knowledge, and to share what they learned with colleagues or students at their institutions. We painstakingly edited the videos so that the material can be seen and heard better by students. We also enhanced the workshop's Drupal-based website, a portal from which participants can access workshop materials and information to increase its usability and manageability. We streamlined the process for setting up the site for each new year and for archiving previous years. We also updated style sheets to aid the interpretability of the information. We created custom content types and views, which allowed us to enter information once and have it displayed in several useful ways. Our enhancements could also be used as a model for setting up other workshops or courses.

31A. Kelly Sovacool
Mentor: Jerzy Jaromczyk, Michael Goodin

Processing RNA-Seq Data of Plants Infected with Coffee Ringspot Virus

Coffee is a widely traded agricultural commodity across the globe. The emerging coffee ringspot virus (CoRSV) reduces the quality of beans harvested and amount produced by infected plants. Besides coffee, CoRSV also infects Chenopodium quinoa when incubated at 28°, (4° above typical conditions for this plant) an expanded host range which may indicate increasing risk to crops as global temperatures continue to rise. Examining the differences in expression levels between infected and uninfected C. quinoa may shed light into the effect of CoRSV on gene expression and the effect of temperature on host susceptibility. As an initial stage toward this goal, we developed methods for processing RNA-Seq data of virus-infected plants for which there is no reference genome. Our methods began with paired-end Illumina RNA-Seq data from three samples of Chenopodium quinoa: One sample CoRSV-infected and incubated at 28°, another sample uninfected and incubated at 28°, and the third uninfected and incubated at 24°. First, we analyzed the quality of the RNA-Seq data with fastqc, and trimming low quality reads with Trimmomatic-0.30. We then aligned the trimmed reads to the viral RNA genome (Genbank accession numbers KF812525.1 and KF812526.1) using Bowtie2. We used HTSeq-count to determine the number of reads that mapped to each viral gene. Reads from the uninfected samples which mapped to viral genes were examined for the possibility of artifacts arising from sample bleeding. To assist with this examination, we wrote a Python program to visualize the layout of reads as they were arranged on the Illumina flow cell. Finally, we are in the process of building a de novo transcriptome assembly of the non-viral reads using trinityrnaseq-2.1.1. This research is supported by a CAFE Seed Proposal awarded to M. Goodin.
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**Dairy Science**

31B. Natasia Lind  
Mentor: Jeffrey Bewley

*Evaluating the Effects of a Sodium Hypochlorite Post Milking Teat Disinfectant on Teat Condition Using a Split Udder Trial*

The objective of this study was to compare the effects of sodium hypochlorite, DX 648, (GEA Farm Technologies, Naperville, Illinois) and 1% iodine post-milking teat disinfectants on teat condition. Sixty-two primiparous and multiparous lactating Holstein cows averaging 209.63±128.12 days in milk, from the University of Kentucky Coldstream Dairy Farm, were included in an 8-week study from November 27, 2015 to January 21, 2016. A split udder trial was used to control for cow effects and maximize the number of experimental units. The left-side teats were dipped in DX 648 while the right-side teats were dipped in iodine. All teats were dipped using non-return dip cups. Teat end condition and teat skin condition were scored weekly after milking. Teat end condition was scored on a scale of 1 to 4 (1 = no ring, 2 = smooth or slightly rough ring, 3 = rough ring, and 4 = very rough ring). Teat skin condition was scored on a scale of 1 to 3 (1 = normal, 2 = dry, and 3 = rough). The MIXED procedure of SAS 9.4 was used to evaluate the fixed effects of week and teat dip on teat end and teat skin condition. Data was repeated by week with teat within cow as subject using a compound symmetry covariance structure. Teat skin condition scores were not significantly different (P = 0.98) between teats dipped with sodium hypochlorite (1.04 ± 0.01) and iodine (1.04 ± 0.01). Teat end condition scores were not significantly different (P = 0.40) between teats dipped with sodium hypochlorite (2.45 ± 0.05) and iodine (2.45 ± 0.05). The DX 648 teat dip performed similarly to iodine regarding teat end and teat skin condition, indicating that this dip may be used without adverse effects.

**Design**

31C. Sarah Donoho  
Other Authors: Alexandra Travis, Jennifer Daniel, Kristian Roberts  
Mentor: Sara Bayramzadeh

*Designing for Better Smiles*

This research looks at the role of design in addressing operational issues of the University of Kentucky's College of Dentistry. Through evidence-based design, researchers are able to explain the importance of understanding behaviors and operations in an environment in order to design for the best possible outcomes. The research draws upon multiple methods including literature reviews, observations, focus groups, and interviews to gather evidence. Student Researchers gained insight from Literature Reviews focused around workplace, outpatient care, and dentistry to create design implications relative to designing in a dentistry practice. Two focus groups, separating faculty and staff from students, allowed for unbiased insights to see how their experiences are influenced by the environmental design. Interviewing a total of 40 dental patients, helped gain an understanding of the role that environmental design plays in patient experience and overall satisfaction. Observations allowed student researchers to evaluate the existing patient experiences in the receptions areas. This research helps to define the parameters of design implications that in turn help to increase staff efficiency, staff work flow, and patient satisfaction. A total of 20 observation hours were tracked, noting check-in time, wait time, activities, and the patients’ ability to wayfind throughout the space. Common themes throughout the research showed that in its current condition the college lacked flow, circulation space, and privacy. There is also insufficient wayfinding and signage. By implementing these findings into the design process at College of
dentistry, overall experiences in the space will be improved. Solutions to current issues were implemented into the designs through better utilization of the space. Additionally, the orientation of the space was redesigned with an increase of flow and circulation, and frosted glass partitions were added to increase daylighting throughout the space. The new design will add visual and acoustical privacy through material selections.

32A. Sarah Hancock
Other Authors: Megan Crowe, Emily Corner, Olivia VonBokel, Makenna Lawson, Hayley Price, Emily Preece, Jasmine Mason, Ashley Pryor, Kendall Miller
Mentor: Christina Birkentall

The University of Kentucky has seen tremendous growth over the past one hundred and fifty one years! With that growth came new colleges and new buildings popping up across the ever-expanding campus. As the campus has grown the colleges have moved to contract or expand with the needs of the student population. This is the state of the College of Design. It currently functions in five different buildings across campus, creating challenges to effectively coordinate projects and communications are strained. These challenges could be overcome if the College was under one roof. Currently the Reynolds 1 building is vacant and shows potential to hold the future home of the College of Design. However, this does require a thorough assessment to determine if the building is adequate to house the College of Design today and in the future. Ten of the third-year interior design students and their mentor have focused their studio project to develop a plan to solve the current spatial issues and lack of community within The College of Design. During this process they have developed their research through three main phases’ analysis, design, and evaluation. This process has provided new opportunities to produce tools, approaches, theories, and products that forward a position within the design process. The research provides effective ways to design a customized solution for the College of Design. This research has enabled the students to provide information on emerging learning technologies and ways to plan for the current and future state of The College of Design. These research findings will determine if the Reynolds building will allow the College of Design to accomplish their goals and utilize the space effectively now and in the years to come.

32B. Kirsten Lyvers
Other Authors: Allison Holliman, Allison Hoffman
Mentor: Sara Bayramzadeh

Redefining Dentistry Design

From a design perspective, educational dentistry settings are complex facilities that serve a large range of users and functions, such as education, workplace, and health services. In a collaboration with the University Of Kentucky’s College Of Dentistry, this study aimed to offer design solutions based on research to improve the operational issues and overall user experience. This research-based design approach is known Evidence-Based Design, and is defined by the Center for Health Design as “the process of basing decisions about the built environment on credible research to achieve the best possible outcome.” After a thorough literature review to understand the current status of knowledge on dentistry design issues, we found a lack of research on the role of design on dentistry operational efficiency, flow, and user experience. Therefore, this study aims to address this gap. After obtaining IRB approval, this research study utilized research methods including observations, focus groups, and interviews. The observations of the waiting rooms recorded patients’ wait time as well as patients’ behavior while waiting. Next, two focus groups with staff and dental students were conducted, and issues discussed ranged from functionality of the space to aesthetic preferences. Finally, to holistically understand the
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dentistry experience, a total of 15 interviews with patients were conducted. The findings revealed the needs of staff and students in the College of Dentistry, and patients’ desired experience. The evidence discovered through this research guided the innovative design strategies that can improve issues such as stress, poor circulation, and lack of privacy. Such strategies include improved ergonomics, providing positive distractions for patients, maintaining visibility in operatory for educational purposes, access to daylight and natural views, and increasing privacy for patients and staff. This research contributes to the limited existing literature on design issues in dentistry settings.

32C. Emily Preece
Mentor: Helen Turner

*Biophilic Design and its Effect on the Occupants of Interior Spaces*

This research involves an analysis in the field of Biophilia, a hypothetical tendency to be closely associated with other forms of life in nature. Observations were recorded in the existing sustainable garden initiative on the University of Kentucky campus, Cultivating Place for a Sustainable Community, and how it set to utilize the existing land and rejuvenate it into a sustainable outlet accessible to the entire community by combining design and horticulture. The garden served as a form of Biophilic Design continuing the individual’s connection with nature in the environments in which they live and work everyday. In relation to the interiors field, research was extended into the effects of Biophilia in the work field and the related rise in productivity and well-being. 6-15% increases of productivity were observed in interiors containing natural elements, such as greenery and sunlight. Other theories were observed, including the Ecological Valence Theory, stating that colors related to those found in nature could elicit positive responses when utilized in interior spaces. It is hoped that the results of this research will serve as a foundation for future research on Biophilic Design and Sustainable Initiatives.

33A. Emma Shiffert
Other Authors: Heather Hemmer, Lexi Ross
Mentor: Sara Bayramzadeh

*Re-Defining the Productivity of Dentistry: An Evidence Based Design Approach*

Dentistry, as a type of healthcare systems, constantly needs to progress to be aligned with the rapid pace of technological advancements and healthcare evolvements. Research in healthcare fields has been introduced to interior designers as an area of great contribution. This contribution has been promoted by Evidence- Based Design movement, which bases design decisions on credible research to achieve the best possible outcomes (Center for Health Design, 2008). In return, this promotes patient and staff well-being and increases efficiency. The use of literature reviews, observations, interviews and focus groups assisted in identifying the current issues within the College of Dentistry’s design at the University of Kentucky. Each research phase exposed more problems within the design. During observations, the lack of circulation and college identity was apparent. The staff and students also both expressed their well-being and patient wellbeing during focus groups. These problems have the likelihood of causing medical errors, psychological ill-being for patients and staff, and overall dissatisfaction of both patients and staff. By improving circulation, college identity, privacy, and applying appropriate materials, the college facility would better reflect the quality of work conducted within the walls.
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33B. Erin Taylor
Mentor: Lindsey Fay

The Translation and Communication of Design Research

With the introduction of the new University of Kentucky Cardiovascular Unit designed by GBBN Architects, changes are visible in the design outcomes and functionality of the space. The primary difference in the transition of units was the use of decentralized versus centralized nursing models. The original hospital was centralized, which provided one unit for all nurses to work, while the new hospital houses the decentralized model, where there are smaller stations between patient rooms for individual or paired nurses to work. Traditionally, research presentations are composed into lengthy documents and published. For a designer, this format is frequently overlooked due to lack of visual interest and attraction to wordy documents, therefore causing a disconnect in the benefits accompanied by research. It is important that research is understood, valued, and used as a basis of design so we can continuously improve healthcare workplace design in regards to functionality and patient satisfaction. In order to demonstrate this, it is clear we must take existing research and provide a visual representation. Research was conducted by design students to examine the effectiveness of the decentralized nursing model on efficiency, workflow, and communication. The students hand-documented observations of paths traveled, distance traveled, time spent with patients, and communication among users of the space. I then digitally documented the information to make it shareable for the design community. Methods of color-coding, easily readable lines and graphics, layering, and keying provide a clear illustration of several research documentation methods into one visual. These strategies of displaying research translate the information into a graphic document, which best articulates to the designers the influence of design in the hospital configuration. Once presented in an appropriate manner, ideally designers would learn from them and consider this as an opportunity for healthcare design improvement.

Drug Discovery

33C. Paul Eapen
Mentor: Jürgen Rohr

Amino Acid Conjugates of Mithramycin-SA Towards a Possible Drug Candidate for Ewing's Sarcoma

Mithramycin is an aureolic acid-type polyketide produced by various soil bacteria of the genus Streptomyces found to possess anticancer activity against a wide variety of human cancers. However, its clinical use has been largely impeded because of poor specificity and side effects. However, mithramycin was put back into the research spotlight after a high throughput screen revealed EWS-FLI 1, an abnormal oncogenic fusion transcription factor, responsible for Ewing’s Sarcoma was inhibited by mithramycin, as the only out of 50,000 compounds. Ewing’s Sarcoma is the second most common bone cancer in the United States, mostly affecting adolescents. Mithramycin SA, produced by an S. argillaceus mutant upon inactivation of the mtmW gene, provides an immense chemical space to expand this class of compounds because of the presence of a free carboxylic acid group in the 3-side chain, which permits regioselective chemical derivatization without cumbersome protection group chemistry. This study looked at bacterial media optimization to increase the microbiological production of the desired compound Mithramycin SA as well as optimizing its isolation to further increase the yield. For the derivatization program, we focused on the synthesis of amino acid-Mithramycin SA conjugates, their anticancer activities, and specificity towards Ewing’s Sarcoma cell lines.
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Earth and Environmental Sciences

34A. Darion Carden
Mentor: Michael McGlue

The Volta Grande do Xingu: A Holocene Paleoenvironmental Reconstruction of a Unique Amazonian Landscape Using Lake and Ria Sediments

The Xingu River is the third largest tributary to the Amazon and the second largest clear water river system in South America. Climate change and the impending construction of the Belo Monte dam pose complex threats to the Xingu River, its biodiversity, and the people that rely on its ecosystem services. However, the late Quaternary history of this lower Amazonian landscape is largely unknown, and therefore the response of the region to future environmental change is unclear. This study is centered on a 122 cm sediment core that was extracted from a floodplain lake within the Volta Grande, a large bend in the Xingu River upstream of the prominent Xingu ria. Here, we integrate sedimentological, geochemical, and chronological data to determine how this lake has evolved, which may improve predictions of how the Xingu River system will respond to disturbances in the Anthropocene. The sediment core was dated using radiocarbon and optically stimulated luminescence techniques. A multi-proxy analysis of the core involved measuring magnetic susceptibility, carbonate coulometry, total organic carbon, and major and trace element geochemistry from energy dispersive x-ray fluorescence. Data was collected at a 2 cm interval, in order to capture variability with high resolution. By incorporating multiple approaches to sediment analysis, the capacity to evaluate geomorphological and paleoenvironmental change is greatly increased. The core represents a depositional record of the mid-Holocene to present (~7000 yrs). Lithostratigraphic, geochemical, magnetic data indicate that topographic closure and lake formation was achieved by ~4800 yrs BP. Three chemostratigraphic units have been interpreted for the late Holocene lake phase, which likely reflect the response of the basin to changes in fluvial dynamics, climate, and human-landscape interactions. The data produced from this research will serve as a reference point for the impacts of large hydropower projects on tropical rivers and their aquatic ecosystems.

Educational Leadership Studies

34B. Madelyn Roeder
Mentor: Wayne Lewis

Teachers Collective Bargaining Agreements and Principals’ Personnel Autonomy

Teachers’ unions represent a nontrivial segment of the K12 teaching population; however, teachers’ unions in general, and their collective bargaining agreements with local school districts specifically, have come under increasing scrutiny in recent years. Of particular interest in this paper are the provisions of collective bargaining agreements that place constraints on the personnel decision making of school administrators. Specifically, collective bargaining agreements may constrain school administrators’ ability to select or hire teachers; observe, supervise, and evaluate teachers; and if need be, terminate teachers’ employment. As charter statutes in many states relieve public charter schools from some of the state and district regulations that constrain traditional public schools, including the requirements of a collective bargaining agreement negotiated between teachers’ unions and local school districts, charter schools provide the opportunity to explore varying degrees of school administrator autonomy in public schools. In this paper, we provide a synthesis of the scholarly literature on teachers’ unions collective bargaining agreements; principal and school level autonomy, with emphasis on personnel autonomy; and how teachers’ collective bargaining agreements affect the personnel decision making of school-level
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administrators. The paper concludes with a discussion of general areas that warrant further investigation and specific questions that will be addressed with further research.

*English*

**34C. Hallie Brotherton**  
Mentor: Andrew Byrd, Brenna Byrd

*The Threads of Magic: The Prehistory of Old Norse Seior*

This paper seeks to establish whether the ancient Scandinavian mystical weaving practices of Seior are unique to proto-Germanic culture or stem from a common Proto Indo-European origin of practice. Seior is a form of magic practiced predominately by women in ancient and medieval Northern Europe using symbolic forms of textile arts such as weaving, spinning, and tying. The purpose of Seior was to manipulate or attract an outcome using a spiritual agent created by spinning, weaving or tying. In the context of Northern European folklore, Seior was often used as a form of agency of power for women and was considered taboo to be practiced by men. Due to the significance of gender roles and sexual power in Seior and its taboo nature, there is no written record of the exact method of practice only allusions in Old Norse sagas and other Northern European folklore. With the recurring motif of the manipulation of fate and power being symbolically represented as weaving, spinning or tying in cross-cultural mythologies, there may be a broader origin found in Proto Indo-European culture. By using comparative literature and comparative linguistic methods, this paper will investigate similar cross-cultural motifs in folktoric texts that may relate to Seior practices and determine whether a common origin can be discovered.

**35A. Katelyn Dooley**  
Mentor: Rynetta Davis

*The Ghosts of Slavery in Kentucky: Past and Present*

Societal issues concerning race continue to circulate in modern society. This is especially true concerning African American race relations. This presentation argues that the history of slavery in Kentucky penetrates into modern society creating a domino effect that continues to evoke racist manifestations. This presentation analyzes three native Kentucky slave narratives as well as interviews with former Kentucky slaves and newspaper clippings to create a localized awareness of the history of slavery in Kentucky culture. The results offer a parallel between conflicts past and present. Encouraging an open dialogue through the use of early African American literature aids in the recognition of the existence of racially centered societal conflict and provides an explanation of the root cause advocating awareness as a step towards healing.

*Entomology*

**35B. Kasey Schock**  
Other Authors: Kyndel Haubner  
Mentor: Xuguo Zhou, Jordan Hampton

*Cannibalism or Burial: Influence of Causes of Death on Undertaking Behavior in Termites*

Undertaking behavior, the disposal of dead individuals, is an essential adaptation in social insects to prevent potential pathogenic attack. Eusocial insects such as ants and bees manage corpses by removing them outside the nest, but termites respond to corpses differently by cannibalism or burial. Given the
importance of undertaking behavior and its prevalence in eusocial insects, it is necessary to understand how undertaking response is affected when corpses are the result of various natural factors such as fire, freezing, drought, and injury. Based on our preliminary research, we hypothesize that termites perform differential undertaking behavior toward corpses killed differently. To test this hypothesis, the eastern subterranean termites, Reticulitermes flavipes, were exposed to corpses resulting from these natural causes. Undertaking responses were videotaped and quantitatively analyzed. Our observations showed that corpses deceased within 24 hours were cannibalized regardless of the treatments, while corpses decomposed for 3 days were buried. These findings suggest that, when corpses are associated with low risks of pathogen, cannibalism to recycle nutrients is the primary undertaking strategy in termites.

Equine Research

35C. Jeffrey Mitchell Jr
Mentor: David Horohov

Inflammation and Injury: Assessing Risk and Preventing Loss In The Equine Athlete

The outbreak of injuries and fatal occurrences on the racetrack involving Thoroughbred horses has been a major issue in the Equine Industry. This research mainly focuses on the relationship between the injuries and inflammatory markers by looking at the inflammatory index of the horses we can potentially predict the risk for injury. We have looked at several factors such as: age, sex, length of race, track surface, etc. but mainly focusing on the horse’s inflammatory index. While conducting this research, our hypothesis is, among the horses injured while racing, those who suffered career-ending injuries had higher levels of pro-inflammatory cytokines than the horses which continued to race after their injury. A total of 1400 blood samples were collected from racing Thoroughbreds ages 2-3 years old, from Turfway Park, Keeneland Racecourse, and Churchill Downs. Out of all those samples collected, 12 were identified as injured. Specific samples were analyzed by using RT-PCR, looking at the different pro-inflammatory cytokines. Information for the different horses (injured and non-injured), including race and performance information was obtained from Equibase. An inflammatory index was calculated from the RT-PCR data. Our results indicated that there was a significant difference in inflammatory gene expression between injured and non-injured horses. This data supports our hypothesis that injured horses express elevated inflammatory indices at the time of injury. Given the time of pro-inflammatory gene expression post exercise, it is likely these horses had elevated inflammatory indices prior to the race.

Finance

36A. Alexander Polus
Mentor: Brad Jordan

The Effect of Undervaluation on the Market Value Fluctuations of a Security

The stock market is a very volatile entity. For years, investors have tried to predict the price shifts of stocks in order to earn an investment profit. One of the most successful investors ever, Warren Buffett, is a huge believer in the Value Investing strategy coined by famous financial genius Benjamin Graham. Over the last 50 years, ‘Value Stocks’ have been proven to outperform ‘Growth Stocks’ in almost every situation (under long-term investment conditions). This study has served to evaluate the statement that the most important factor to look for in an investment is an undervaluation of the underlying security. Valuation is derived from a variety of financial models. The two models used the most in this study are the Net Present Value model, and the Dividend Discount Model. These models return a value of what they believe the stock should currently be worth, and if that value is greater than the current market value,
it implies that you should buy that stock. The difference between what the model returns and what the market value is represents the Margin of Safety for the investment, and investors want this to be as large as possible. To examine this, stocks will be evaluated based on these metrics, and purchased with real money from the University of Kentucky Gatton College of Business and Economics’ endowment. The result is whether or not these investments turn a profit.

**Forestry**

**36B. Daniel Eaton**  
Mentor: John Lhotka

*The Effect of Silvicultural Gap Size on the Growth Rate of Individual Trees in a Mixed Broadleaf Forest*

This project analyzes the effect of silvicultural gap size on the growth rate of individual oak trees in a mixed broadleaf upland forest over 54 years. In 1960, circular openings of 15.2 m, 45.7 m, and 76.2 m were established as part of a USDA Forest Service study on the University of Kentucky Robinson Forest. This study focuses on trees in the 45.7 m opening. In 2014, tree increment core samples were taken from a subset of oak trees at varying distance intervals from gap center to understand if temporal growth responses were influenced by a tree’s spatial position within a gap. Increment cores were mounted, sanded, and cross-dated visually using skeleton plots and statistically using the dplR package for the R programming language. The data shows rapid growth following the opening in mature understory trees and in saplings, as well as variability in the start year of growth. This study also analyzes the impact of drought events based on the position of the tree in the gap and its age.

**Geography**

**36C. Nicholas Hodge**  
Mentor: Richard Schein, Stacie Williams

*The American Streetcar and its Effect on Local Economies*

Lexington has a rich history of public transportation much like many other cities in the United States. Studies have shown the strong connection between public transportation and economic development. The rise in personal automobile use and shift from a centralized city to the expanse of the suburbs is a story many other communities of the same size share within the United States. As Charles H. Bogart mentions in his book Yellow Sparks over the Bluegrass, when the streetcar tracks were removed in 1938, “the slow death of downtown Lexington” began. By looking at this change in the city’s makeup over the last century, specifically on N. Limestone from E. Main St to 7th street, one can begin to understand the benefit of a type of light rail system in Lexington, as well as the economic opportunity and diversity it can encourage. Using the city directories for Lexington in the year 1921, I was able to analyze businesses and residents as well as their professions on my selected portion of the N. Limestone corridor. Current data for property values, incomes, etc. further demonstrate the shift in wealth from the city center to the suburbs. When comparing the data from 1921 to today, one can see the economic shift from a diverse selection of businesses and residents to a downtown lacking in the life it once had. The properties being analyzed as a part of this research are now home to various bars and restaurants, while some homes still remain residences. Observing other examples of light rail systems being preserved or reinstalled/expanded in other cities such as Portland and Cincinnati, we can begin to understand the benefits and feasibility of such a system here in Lexington, as well as the positive changes it could bring back to the downtown Lexington area.
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Health Management and Policy

37A. Elijah Myers
Mentor: Ty Borders

Availability of Buprenorphine Treatment in Kentucky

Opioid abuse in Kentucky has risen significantly in the past 15 years, particularly in rural areas. In the same timeframe, physicians have been granted a more expanded role in combating opioid addiction with the ability to prescribe buprenorphine in the clinical setting. The objectives of this study are to determine the availability of buprenorphine treatment for patients in Kentucky by metropolitan, micropolitan, and other status and to further explain the characteristics and attitudes of physicians prescribing buprenorphine in opioid dependency treatment. Data from the Substance Abuse and Mental Health Service Administration (SAMHSA) was analyzed to determine the availability of buprenorphine treatment in all 120 Kentucky counties. Counties were categorized by metropolitan, micropolitan or other status to find the average number of waived physicians per population designation. A survey of the physicians from the SAMHSA database was also conducted to assess the characteristics of physicians prescribing buprenorphine. 425 of 643 physicians certified to prescribe buprenorphine made their information public through SAMHSA. Approximately 57% of metropolitan counties, 70% of micropolitan counties and 45% of other counties had at least one buprenorphine waived physician available. The average number of waived physicians per 10,000 capita in metropolitan, micropolitan and other designations were 0.60, 1.05, 0.79, respectively. Results are currently unavailable for the physician survey. This study aims to gain a better understanding of the location of available buprenorphine treatment in Kentucky. The results suggest that availability of buprenorphine treatment is highest in micropolitan counties. It also appears that available treatment is higher in metropolitan counties than other counties, but the availability per capita is higher in other counties than metropolitan counties. It can be concluded that availability is comparable among the population statuses, but more can be done to counteract opioid abuse in Kentucky.

Honors

37B. Kaelyn Short
Other Authors: Evelyn Hudson, Jack Schaller
Mentor: Thomas Wallace

Exploring Health and Health Care: Examining our Health Care Crisis and Potential Solutions for Kentucky and the Nation.

Health care is in crisis in Kentucky, and in the US as a whole. There are many misconceptions, emotions, and rhetoric surrounding health care. Many stakeholders have strong interests in the way in which our healthcare systems operate. This collective effort sought to identify the important potential approaches to improving our health system and involving the stakeholders in that solution. Using an Honors seminar approach, students presented and learned from each by addressing the following: What is health, and how is it defined? Should health care be a right or a privilege, or some combination? What is the history of US and Kentucky health care systems, including health care professions and health insurance? How do they influence our health system? How do economics drive our health care market? Who are the stakeholders in our country’s health care system, and what role do they play? How do they influence our health care system? To address these questions, students worked in teams, researched the health systems of at least 20 countries, and compared and contrasted these systems with those in the US. Through analysis of the resulting data, they then designed new health systems and discussed how one might influence the
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stakeholders to achieve such innovative models. Many positive ideas were created to bring about positive change to improve our health system. Interestingly, many students favored health care as a right with responsibility and accountability included, but realized that many of these ideas must deal with the varied and sometimes opposing interests of stakeholders. This presentation will expound on these innovative ideas and the issues surrounding their potential implementation.

**Horticulture**

**37C. Ellen Green**  
Mentor: Krista Jacobsen, Keiko Tanaka

*High Tunnels as Tools for Building Community Food Systems: An Examination of the Practices and Motivations of Central Kentucky Farmers*

The re-localization of agriculture is a highly publicized trend in the US agrifood system and lies at a major intersection of the three pillars of sustainability. Consumers are increasingly placing value on the perceived environmental and economic benefits to their communities of “buying local”, and are often willing to pay higher prices for food produced in their communities as compared to those procured through industrial supply chains. However, consumers also make their food choices based on convenience. If local foods are to appeal to consumers who value both locality and convenience, bottlenecks in supply, such as reduced production due to seasonality, must be addressed. Seasonal high tunnels are production tools that serve this purpose. The unheated, passive-solar structures offer the ability to increase warm season production earlier and later, and to grow cool season crops through the depths of winter. This research was designed to improve the understanding of how high tunnels are being utilized in Central Kentucky and to better understand high tunnel growers’ perception of sustainability and their role in the local food system. Seven high tunnel growers in Fayette County and surrounding counties were surveyed and asked questions about their farms’ land uses, high tunnel production practices, marketing, and other questions addressing other economic, social, and environmental sustainability aspects of their systems. The majority of the farmers expressed value for environmental, social, and economic aspects of sustainability. They viewed their high tunnels as highly profitable, with the produce sold mainly for direct sales, highlighting the contributions of this production system and these farmers to the emerging local food economy in Central Kentucky.

**Human Environmental Science**

**38A. Logan Douglas**  
Mentor: Ingrid Adams

*Probiotics and the Gastrointestinal System of Children With ASD.*

The discovery of the complexity of human microbiome has led scientists to reevaluate how they view diseases, especially diseases that affect neurological development. Gut microbiota play a significant role in modulating human metabolism and in the development of the immune system. Autism spectrum disorders (ASD), comprise a group of neurodevelopmental abnormalities that begin in early childhood and are characterized by impairment of social communication and behavioral problems including restricted interests and repetitive behaviors. Also about 90% of children with ASD suffer from gastrointestinal problems. A number of environmental factors and associated conditions such as gastrointestinal (GI) abnormalities and immune imbalance have been linked to the pathophysiology of ASD. Probiotics are generally used to promote digestive health, but have been found to affect the interactions within the brain-gut axis. These findings have resulted in speculation that alterations in the
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gut microbiome may play a pathophysiological role in human brain disorders including autism spectrum disorders. To determine the relationship between the intestinal microbiota and children with ASD and the role of probiotics. A review of the literature was conducted for studies related to the intestinal microbiota with children of ASD and relevant studies were identified, and summarized. Studies showed differences in the fecal microflora of children with autism and non-autistic children. Autistic children had elevated levels of Desulfovibrio spp. and decreased levels of Bifidobacterium spp. Published data suggest a correlation between an alteration in intestinal microflora and autistic symptoms. Studies should examine the use of probiotics in both food and supplements and the effect the microbiota of children with ASD.

Journalism

38B. Sawyer Holcomb
Mentor: Buck Ryan

Exploring Creativity: Vivi, the Coach, and Vampire Dad Meet Originality, Emotion, and Intrigue on the U.S-China Cultural Border

As college students pursue dream jobs in the arts or sciences, in medicine or engineering, creative thought processes are considered increasingly necessary as criteria for accomplishment in the progressively complex and interdependent 21st century (Mishra, 2012). The complexity and interdependence are manifested in an increased focus on globalization, particularly the rise of China as a challenge to America's economic prominence. Knowledge of China is rapidly becoming as important as creativity itself. But what is creativity, and how do you know it when you see it? Findings from this study suggest that creative works share three common elements--originality, emotion, and intrigue--and that anger and happiness are the two key emotions to engage readers. For the study, Honors students wrote short stories to help middle school children understand differences in American and Chinese art and culture. They structured their storytelling around a formula championed by media mogul William Randolph Hearst: every good story has a villain, a victim and a hero. Findings from the study showed that in the children's stories Vivi was the favorite villain, the Coach was the favorite hero, and Vampire Dad was the most sympathetic victim. In each case, they were rated high on originality and intrigue, and emotion related to their conflicts and resolutions. Overall, the story rated "most creative" involved a scheming boy trying to steal the Chinese girlfriend of another boy in a heart-breaking tale centered on Valentine's Day. The results of this study will be valuable to scholars studying creativity, middle school teachers of language arts and social studies, and researchers exploring U.S.-China relations.

38C. Kami Griffith
Mentor: Mike Farrell

Open Records and Open Meetings: How the Sun Shines Bright on Kentucky Laws While Casting a Shadow on FOIA

The federal Freedom of Information Act is celebrating its 50th anniversary on July 4, 2016. This is an act that protects only open records. Although the law has been in effect for half a century, some state laws offer more protection for citizens rights to gain information. Kentucky is a state that has relatively strong laws pertaining to both open records and open meetings. This research will look at Kentucky's Sunshine laws and the court decisions leading up to and following their enactment. It will compare the strength of these laws to Kentucky's surrounding states. These states include Tennessee, Ohio, Indiana, Illinois, Missouri, Virginia and West Virginia. Lastly, it will look at the need for reform of the federal FOIA. The research will be conducted using state laws and state Attorney General records. The project will also include interviews of various lawyers and journalists who have become experts at navigating these laws.
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**Landscape Architecture**

39A. Wes Griffith  
Mentor: Christopher Sass

*Re-establishing the Playground: Using Nature Play to Expand and Challenge Children of All Ages*

United States’ playgrounds have lost the attention of many children over the age of five due to the overuse of under-stimulating, modular play equipment. While playground equipment manufacturers have attempted to mimic nature play, they have been stifled by various approval agencies. Since the 1970s, these agencies have controlled how American playgrounds are developed and what types of equipment can be used. I have studied how playgrounds were designed pre-1970 and those abroad today in an effort to mentally and physically challenge children from toddlers to adults here in the United States. A matrix was first developed using child development norms and then applied to a playground here in Lexington, Kentucky. The designed playground will educate and challenge a child every time they enter the playground. This type of playground is cheaper than traditional playground equipment and better for children in their physical, emotional, and mental development.

39B. Jonathan Wehmer  
Mentor: Jayoung Koo, Brian Lee

*Paris/Bourbon County Park System Planning and Design Proposal*

Bourbon County, Kentucky’s community has shown interest in planning and designing for a park system located within and around Paris, Kentucky. The city has been growing and performing well with numerous parks. Going forward, there is a need for a sustainable park system plan that is inclusive to all users with a variety of activities in order to promote physical activity and a higher quality of life for residents and visitors. The project goal was to plan for the connectivity of the existing cultural and recreational resources. The proposed park system consists of green-ways and a trail system that connects parks with other open/green spaces or cultural resources throughout the county while including a proposed location for a new 200 acre multi-sport tournament facility. The overall park system design incorporates the environmental and economic conditions that the proposed county wide park system will have on the county and its community. The park system takes research through case studies to support rational decision making.

**Management**

39C. Jonathan Hamilton  
Mentor: Joe Labianca

*Promotability From a Social Network Perspective*

“It’s not what you know, it’s who you know.” Nearly all members of the workforce have heard this advice at some point in their career, but to what degree does one’s social network determine one’s promotability? This study investigates the promotability of upper management employees at a major consumer goods company following a corporate merger, from a social network perspective. Data attained from internal surveys over three years is used to see if certain communication and personality traits are correlated with promotability, as determined by the supervisors of the subjects investigated. Thus far, the statistics program STATA has been used to run polyserial correlations to find the most accurate rho values between the continuous variables that are generally related to demographic data, with the discrete
variables that characterize the majority of survey responses. As the study progresses, more sophisticated methods of determining correlations will be used to illuminate how social network position and interactions play a role in promotability.

**Marketing**

**40A. Brett Seymore**  
Mentor: Daniel Sheehan

*Winning the Battle, but Losing the War: How Suppressing Decision Biases Can Make them More Powerful.*

"Control Yourself." That’s the title and premise of an article in the Wall Street Journal warning investors and consumers about common psychological biases and their detrimental impact on both important and everyday decisions (Dagher 2009). Intuition suggests that consumers should be mindful of these biases to avoid them. Yet, psychological research has demonstrated that these biases occur non-consciously and can persist even when customers are aware of the potential bias (Wilson et al. 1996). Thus, if mere information is not enough, would it be a more prescriptive strategy to actively suppress these sources of bias? The purpose of this research is to examine anchoring and adjustment and whether a prescriptive remedy, active suppression, impacts an anchor’s influence and persistence. Anchoring and adjustment (Tversky and Kahneman 1979) can be characterized by situations where judgments and decisions are systematically biased upon encountering and assimilating seemingly irrelevant information. For example, decision makers have been shown to increase (or decrease) the amount they would pay for a product after encountering a large (or small) number in a seemingly irrelevant context. This theory suggests that decision-making occurs non-consciously, suggesting that decision makers do not realize they are doing this. By building on literature regarding thought suppression, we suggest that actively suppressing the anchored information may not be the best course of action. Thought suppression is a form of mental control in which one tries not to think of a certain thing, idea, etc. Research has demonstrated that this can be counterproductive, often leading consumers to think about the concept even more. In two studies, this research demonstrates that this indeed the case. Specifically, we show that suppressing an anchor would initially allow consumers to make more accurate judgments. However, once they stop suppressing the anchor, it becomes more influential in subsequent judgments.

**40B. Payton Wallace**  
Mentor: Daniel Sheehan

*Earlier Promotions Help Consumers To Justify Their Choices*

Traditionally, shoppers encounter price promotions either before entering a store or at the moment of choice (Blattberg et al. 1995). Yet, with the proliferation of consumer-facing technology, such as smartphones or smart shopping carts, retailers and manufacturers have a greater level of flexibility as to when to engage shoppers with promotions during a shopping experience. To explore this topic, subjects were asked to be a part of a simulated grocery-shopping task as a way to observe the effects of temporal price promotions. This research contributes by examining the role of the temporal distance between the promotional offer and the promoted product and its influence on redemption likelihood, product perceptions, and spending behavior. Priming literature states that promotional offers should be transient, which suggests that shoppers are more likely to redeem a promotion when it is encountered closer to the purchase decision for the promoted product (Crowder 1976). However, by building on literature about choice justification (Okada 2005), temporal framing (Chandran & Menon, 2004) and attitude accessibility (Morowitz & Fitzsimons 2004), we theorize and propose that temporal promotions can enhance a
consumer’s evaluations of the product. This ultimately increases the effectiveness of temporal promotions. Furthermore, we demonstrate that this effect is moderated by the initial evaluations consumers have regarding the promoted product and its product category.

**Martin School of Public Policy**

**40C. Ben Childress**  
Mentor: Eugenia Toma

*Charter Schools: Social and Economic Conditions That Give Rise and the Implications for Kentucky*

There has been much debate nationally over the effectiveness and desirability of charter schools in the last few years, and now that debate is front and center in Kentucky. Governor Matt Bevin, for example, has said that he would like to see charter schools in both Lexington and Louisville, which would be allowed if a bill currently under consideration by the Kentucky General Assembly becomes law (SB253). Charter schools are publicly funded schools that operate under a third party that is independent from the local school district. While most of the debate has centered on the educational effectiveness and learning environment of charter schools, the goal of this project is to estimate the likelihood a charter school will appear in a community given its socio-economic characteristics. The evidence suggests that areas with greater heterogeneity in race and education as well as income inequality are more likely to bring about charter schools. Using the experience of Tennessee, a state similar to Kentucky that has had charter schools for several years, data will be collected and analyzed in order to project what the landscape of charter schools might look like in Kentucky if and when state leaders authorize their establishment.

**Mathematics**

**41A. Drury Bell**  
Mentor: David Royster

*A Translation of Jordanus de Nemore’s De Elementis Arithmetice Artis*

In A Short Account of the History of Mathematics, mathematical historian W. W. Rouse Ball writes on various mathematicians who, beginning in the twelfth century gradually adopted Arabic numerals and the symbolic notation used today. One such mathematician was Jordanus de Nemore, one of the earliest mathematicians to use letters as representatives of numbers (143). In the introduction to his critical edition of the Latin text of Jordanus’s work on number theory entitled De Elementis Arithmetice Artis (On the Elements of the Arithmetical Art), H. L. L. Busard describes briefly the lasting significance of the work, which was commonly studied from the time it was written, likely in the early thirteenth century until the beginning of the sixteenth century (10-11). This project is a translation of Busard’s critical edition of Jordanus’s Elements. It is intended to be literal whenever possible in order to stay true to Jordanus’s view of the mathematics instead of relying on modern thought and notation. Accompanying the translation is Jordanus’s work shown in modern notation. Though his theorems can often be proven more easily in this notation, his full work is displayed when it is reasonable to do so, along with whatever explanation seems necessary. Currently the first two of the ten books in De Elementis Arithmetice Artis have been translated. The first deals with ‘parts,’ a term used by Jordanus to describe a number that divides another. A modern reader would see in this book simple properties of the four basic operations and relations between numbers acted on in such operations. In the second book, Jordanus uses the relationships established in Book 1 in order to define and prove several properties of proportions. This translation sheds light on medieval mathematical thinking and expression and will perhaps give the reader a greater appreciation of modern notation.
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Mechanical Engineering

41B. Ibrahim Appleton
Mentor: Johnie Parker

Development of Testing GUI for Radio Frequency Identification M6e

Radio Frequency Identification (RFID) is a method of transferring data to and from tags over short distances through the use of electromagnetic fields. These tags are extremely useful for locating objects, security mechanisms, and electronic payment methods such as Apple pay. However, this technology has faults. For example, the successful read of a chip is dependent on factors including read angle, tag distance, and uncontrollable environmental factors such as surrounding materials that may affect the magnetic field between the tag and reader. In addition, it is difficult to specify which tag needs to be read if there are multiple tags in an area. This may cause problems like cross programming of nearby tags (programming a nearby tag instead of the target tag). Thus, the goal of this project is to create a database of environmental factors and to determine their affects on the readability and the probability of cross-programming. The current version of the GUI (Graphical User Interface) for the M6e was created using Microsoft’s C Sharp programming language. So far, it can report whether a tag is read or not for a single tag read or for a set number of tag reads. This data is then output onto a list of tag names for tags that were read and Tag not Read for failed attempts to read tags. In our previous experiments with the skytek reader, we found that as tag readability goes up, cross programming also goes up. In addition to that, we saw a trend where as tags grew closer to each other, cross programming went up. Tags are also more likely to be read at a 90 degree angle where the reader and tag are parallel.

41C. Chris Meek
Mentor: Suzanne Smith, Alexandre Martin

KRUPS: Design Integration and Overview

The Kentucky Reentry Universal Payload System (KRUPS) is a spacecraft design for collecting thermal protection system (TPS) and atmospheric entry data for research purposes. The device is an ongoing multidisciplinary project developed by student at the University of Kentucky. The ultimate goal of the project is to deploy a cluster of KRUPS devices with high orbital velocity in a relatively small space over a short time period. As a result of the project’s highly matrixed requirements and interdisciplinary involvement, a systems engineering approach is being implemented. Initial prototypes of the subsystems have been developed by student capstone groups so that aspects of the system could be better understood. With the results of these ‘in essence, feasibility studies’ the sequence of systems requirements and final designs will be developed. The primary objective for the capsule in 2018 is to complete a mission where the device enters Earth’s atmosphere and transmits data. It is hopeful to include the capsule in the payload of an ISS resupply mission, where it will be ejected from the ISS with the Pacific Ocean as its intended target. The capsule will de-orbit and enter the atmosphere with a ballistic trajectory. During reentry, KRUPS will collect and transmit data through the Iridium satellite constellation system before splashdown. The shape of the capsule, based on REBR, was first tested in 1976 at NASA Langley Research Center. This, along with other technology, provides a sound base for a reliable reentry test platform. Several low cost probes will be launched to establish a strong statistical data set. KRUPS is also being designed for modularity. In the long term, the KRUPS platform can be used to validate new technology in space conditions in an inexpensive and reliable manner.
42A. Olivia Schroeder  
Mentor: Alexandre Martin  

Modeling and Analysis of Permeability in Carbon Fibrous Materials

Experimental measurements of permeability were obtained for FiberForm, a carbon preform used to manufacture PICA, an ablative material used for thermal protection systems of re-entry vehicles. A permeability model based on Darcy’s Law with Klinkenberg effects, which accounts for the slip behavior of rarefied regimes, was used to model the experimental data. The effects of temperature and pressure on the permeability were demonstrated. A function for the effective permeability of FiberForm, dependent on temperature, pressure, pore geometry, and type of gas was proposed. The intrinsic permeability was evaluated \( K_0 = 5.57 \times 10^{-11} \text{ m}^2 \), with a Klinkenberg parameter of \( 8c/dp = 2.51 \times 10^5 \text{ m} \) and a reference porosity of \( \phi = 0.87 \).

42B. Claire Kellen  
Mentor: Jeffrey Peters  

Standardization of the French Language in the 17th Century and Beyond: a Historical and Political Analysis

Though the common impression of language is one of prescriptive and theoretically objective rules, language is undoubtedly a social, and therefore political, tool. Language standardization is a long-standing and common phenomenon, though of all the countries of the globe, France has perhaps the most strong and politically charged tradition in this area. Beginning with the Villers-Cotterêts decree of 1539 establishing French as the royal and governmental language, a nationally ideology was slowly but firmly formed. This political mentality led to the establishment of l’Académie Française in 1635, a quasi-government body dedicated to ruling over the language, and its subsequent suppression during the French Revolution, causing language standardization in France to support at times both courtly and democratic ideals, sometimes simultaneously and paradoxically. This paper will trace and analyze the linguistic and ideological basis for the standardization of the French language. It will focus primarily on the split public opinion on this issue in the 17th century, as the debate and politicization of language during this period is in still reflective of the split opinion on similar issues of language usage in modern France and the United States.

42C. Kyle Auger  
Mentor: Matthew Gentry  

Defining carbohydrate binding of glucan phosphatases via Affinity gel electrophoresis

In plants, starch is the energy storage molecule that is readily broken down when needed. In animals, glycogen is the molecule that is used for energy storage. Both molecules are comprised of -1, 4 linked glucose polymer chains and -1,6 glucose branches that are tightly compacted. Our lab has determined the x-ray crystal structures of both plant and human glucan phosphatases and their enzymatic mechanisms. Despite this progress, we lacked the techniques to quickly and efficiently quantify their glucan phosphatase affinities for different substrates. The main objective of this study was to determine a technique to measure carbohydrate binding quickly and efficiently. We established a protocol to
reproducibly and quantitatively measure the binding of the enzymes to glucans utilizing Affinity Gel Electrophoresis (AGE). The results show that the various glucan phosphatases possess differing abilities to bind to different glucan substrates. The plant glucan phosphatase SEX4 possesses a 50 fold higher affinity for the glucan amylopectin than LSF2, while SEX4 only possessed a 3 fold higher affinity for the glucan amylose than LSF2. Mutations were made to the various domains of the plant and animal glucan phosphatases to determine which regions of the enzyme are most necessary for binding.

43A. Catherine Crawford  
Mentor: Craig Vander Kooi  

*Determining the Structure of GIPC3: A Key Contributor to Sensorineural Hearing Loss*

Recent genetic analyses have linked mutations in a protein, GIPC3, to sensorineural hearing loss. SNHL is a form of hearing loss resulting from damage to the inner ear, and often leads to social isolation, cognitive decline, and depression in affected individuals. GIPC3 localizes in the hair cells of the cochlea, and contributes to effective mechanotransduction. Eleven mutations have been identified and are distributed throughout the primary sequence of GIPC3. However, little is known about the specific role of GIPC3 on a molecular level. We hypothesized that point mutations in GIPC3 prevent function by changing key regions of its structure that are critical for stability and ligand binding. We determined the effect of patient mutations on GIPC3 stability using Differential Scanning Fluorimetry (DSF), and identified a subset of patient mutations that were deleterious to stability. For those mutations that did not affect stability, we further defined their role in affecting the interaction of the GIPC3 PDZ-domain with ligands. Further, structure/function studies defined a key mechanism important for ligand-mediated GIPC3 function. These data provide key insights into GIPC3 function and dysfunction in disease, and will contribute to ongoing efforts to develop treatments for sensorineural hearing loss caused by mutations in GIPC3.

43B. Brianna Barksdale  
Mentor: Yang Jiang  

*How Does Music Tempo Affect Performance of a Mind-Controlled Attention Task?*

Previous studies have provided evidence that classical music, such as Mozart, can improve college students’ spatial-temporal reasoning. Such far, few studies however have tested whether the tempo of the music affects the performance of a mental task and brain activity during the task. The purpose of this experiment is to investigate whether different tempos of the same song will affect the brain activity and performance (accuracy and speed) of a task. We hypothesize that tempo of auditory inputs interferes with brain activity during a visual attention task. Participants (undergraduates at the University of Kentucky) are asked to perform a mind-controlled task, i.e. maneuvering a virtual ball on a computer screen using their brain waves via a wireless headset. The headset records electroencephalogram (EEG) from participants’ scalps and communicates in real-time to the computer to control the movement of a virtual ball. This task is performed for 40 trials, each under: (1) no music as the control condition, (2) with a slow paced song, and (3) with a fast paced song. The order of the here conditions is counterbalanced between human participants. The accuracy and reaction times of the mentally moved ball to target is measured for each trial. Data collection is underway. We expect that the performance of the mind-controlled task is different under no, slow and fast tempo conditions. This proof-of-concept study provides a new understanding of how human brains react to the tempo of auditory stimuli and potential interference
between sensory modalities and high-level cognitive functions, such as attention. It will also provide insights for improving task performance and study habits of college students.

43C. Esias Bedingar  
Mentor: Yang Jiang

*Brainwave Signatures for Detecting Malingered Neurocognitive Deficit*

Traumatic brain injury is a major public health concern in the United States, affecting up to 1.7 million people each year. Mild traumatic brain injury (mTBI) accounts for 80% of these cases. Various tests have been created in order to document brain injury and evaluate cognitive functions. However, neuropsychologists report that up to 40% of individuals undergoing evaluations following mTBI may be malingering deficits. The aim of this study was to utilize neuroimaging approaches to detect Malingered Neurocognitive Deficit (MNCD) by comparing the reaction times and brainwave signatures of honest and malingering cohorts during a working memory test (Vagnini, Berry, Clark, & Jiang, 2008). Healthy participants with no history of head injury were grouped into two groups: honest (mean age=37; n=16), and malingering cognitive deficits (mean age=33; n=16). Subjects were asked to perform a computerized old-new memory recognition task while 32-channel Electroencephalogram (EEG) calp signals were recorded. Data were recorded using Neuroscan 4.5 and analyzed using EP Toolkit 2.0. Event-Related Potentials (ERPs), which are averaged EEG signals time-locked to events (e.g., memory recognition), were analyzed. In this study, P300, or the later ERP component, is known as an indicator for cognitive processes including memory, attention and decision making. Preliminary results revealed that compared to healthy control subjects, the delayed ERP responses to studied images (mean delay 123 ms) at the frontal sites were found in subjects who fake brain injury. The delayed neural responses are likely due to additional neural processes associated with malingering (i.e. pretending failure of recognizing images seen before). There were no significant group differences in ERPs responses of new images. These results indicate that additional processing time and effort are involved in the brain activity in individuals who mangle cognitive deficits.

44A. Emily Willis  
Mentor: Yang Jiang

"Say What?": How does a Native English Speaker's Brain Respond to Foreign Language?

Different human languages vary in sound, rhythm, pitch, and written form. These differences alone make learning a new language challenging. While the process of learning a new language improves cognitive functions, some studies have found that patterns of activity in our brains may affect the initial stage of learning a new language. This study focuses on neural mechanisms observed in those who are not familiar with a foreign language and how the brain responds during initial exposure to a foreign language. Participants of the study are non-German speaking undergraduate students at the University of Kentucky. Brain activity during exposure was recorded using a wireless headset while participants both listened to words in their native language (English) and a foreign language (German). The order of the languages presented was counterbalanced. The data collection is underway. The EEG signals during comprehension were analyzed to examine the response differences, or similarities, between the two conditions. It is predicted that the brain activity of native English speakers will show different patterns during the listening comprehension of English and German. This proof of concept study will be the cornerstone of future research to understand how brain activity changes at different stages of knowledge of a distinctly different language.
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Nursing

44B. Sara Assef
Mentor: Kristin Ashford

An Examination of the Misclassification Rates of Prenatal Smoking Behaviors throughout Each Trimester of Pregnancy.

Purpose: Smoking during pregnancy is the most modifiable risk factors associated to poor pregnancy outcome (CDC, 2012). Self-reported smoking status has been associated with high misclassification rates (Lawrence et al., 2003). The aim of this research study was to examine misclassification rates of prenatal smoking behaviors during each trimester of pregnancy and evaluate personal characteristics associated with women who misclassify their smoking status. It was hypothesized that third trimester self-report would be the most reliable measure of prenatal smoking status. Research Methodology: This study was a secondary analysis of a prospective, multicenter trial of pregnant women. Each trimester, prenatal smoking status was assessed via maternal self-report and validated using preset urine cotinine limits. Nonsmokers were defined by a urine cotinine level of < 100 ng/mL; compared to smokers with a level of > 100 ng/mL. Bivariate statistics including the two-sample t-test or chi-square test of association were conducted using SAS version 9.3, with an alpha level of .05 throughout. Results: The present study included 380 women in the first trimester, 271 in the second trimester, and 256 in the third trimester. As pregnancy progressed, there was a decrease in misclassification of smoking status. In the first trimester, 35% of pregnant women self-identified as nonsmokers; however, were biochemically validated as smokers. In the second trimester and third trimesters, 31.9% and 26.6%, respectively, misreported their smoking status. Comparisons among those who did or did not misreport their smoking status, yielded no differences in age, education, or planned pregnancy; however smokers who self-reported as non-smokers were more likely to be non-White (p<.001) and had significantly fewer smokers living in the (p=.043). Conclusion: Misclassification of prenatal smoking status decreases as pregnancy progresses. Biochemical validation of smoking status should be considered when assessing prenatal tobacco use; as misclassification rates remain high throughout each trimester of pregnancy.

44C. Sirah Kolstedt
Mentor: Amanda Fallin

Barriers and Facilitators of Successful Smoking Cessation Among Patients with Mental Illness

Smoking is the leading cause of preventable death and illness worldwide, with approximately 5 million attributable deaths annually. Patients with mental illness are disproportionately burdened by the tobacco epidemic. Those with mental illness consume over 44% of cigarettes smoked worldwide, and individuals with a history of mental illness are more than twice as likely to smoke as the general population. Tobacco use can also decrease the bioavailable doses of many psychoactive drugs and exacerbate psychiatric symptoms. Tailored tobacco treatment programs are needed to promote smoking cessation among this highly vulnerable population. The purpose of this study is to identify barriers and facilitators of obtaining tobacco treatment among patients with serious mental illness. For this ongoing study, participants are recruited from an outpatient clinic providing recovery-focused mental health treatment to patients with serious mental illness. Participants are asked to take part in semi-structured individual interviews in which they discussed their smoking history and what might motivate or prevent them from quitting smoking in the future. Interviews are audio recorded and professionally transcribed verbatim. These transcripts are analyzed in MAXQDA using content analysis to identify themes in the data. The sample consists of 8 participants aged 28-52 years old, with at least one of the following primary diagnoses: major depression, bipolar disorder, or schizophrenia. Participants report a strong desire to stop smoking, but report barriers
of peer influence, boredom, and habit. Patients are motivated to quit smoking by the cost of cigarettes, family desires, and current or future health. Despite high smoking prevalence among patients with mental illness, study participants reported a strong desire to quit. Results of this ongoing study will be used to develop tailored tobacco materials for these patients. These interventions can potentially reduce lives lost to tobacco-related disease for this highly vulnerable populace.

**Nutritional Sciences**

**45A. Ellen Combs**  
Mentor: Analia Loria

*High Fat Diet Situations Affecting Vascular Reactivity*

Early Life Stress is a problem that is becoming more common in today’s society. The motivation behind research of the cause of this stress is to find the problem causing early onset anxiety, cardiovascular disease, and obesity. It is causing both health problems and short life spans in adults. Through the research of vascular function in rats, I will view the systemic arteries and how they react to vasoactive peptides. The reasoning for causation of failure with vascular reactivity is currently unknown. In particular, the females derive glucose intolerance and begin the stages of obesity after being fed a high fat diet for approximately three to four months. Thus, the aims are to test the metabolic effects on the vascular function. Furthermore, my approach to this problem will be to analyze mRNA expression of vascular tissue such as thoracic aorta from rats fed a normal fat diet or high fat diet. Nano dropping will also be performed on these samples to further assure accuracy in each RNA sample. Additionally, the results will be viewed in fresh tissue using a Myograph on the computer to analyze both the constriction and relaxation of each aortic ring mounted to the myograph. Therefore the results should conclude that a high fat intake does lead to functional issues with vascular reactivity later in life. Through this research, it was learned that many factors happening in early life situations could provide stress later in life leading to malfunctions in vascular reactivity. These findings can be applied to aspects of long-term human stress complications. Being able to research and discover the causes of problems in vascular reactivity can lead to prevention measures of cardiovascular disease. The implication of this research shows how exposure to early life stress enhances the high fat diet-related issues with aortic arteries function.

**Obstetrics & Gynecology**

**45B. Kalin Wilson**  
Mentor: Misung Jo

*Core Binding Factor Beta Knockdown Alters Ovarian Gene Expression and Function in the Mouse*

Core Binding Factor (CBF) is a heterodimeric transcription factor complex composed of a DNA-binding subunit, one of three RUNX factors, and a non-DNA binding subunit, CBFB. CBFB is critical for DNA binding and stability of the CBF transcription factor complex. In the ovary, the LH surge increases the expression of Runx1 and Runx2 in periovulatory follicles, implicating a role for CBFs in the periovulatory process. The present study investigated the functional significance of CBFs (RUNX1/CBFB and RUNX2/CBFB) in the ovary by examining the ovarian phenotype of granulosa cell-specific CBFβ knockout mice; CBFβ(fl/fl) * Cyp19 cre. The mutant female mice exhibited significant reductions in fertility, with smaller litter sizes, decreased progesterone during gestation, and fewer cumulus oocyte complexes collected following induced superovulation. RNA sequencing and transcriptome assembly revealed altered expression of over 200 mRNA transcripts in granulosa cells of Cbfβ knockout mice following hCG stimulation in vitro. Among the effected transcripts are known
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regulators of ovulation and luteinization including Sfpr4, Sgk1, Lhcgr, Prlr, Wnt4, and Edn2, as well as many genes not yet characterized in the ovary. Cbfb knockdown mice also exhibited decreased expression of key genes within corpora lutea and morphological changes in ovarian structure, including the presence of large antral follicles well into the luteal phase. Overall, these data suggest a role for CBFs as significant regulators of gene expression, ovulatory processes, and terminal differentiation of granulosa-lutein cells in the ovary.

Oral Health Sciences, Division of Orthodontics

45C. Heather Gosnell
Mentor: Sarandeep Huja, Subramanya Pandruvada

Role of Protein Tyrosine Phosphatases in Regulating Migration and Invasion Potential of Breast Tumor Cells

Soluble growth factors secreted by cancer cells support growth, migration and establishment of cancer cells in new environments. These factors support differentiation and activation of bone resorbing osteoclasts and contribute to enhanced bone loss in cancer. In addition, the expression of matrix metalloproteinases (MMP) produced by osteoclasts and cancer cells have been associated with the high potential of migration and bone destruction in several human carcinomas, including breast cancer. Several pieces of evidence demonstrate that protein tyrosine phosphatases (PTP) have functions that promote tumor growth and cell migration in breast tumor cells. In addition, tyrosine phosphatases also play a vital role in osteoclast migration and function. We investigated whether inhibiting PTP in breast tumor cells will have any effect on the secreted growth factors. Using a broad-spectrum PTP inhibitor, Sodium Orthovanadate, we investigated MMP-9 secretion by human breast tumor cell line SUM1315 using gelatin zymogram. Preliminary results show decreased secretion of MMP-9 by breast tumor cells suggesting a probable role of PTP in secretion of soluble growth factors necessary for cell migration and tissue invasion. We are currently investigating the osteoclast differentiation potential of secreted growth factors (cancer cell-conditioned media) derived from Orthovanadate treated SUM1315 cells. Recurring treatment failures in cancer warrant new treatment strategies and inhibition of tyrosine phosphorylation is a promising venue to target tumor metastasis and associated bone loss.

Pharmacology and Nutritional Science

46A. Noah Bosa
Other Authors: Brent Cotter, Madison Forbing, Cecilia Kemper, Bethany Lawrence, Harrison Lee, Cheyanne Shook, Benjamin Starr, Evan Yang
Mentor: Hollie Swanson, Ok-Kyong Park-Sarge

Impact of Nutritional Supplements on Estrogen Receptor α Signaling

Many studies indicate that the presence of estrogen in breast tissue induces the progression of cancer and that beta estradiol is a pro-proliferative factor in estrogen receptor-positive breast cancer cells. With an understanding of the mechanism underlying estrogen induced breast cancer, several anti-hormonal therapies have been developed to counteract this particular pathway. One such strategy is the use of estrogen receptor α modulating drugs, such as tamoxifen, to treat estrogen receptor-positive breast cancer by antagonistically inhibiting estrogen from binding to the estrogen receptors. However, the use of such drugs is not without consequences, as it is usually accompanied by the symptoms associated with menopause due to the deprivation of estrogen levels. In our study, we have questioned whether supplements that remedy the symptoms of menopause may alter estrogen receptor α activity. We tested a
“hot flash” supplement composed of isoflavones, black cohosh extract and licorice extract as well as ginseng, black cohosh, licorice and golden rod extract. In our experiments, we used modified Saccharomyces cerevisiae engineered to express a plasmid encoding estrogen receptor $\alpha$ and $\beta$-galactosidase regulated by estrogen responsive elements. We treated the yeast with either the vehicle control, the positive control (beta-estradiol) or increasing concentrations of hot flash supplement, ginseng, black cohosh, licorice or golden rod extract. In some experiments, the yeast were treated with a combination of nutritional supplements and either beta-estradiol or tamoxifen. After an overnight incubation, the activation of estrogen receptor $\alpha$ was determined by using colorimetric analysis for beta-galactosidase activity. Our initial results indicate that ginseng and licorice, but not black cohosh may alter the activity estrogen receptor $\alpha$. Ongoing experiments will determine the impact of the hot flash supplement and golden rod extracts. The results of these experiments will help inform breast cancer patients and physicians regarding the safety of nutritional supplements.

46B. Nicole Frost
Other Authors: Nicole Yvonne Cortez, Jacob Osborne,
Mentor: Florin Despa

Amylin Interaction with Alzheimer’s Disease Pathology in Humans

Hyperamylinemia, a common pancreatic disorder in obese and insulin-resistant patients, is known to cause amylin oligomerization and cytotoxicity in pancreatic islets, leading to $\beta$-cell mass depletion and development of type 2 diabetes. Recent data has revealed that hyperamylinemia also affects the vascular system, heart, and kidneys. We therefore hypothesized that oligomerized amylin might accumulate in the cerebrovascular system and brain parenchyma of diabetic patients. Amylin accumulation in the brain of diabetic patients with vascular dementia or Alzheimer disease (AD), nondiabetic patients with AD, and age-matched healthy controls was assessed by immunohistochemistry and immunofluorescence. Amylin oligomers and plaques were identified in the temporal lobe gray matter from diabetic patients, but not controls. In addition, extensive amylin deposition was found in blood vessels and perivascular spaces. Intriguingly, amylin deposition was also detected in blood vessels and brain parenchyma of patients with late onset AD without clinically apparent diabetes. Tissues infiltrated by amylin showed increased interstitial space, vacuolation, spongiform change, and capillaries bent at amylin accumulation sites. Metabolic disorders and aging promote accumulation of amylin amyloid in the cerebrovascular system and gray matter, altering microvasculature and tissue structure. Amylin amyloid formation in the wall of cerebral blood vessels may also induce failure of elimination of A\textsubscript{B} from the brain, thus contributing to the etiology of AD.

46C. Ariana Johnson
Other Authors: Margaret Stull, Summer Schmitt
Mentor: Florin Despa

Rat Model of Late-onset Alzheimer’s Disease and Type-2 Diabetes

Type-2 diabetes (T2D) increases the risk for developing Alzheimer’s disease (AD) marked by amyloid beta plaque deposition in the brain and cognitive decline. However, the direct molecular link remains elusive. Human amylin, a hormone that injures the insulin-producing $\beta$-cells in T2D, has similar amyloidogenic properties to amyloid beta. Human amylin has been demonstrated to deposit as plaque in T2D brain and is associated with cognitive decline. The hypothesis is that aggregated amylin damages brain cells and accelerates AD progression. To test this hypothesis, a novel transgenic animal model was established to identify mechanisms by which amylin contributes to exacerbate AD. This diabetic model carries both human amylin and AD genes, resulting from the breeding of the human amylin transgenic...
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rats to late-onset Alzheimer’s disease rats. DNA polymerase chain reaction is used to identify the offspring genotypes. To track their diabetic stages, blood glucose and weight are monitored monthly. In vivo amyloid plaque deposition in the brain is assessed by immunohistochemistry. The animals will be tested for AD-associated neurological deficits as they become diabetic in the future. Together, these results will help to identify the role of aggregated amylin in AD progression and to develop preventative therapy for T2D patients. Amylin accumulation in the brain induces plaque deposition and cognitive decline, which may explain why T2D increases the risk for Alzheimer’s disease.

47A. Evan Reeder
Other Authors: Dylan Holland, Olivia Bodart
Mentor: Florin Despa

Alzheimer’s Disease Model in a Petri Dish

A potential complication in patients with type-2 diabetes (T2D) is the development of Alzheimer’s disease, marked by amyloid plaque deposition in the brain and cognitive decline. However, the direct molecular link remains unexplored. Human amylin, an amyloidogenic hormone that injures the insulin-producing β-cells in type-2 diabetes, has been demonstrated to deposit as plaques in the brain and is associated with cognitive decline. The hypothesis is that aggregated amylin damages brain cells and induces amyloid plaque production. To test this hypothesis, a neuronal cell model was established in order to identify mechanisms by which amylin contributes to inducing Alzheimer’s disease. In brief, rat primary neurons are incubated with human amylin. Amyloid beta produced from neurons is measured by immunofluorescence and enzyme-linked immunosorbent assay (ELISA). In vivo amyloid plaque deposition in human amylin transgenic animal is assessed by immunohistochemistry. The data shows that amylin treatment increases amyloid beta production from neurons. Together, the accumulation of aggregated amylin in the brain leads to neuronal cell damage and amyloid plaque deposition. Amylin induces amyloid beta production from neurons, which may explain why T2D increases the risk for Alzheimer’s disease.

47B. Chaitranjali Tirumalaraju
Other Authors: Prachi Raichur, Elizabeth Parvin
Mentor: Florin Despa

Dyshomeostasis of Amylin in the Brain, a Mimic of Alzheimer’s Disease

We recently found that brain tissue from patients with type-2 diabetes (T2D) and cognitive impairment contains deposits of amylin, an amyloidogenic hormone synthesized and co-secreted with insulin by pancreatic β-cells. Amylin deposition is promoted by chronic hypersecretion of amylin (hyperamylinemia), which is common in humans with obesity or pre-diabetic insulin resistance. Human amylin oligomerizes quickly when oversecreted, which is toxic, induces inflammation in pancreatic islets and contributes to the development of T2D. Here, we tested the hypothesis that accumulation of oligomerized amylin affects brain function. In contrast to amylin from humans, rodent amylin is neither amyloidogenic nor cytotoxic. We exploited this fact by comparing rats overexpressing human amylin in the pancreas (HIP rats) with their littermate rats which express only wild-type (WT) non-amyloidogenic rodent amylin. Amylin deposition in the brain was documented by immunohistochemistry, and immunofluorescence. Compared to WT rats, HIP rats show i) reduced exploratory drive, ii) impaired recognition memory and iii) no ability to improve the performance on the rotarod. The development of neurological deficits is associated with amylin accumulation in the brain. Accumulation of oligomerized amylin alters the brain structure at the molecular level. Immunohistochemistry analysis confirming that amylin deposition in the brain induces a neuroinflammatory response. Hyperamylinemia promotes
accumulation of oligomerized amylin in the brain leading to neurological deficits through an oligomerized amylin-mediated inflammatory response. Additional studies are needed to determine whether brain amylin accumulation may predispose to diabetic brain injury and cognitive decline.

Physics and Astronomy

47C. Deborah Ferguson
Mentor: Susan Gardner

Milky Way Tomography with K and M Dwarf Stars: the Vertical Structure of the Galactic Disk

This analysis uses the number density distributions of K and M dwarf stars with vertical height from the Galactic disk, determined using observations from the Sloan Digital Sky Survey (SDSS), to probe the structure of the Milky Way disk across the survey’s footprint. Distances are determined using photometric parallax and address possible calibration errors through the use of distance estimators in both (g-i)0 and (r-i)0 color. Comparing regions looking towards the center of the galaxy and regions looking away from the center of the galaxy (with respect to the Sun’s location) using our selected stars in the north with latitudes 30°<b<90 reveals an increase in thickness of the galactic disk with radial distance from the galactic center. It can be shown that this behavior is consistent with a decrease in mass with radial distance as expected from galactic models. Additionally, a comparative analysis of matched north and south regions shows an north/south offset in thickness, with the north appearing thicker than the south. Overlaying the shapes of the north and south demonstrates this may arise from a genuine difference in stellar densities, north and south, as observed previously by Widrow et al. (Widrow, 2012). Finally, the comparison of different latitude regions for a fixed range in longitude shows sensitivity to the selected latitude window. This reveals a change in stellar populations in the compared latitude regions, which could be representative of metallicity changes in the vertical structure of the Galactic disk, or possibly of changes in its in-plane structure.

48A. Connor Johnstone
Mentor: Christopher Crawford

Qualification of an Active/Passive Magnetic Field Cancellation Apparatus

For the past semester, our team has been concerned with the construction and testing of the combination of the two currently most common methods of magnetic field cancellation. Typically, for an experiment that requires a null magnetic field, the field is cancelled via a series of Helmholtz coils (which utilize the induced magnetic field properties of a current loop) or by placing around the experiment a highly magnetic-permeable material, such as mu-metal. For this experiment, it is to be determined whether a combination of these two principles would allow for a compounding effect that would be able to achieve higher shielding factors than either of them by themselves. This technology could potentially drastically reduce the cost of magnetic shielding necessary for certain physical experiments.

48B. Patrick Montgomery
Mentor: Christopher Crawford

Construction and Field-Mapping of a Double Cosine-Theta Coil

Precision Nuclear Magnetic Resonance (NMR) with neutrons requires an extremely uniform magnetic field. A cosine theta coil is the standard coil used to create a uniform transverse magnetic field. We have
developed a double cosine theta coil using inner and outer coils to produce a uniform field while canceling fringes outside of the coil and near the end caps. We designed a new method to construct a cylindrical double cosine theta coil comprised of printed circuit board end caps with a carefully calibrated wire cage. Our method provides a lighter, and more cost efficient way to produce coils with a desired uniform transverse magnetic field. We used a Stabuli RC-130 robotic arm to drill the printed circuit board end caps, and to map the uniformity of the resulting field.

48C. Ben Riley  
Mentor: Christopher Crawford

*Calibration of High Precision Robot Arm for the Crafting of Magnets for Use in Neutron Experiments*

This project is centered around the calibration of a high precision robot arm that will be used to construct magnets that are necessary for the detection of the proposed electric dipole of the neutron. Here, preliminary calculations are presented about the design and characteristics of the calibration fit. The arm has a 35-micron repeatability in its movements. Our goal is to reach 35-micron absolute accuracy. The arm has six joints which give it six degrees of freedom so that it can reach an arbitrary point in space (3 degrees) and orientation (3 more degrees). Each of these joints relies on four parameters each, called Denavit-Hartenberg Parameters, that relate each joint to the other joints, so that it is possible to tell the robot how to move. After factors such as coordinate system degeneracies and free parameters are taken into account, there are 29 parameters that must be calibrated. The calibration itself is a non-linear fit in the 29 parameters already mentioned, which is being approximated by a generalized least squares linear fit. Here, preliminary calculations are presented about the design and characteristics of the fit.

*Physiology*

49A. Ashami Athukorala  
Mentor: Lu-Yuan Lee, Ruei-Lung Lin

*Measurements of Cough Responses to Inhaled Irritants in Awake Mice.*

Cough is evoked by excessive mucus production in the respiratory tract or inhalation of irritants that stimulate the afferent nerve endings in the larynx and tracheobronchial mucosa. Despite the unique potential of mouse as an animal model for developing and testing therapeutics in various airway diseases, little is known about the effects of inhaled irritants on cough responses in this rodent species. This study was carried out in 12 awake mice to determine the cough responses to two different types of inhaled irritant gases that are also common environmental air pollutants: ammonia (NH3) and sulfur dioxide (SO2). During the experiment, each mouse was exposed separately to two concentrations of NH3 (0.1% and 0.2%) and SO2 (300 ppm and 600 ppm) in a tightly sealed recording chamber (volume = 200 ml) that was ventilated with a constant flow (200 ml/min) of air or the gas mixture. The pressure change in the chamber, audial and visual signals of the mouse were recorded continuously during the experiment and analyzed by an on-line computer using the software AcqKnowledge 4.2. Prior to the experiment, the animal was placed in the testing chamber for 30 minutes for adaptation to the experimental condition and protocol. It was then followed by a baseline period of 5 minutes, 8-minute period of inhalation challenge and another 5 minutes of recovery; 30 minutes elapsed between two consecutive inhalation challenges for recovery. Our preliminary data showed that both concentrations of ammonia and sulfur dioxide triggered a significant number of cough and expiratory reflexes during and after the NH3 and SO2 inhalation challenges. In summary, this pilot study has demonstrated the potential of this rodent cough model for pharmaceutical companies to use as a validation tool in their pre-clinical trials of antitussive agents. (Supported by NIH grant AI117588)
49B. Carly Caverly  
Mentor: Donna Wilcock

Determining the neuroinflammatory phenotype in a model of amyloid deposition and vascular cognitive impairment after anti-Aβ immunotherapy.

Alzheimer’s disease (AD) and vascular contributions to cognitive impairment and dementia (VCID) are the two most common forms of dementia and it is estimated that 40% of AD patients also have VCID. Several studies have described the heterogeneity of neuroinflammatory phenotypes in AD and the effects of these states on the pathologies of the disease. Our laboratory has recently shown an M1 phenotype dominates when VCID is co-morbid with amyloid deposition in a mouse model. Due to the disappointing outcomes of anti-Aβ immunotherapy clinical trials, and the significant vascular adverse events in these trials we hypothesized that anti-β immunotherapy could result in an adverse neuroinflammatory response when AD and VCID are co-morbid leading to adverse events and reduced efficacy. To model AD-VCID co-morbidity we use the APP/PS1 mouse model of amyloid deposition and induced hyperhomocysteinemia (HHcy) via diet, which models a form of VCID. For this study, we placed 9 month old wildtype or APP/PS1 mice on a control diet or the HHcy diet. After 3 months on diet, when cerebrovascular pathology is induced by the HHcy, the mice received weekly intraperitoneal injections of a control antibody (IgG2a) or N-terminal anti-Aβ antibody (3D6). The neuroinflammatory phenotype was assessed by qPCR for gene markers specific for inflammatory phenotypes. Protein levels via ELISA and microglial activation via CD11b immunohistochemistry are currently in progress. We found that the APP/PS1 mice on control diet with 3D6 treatment were polarized towards an M1/M2b phenotype. Interestingly, of the genes tested, the APP/PS1 mice on the HHcy diet with 3D6 treatment showed significant exacerbation of many neuroinflammatory markers and we are continuing to assess these more carefully. Overall, we found that anti-Aβ immunotherapy in a model of amyloid deposition and VCID results in a different neuroinflammatory response than in a model of amyloid deposition alone.

49C. Taylor Elder  
Mentor: John McCarthy

Central Nervous System Regulation of Skeletal Muscle Mass

The regulation of skeletal muscle size is thought to occur exclusively at the level of the muscle. This idea of "local" control of skeletal muscle size is based upon the well-established observation that resistance exercise training, such as weightlifting, only causes a significant increase in the size of the working muscle; muscles not involved in the resistance exercise show no change in size. The purpose of this study is to determine if the central nervous system is involved in regulating skeletal muscle size. To test this idea, we will infuse the myostatin protein into the brains of mice for up to a month; at the designated time point, mice will be euthanized and various skeletal muscles collected for size analysis. Myostatin is a member of the TGF-β family and is primarily made in skeletal muscle and released into the blood stream. Previous studies have shown that myostatin is able to cause skeletal muscle to become smaller so we predict that infusion of myostatin into the brain will result in skeletal muscles becoming smaller. A better understanding of the mechanisms involved in the regulation of skeletal muscle size will aid in the development of a more effective treatment for the loss of skeletal muscle associated with cancer, aging, prolonged inactivity and space flight.
Poster Abstracts

50A. Faith Evans  
Mentor: Ken Campbell  

*Is There a Difference in Collagen Content between Male and Female Human Hearts?*

Heart failure affects 5.1 million people in the United States, making it one of the most common causes of death. The Campbell Muscle Lab aims to study the causes of heart failure by bridging the gap between cellular and organ level function to understand the mechanics of heart failure. The aim of this study is to test the hypothesis that there will be an increase in collagen content in males. According to The American Heart Association Journals, males have higher occurrences of heart failure, and therefore should contain more collagen in myocardium heart tissue. In order to test this hypothesis, collagen content will be measured using frozen tissue specimens transferred from long-term storage in the vapor phase of liquid nitrogen to a cryostat maintained at -26°C. Samples were placed in 10 x 10 x 5 mm cryomolds and covered with optimal cutting temperature medium. Samples were cut in 10 um sections and air dried on glass slides. The tissue sections were stained with Picrosirius red stain, the PSR stained collagen appears red in light microscopy. The sections had an average cross-sectional area of ~16 mm² and were imaged with a 10x objective. The Collagen content was analyzed using software from the Campbell Muscle lab written in MATLAB. In the past, our lab has shown increased collagen content in hearts that are failing. The result of more collagen in the heart will decrease the amount of myocardium muscle fibers, producing decreased heart function. The results of this study will show that male myocardium tissue contains more collagen, explaining the higher rate of heart failure in males.

50B. Daniel Ma  
Mentor: Yuan Wen  

*Regulatory Mechanisms of c-Myc During Muscle Cell Growth*

Skeletal muscle makes up more than 40% of adult body mass and can rapidly grow and shrink in response to environmental conditions. Interestingly, for an organ system that makes up such a large portion of the body, capable of growing so quickly, and regenerating almost on a daily basis, it is exceedingly rare to find a cancer that arises from skeletal muscle cells. One of the most potent tumor growth genes, c-Myc, becomes highly expressed in skeletal muscle fibers during muscle growth without causing cancer. The mechanisms with which skeletal muscle cells achieve such a tight control over growth and effectively minimizing risks of malignant transformation are fascinating and yet unclear. The aim of the current project is to elucidate the regulatory mechanisms affecting c-Myc oncogene activity during muscle cell proliferation, differentiation, and maturation.

50C. Kaitlyn Senay  
Other Authors: Liza Bustle, Cynthia Fieseler  
Mentor: Sandra Legan, Thitinart Sithisarn  

*Effect on Stress Axis Neurons of Non-Opioid vs Opioid Treatment of Neonatal Abstinence Syndrome*

Neonatal Abstinence Syndrome (NAS) is the occurrence of opiate withdrawal in infants whose mothers abused drugs, e.g. oxycodone, during pregnancy. Currently, treatment consists of decreasing doses of opiates such as methadone or morphine to decrease withdrawal symptoms. These drugs are detrimental to brain function and development, especially in areas of the brain that deal with stress. A non-opioid drug, clonidine, has been used to treat withdrawal symptoms, but it is not known to be less harmful to brain development. This study was designed to test the hypothesis that treatment of NAS with clonidine is associated with lower apoptosis and higher neuron survival in brain areas associated with stress compared...
to treatment with morphine. Pregnant rats were exposed to pulses of either oxycodone or saline every 12 hours from gestation day 8-21 using an infusion pump, to induce NAS in the newborn pups. The pups were euthanized on postnatal day 4. Sections of the hippocampus and prefrontal cortex, regions associated with stress, were incubated with vehicle, morphine, or clonidine. Five days later, the sections were stained (propridium iodide) and examined for apoptosis. Statistical analysis used linear mixed effects models with a random effect for litter with significance defined as p <0.05. There was a significant interaction between brain area and treatment (p=0.002). Treatment effects were significant in the prefrontal cortex (p= 0.006), but not the hippocampus (p=0.19). In support of our hypothesis, in the prefrontal cortex, postnatal treatment for NAS with the non-opiate clonidine resulted in less apoptosis in oxycodone-exposed brain slices than with morphine (621 ± 75 vs 737 ± 77, p=0.005). The prefrontal cortex is a key part of the neural stress axis associated with learning and memory. These findings support the hypothesis that clonidine may be a better alternative to opiates like morphine in the treatment of NAS.

**Plant and Soil Science**

51A. Paul Cecil  
Mentor: Tim Phillips

*Comparing Nitrogen Uptake in Different Rye and Wheat Varieties*

The identification and selection of nitrogen uptake in rye and wheat varieties will play an important role in developing cover crops with better performance and nutrient cycling. This research study’s specific objective is to establish a system for analysis of roots and shoots in cereal rye and wheat, and response to two levels of fertilization. This allows the study of rye and wheat as a cover crop, as well as their use in sequestering nitrogen and preventing run off. This will determine the amount of nitrogen able to be obtained by each variety of rye or wheat and released for use by the following crop. This experiment at hand utilizes pioneering the use of tubes by looking for differences among varieties and lines of cereal rye. The seeds will be germinated and begin seedling growth in 8x16 trays, in Promix soil. After three weeks of seedling growth, the lines will be transplanted into clear polyethylene tubing, cut to a 63.5 cm. length, and heat sealed at one end. The sealed end will be perforated for drainage. The tubes will be filled with Quartz wet blasting sand, half of the tubes will be treated with nine grams of osmocote fertilizer, the other with three grams of fertilizer. The tubes and plants will be irrigated by a timed drip system, with a flow rate of 2.2 liters per hour. Traits that will be measured are shoot height, root depth, shoot weight, total weight, shoot height/root depth, shoot weight/root weight, shoot N, root N, total N, and shoot/root N. This technique should be very successful in identifying improved nitrogen uptake varieties.

51B. AnnMarie Kadnar  
Mentor: Krista Lea, Ray Smith

*Ergovaline Stability in Stored Tall Fescue Samples*

Tall fescue (Schedonorus arundinaceus (Schreb)) toxicity, caused by ingesting endophyte infected tall fescue, results in negative physiological effects in livestock including prolonged gestation in broodmares (Monroe et al., 1988) and decreased average daily gain in cattle (Hopkins and Alison, 2006). The objective of this study is to determine the effects of storage on ergovaline stability from endophyte infected tall fescue plant material. Harvests from February 2015 and February 2016 were taken from tall fescue plants grown in the greenhouse. October 2014 and June 2015 samples were harvested from UK’s Spindletop Farm. Harvested plant material was cut to approximately 2.5 cm long pieces and mixed together to ensure homogeny. The material was then randomly split amongst treatments. February 2015, June 2015, and February 2016 contained seven treatments, including freeze-drying while October 2014
did not include freeze-drying; all had three replications. The control samples were analyzed the same day, while whole or milled samples were analyzed at intervals between 1 and 15 days. Ergovaline was determined by HPLC with fluorescence detection using a propanol-based extraction solution with lactic acid. Only data values with an RSD less than 15 were considered in this analysis. As an overall trend, samples stored in a milled format tended to have higher ergovaline levels than the control. Samples stored in the whole condition trended similar to the control or slightly lower. Freeze-dried samples showed some significant variability, indicating that freeze-drying does not mitigate storage inconsistencies. Similar studies (Lea, et al) suggest that ergovaline can be a relatively unstable compound even when stored in the freezer as whole or milled plant material. Grazing management decisions based on ergovaline concentration should be conservative to account for this potential variation.

51C. Amanda Reese  
Other Authors: Colby Rouchka, Macall Campbell, John Klein  
Mentor: Jayadri Ghosh, Ling Yaun

*Potential Role of Phytochrome Interacting Factors in Light-mediated Regulation of Alkaloid Biosynthesis in the Medicinal Plant, Catharanthus roseus*

Light regulates a myriad of biological processes in plants. Light signal perception, transduction, and regulation of gene expression in plants are controlled by a cascade of regulatory proteins including phytochrome interacting factors (PIFs). PIFs belong to the basic helix-loop-helix (bHLH) transcription factor (TF) family and bind to the G/E-box (CANNTG) sequences in promoters of the target genes to regulate their expression. Catharanthus roseus (Madagascar periwinkle) is the exclusive source of a vast array of terpenoid indole alkaloids (TIAs), including vinblastine and vincristine, a group of pharmaceutically valuable specialized metabolites. The leaf-accumulated vinblastine and vincristine are used in the treatment of various cancers including leukemia and Hodgkin's lymphoma. TIA biosynthesis in Catharanthus is highly influenced by developmental and environmental cues. The production of vindoline, the precursor of vinblastine, occurs only in leaf tissues and is influenced by light. Seven genes are involved in biosynthesis of vindoline. However, the influence of light on the expression of these genes is not well studied. The major objective of this project is to determine the effects of light and darkness on gene expression of the vindoline pathway enzymes and their potential regulators, PIFs, in Catharanthus seedlings. The second objective is to determine the potential PIF binding sites in the promoters of the vindoline pathway genes. Using quantitative real-time PCR (qRT-PCR) we demonstrated that light significantly affect the expression of genes encoding the vindoline pathway enzymes and PIFs. Moreover, promoters of several vindoline pathway genes contain the G/E-box elements. We are testing our hypothesis that the Catharanthus PIFs bind to the G/E-box sequences to modulate expression of the vindoline pathway genes.

52A. Ellis Shelley  
Mentor: Seth DeBolt

*Robust Genetic Assay for detection of Périgord black truffle (Tuber melanosporum) in Kentucky.*

The Périgord black truffle is the fruiting body of the symbiotic fungus Tuber melanosporum Vittad. Having a high value on the global market gives an incentive for Kentucky farmers to grow the truffle as a cash crop. However, baby orchards are an expensive and high-risk adventure for farmers as truffle production often takes several years to start from the beginning. The objective of this research was to develop a molecular method to detect T. melanosporum in soil. Using PCR, DNA amplification of selected genetic markers of T. melanosporum was used to indicate the presence of the fungus, indicative of future truffle production in the tested local orchard in Kentucky.
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52B. Ashley Stevens
Mentor: Arthur Hunt, Daniel Howe

Alternative Polyadenylation in Sarcocystis neurona

This project studied the occurrence of alternative polyadenylation during the growth of Sarcocystis neurona. S. neurona is an obligate intracellular parasite that causes equine protozoal myeloencephalitis. Among the stages of growth of the parasite are the merozoite and schizont stages. The merozoite is the extracellular parasite that has been lysed from the host cell once the development has completed. The schizont is the intracellular development stage, where it grows and acquires nutrients, eventually producing 64 haploid merozoites. While some gene expression analysis has been conducted, there is no knowledge on polyadenylation in S. neurona. Moreover, there have been no genome-wide studies of poly(A) site choice for any member of the Apicomplexans phylum. Thus, it is not clear if alternative polyadenylation contributes to changes in gene expression in these organisms, and any findings will add to current knowledge. This study addresses the hypothesis that, indeed, alternative polyadenylation does contribute to regulated gene expression in S. neurona. Poly(A) tags were made to conduct a genome-wide study of poly(A) site choice. The tag libraries were sequenced on a MiSeq instrument, returning 11.9 million reads. The data was analyzed using programs including CLC Genomics Workbench and Bedtools, as well as others designed specifically for APA analysis to define sites and assess alternative polyadenylation. The results suggest that S. neurona possesses a distinctive polyadenylation signal that is reminiscent of that seen in higher plants. The results also show multiple instances of APA. The results from this study confirm our hypothesis that there will be changes in poly(A) site choice during the developmental stages of S. neurona.

Plant Pathology

52C. Meaghan Melody
Other Authors: Lydia Fletcher, Haleigh Whitlock, Alysia Kohlbrand, Steven Wallbrown, Oumaima Karimi, Kate Rodgers
Mentor: Pradeep Kachroo, Aardra Kachroo

Characterizing the defense phenotypes of an antioxidant gene mutant of Arabidopsis thaliana

Reactive oxygen species (ROS) regulate many aspects of plant physiology including defense against microbial pathogens. We studied the importance of ROS in plant defense by analyzing the phenotypes of an Arabidopsis thaliana mutant defective in the peroxisomal monodehydroascorbate reductase (AtMDAR1), an enzyme involved in the ascorbate-glutathione cycle, which is a part of the plant’s antioxidant system. The ascorbate-glutathione cycle recycles ascorbate, a powerful antioxidant that quenches ROS such as H2O2. Arabidopsis is commonly used as a model system to investigate many aspects of plant physiology due to its short life cycle, ease of growth, sequenced genome, and the availability of a large number of molecular and genetic resources. This includes a large database of T-DNA insertional mutants in nearly every gene of Arabidopsis. During this project we analyzed three different lines carrying T-DNA insertions in AtMDAR1 and isolated a homozygous (ie. T-DNA inserted into both copies of the gene) knock out (KO) line. The goal was to analyze this line for its response to pathogens and its ability to generate known defense-related metabolites. Individual Arabidopsis plants were transplanted into separate containers and used for DNA isolation. The isolated DNA was used to identify plants homozygous for the T-DNA insertion using the polymerase chain reaction (PCR) and a specific combination of primers including those flanking the T-DNA insertion site in the AtMDAR1 gene and one primer within the inserted T-DNA. Using this strategy we successfully identified several plants that contained homozygous insertions in the target gene. KO mutations in AtMDAR1 were further
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confirmed using RT (reverse transcription)-PCR analysis. This involved isolation of RNA from the homozygous insertional plants, synthesis of first strand cDNA and analysis of AtMDAR1 transcript in RT-PCR. Plants that did not contain transcripts for AtMDAR1 will be analyzed for their response to microbial pathogens and ability to generate defense related metabolites.

Psychology

53A. J.C. Ausmus
Mentor: Jonathan Golding

The Impact of Witness Demeanor on Jurors in an Adult Rape Case

One of the most common narratives based on myths about rape is that women cry rape when they regret having sexual relations or want revenge against another person (Burrowes, 2013). Actual crying is considered part of one’s demeanor, an individual’s outward behavior including facial expressions, voice intonation, and displays of emotion (Guralink, 1987). The demeanor of a witness is generally accepted as a critical component of judging a witness’s credibility (Cohen et al., 2013). The purpose of the current study is to investigate the effect of demeanor (specifically crying) on jurors in an adult rape case. It was hypothesized that (1) women would render guilty verdicts more than men, and (2) a crying victim would lead to more guilty verdicts than a non-crying victim. The present study used 232 community members as participants, 137 females and 95 males who read a rape trial summary. We used a 2 (woman crying: yes or no) x 2 (participant gender) between-participants design. The results supported Hypothesis 1; women (68%) voted guilty more than men (45%). However, Hypothesis 2 was not supported. There were more guilty verdicts when the witness did not cry (57%) on the stand than when the witness did cry (56%) on the stand. In addition, it was shown that while men were impacted by crying (49%) versus no crying (41%), women were more likely to render a guilty verdict if the victim did not cry (73%) compared to when the victim did cry (64%). This research will assist the legal community in how emotions and outward demeanor may affect the verdict in a sexual assault and rape cases.

53B. Kylie Colvin
Mentor: Jonathan Golding

Juror Perceptions of Child Sexual Assault Cases with Multiple Victims

The believability of children in the courtroom varies with regard to age. In non-sexual assault cases, older children are believed more than younger children because their memory abilities are seen as better (Goodman, Golding, & Haith, 1984). However, in child sexual assault cases (CSA) even though older children will likely be able to remember more details than younger children, younger children will be believed more than older children in CSA cases, because they are viewed as more honest and sexually naive (Golding, Lynch, Wasarhaley, & Keller, in press). The present study was designed to examine juror perceptions in CSA cases with multiple victims that vary in age. It was hypothesized that (1) female participants should render more guilty verdicts than male participants; (2) cases with two victims will lead to more guilty verdicts than cases with one victim; and (3) cases involving at least one young victim will lead to more guilty verdicts than cases involving at least one older victim. The present study was a 2 (Age count 1: 6 year old vs 15 year old) X 2 (Age count 2: 6 year old vs 15 year old) X 2 (Participant gender: male vs female) between-participant design. In addition, there will be two control conditions: (1) one 6-year-old victim and (2) one 15-year-old victim. Male and female community members will read an online trial summary and answer questions about the case (e.g., verdict, victim credibility). The results will be analyzed and discussed in terms of how the age of a victim in a CSA case can impact juror decision making.
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53C. Megan Daniels  
Mentor: Susan Barron

Hyperactivity in a Novel Mouse Model of Fetal Alcohol Spectrum Disorders

Fetal ethanol (ETOH) exposure is associated with a wide range of behavioral effects, including hyperactivity, disinhibition, and cognitive deficits in children with Fetal Alcohol Spectrum Disorders and in rodent models. Fetal ETOH effects have been modeled using C57BL6J mice, an alcohol-preferring strain that voluntarily consumes alcohol during their dark cycle (“Drinking in the Dark” (DID)). Boehm and colleagues (2009) have shown that maternal DID may model the effects of daily voluntary consumption on brain development. However, the 3rd trimester equivalent of brain development occurs after birth in mice and is a period of heightened sensitivity to ETOH in brain structures related to inhibition. This study compared varying ETOH treatments on locomotor activity and exploration in juveniles, observing the effects of maternal DID and postnatal treatment, alone and/or in combination. Prior to and during pregnancy, female mice were given daily access to 20% ETOH solution or water for 4 hours during the dark cycle. Offspring were randomly assigned to receive no treatment or daily intubations of ETOH (i.e. 3 or 4 g/kg on PND 3-10). On postnatal days 20-21, locomotor activity and exploration patterns were monitored in a circular open field for 30 minutes per day. Pups intubated with 4 g/kg of ETOH, regardless of prenatal exposure, appeared hyperactive when compared to controls in exploration overall and in the center of the open field. Maternal DID and neonatal 3 g/kg ETOH treatments did not alter open field exploration. These data suggest that fetal ETOH-induced hyperactivity depends on the dose and timing of exposure, with higher doses in the 3rd trimester representing an increased risk for these problems. This research was supported in part by AA020051 to GC.

54A. DeAnna Duffy  
Mentor: Christia Brown

Sexy Over Smart: An Examination of Sexualized Stereotypes on Academic Performance in Middle School Girls

This study examines how gender stereotypes affect the academic performance of middle school students, with a particular focus on how it affects the girl’s attitudes and abilities towards math and language arts. There is a pervasive stereotype that boys are better suited for math and sciences than girls and investigations into this “math-gender stereotype” show that simple reminders of this stereotype can damage girls’ math performance. We wanted to test if a similar effect emerged from the “sexualized girl stereotype,” which teaches girls to prioritize their appearance and devalue their intelligence. To do this, participants were randomly assigned to one of three conditions. One conditioned reminded participants of both stereotypes, another reminded them of only the math-gender stereotype, and one served as the control condition. Completing an academic assessment and questions about their academic attitudes. While data is still being collected and analyzed, the trends we have found so far show that girls (but not boys) reminded of both stereotypes have lower scores than those primed with the math-gender stereotype. Furthermore, those primed with the math-gender stereotype had lower than those in the control condition. This research will help us address the stereotypes affecting the scores and attitudes of girls towards STEM field.
54B. Joelle Goh  
Mentor: Elizabeth Lorch, Richard Milich  

*Deficits in Story Comprehension as a Mediator of ADHD and Social Status*

Attention deficit/hyperactivity disorder (ADHD) is one of the most common childhood disorders, affecting approximately 10% of school-aged children (Barkley, 1990). Children with ADHD are rejected at a higher rate than their peers (Erhardt & Hinshaw, 1994), and research has endeavored to explain the link between ADHD and social status within a child’s peer group (Coie, 1983; Erhardt, 1944). One possible explanation may involve narrative comprehension difficulties commonly observed among children with ADHD (Lorch et al., 2004). These children often struggle with understanding causal relations between two story events and with understanding characters’ goals. Because social status may be influenced by an individual’s understanding of others’ motivations, children with ADHD may be more likely to misinterpret motivations and react with situationally inappropriate actions. Therefore, this study examined narrative comprehension deficits as a possible mediator between ADHD and social status.

Children 7-10 years old exhibiting a range of ADHD symptoms participated in two sessions; in the first the child watched one of two episodes of the situation comedy Growing Pains. After viewing, the child responded to cued recall questions tapping the child’s understanding of factual story events and of causal connections between events. Parents and teachers completed questionnaires measuring social problems and ADHD symptoms. Children also participated in a second session in which they completed several tasks with a small group of children. Preliminary analyses suggested that ADHD symptoms are significantly related to social problems, and to narrative comprehension difficulties and that certain narrative comprehension difficulties are related to social problems. However, narrative comprehension difficulties did not mediate between symptoms and social status. Future analyses may examine other measures of social relationships derived from the group sessions.

54C. Willie Graas  
Other Authors: Paige Harrison, Sarah Johnson, Hannah Butcher, Katelyn Einloth, Jeffrey Akers, Sean McCarthy, Stephanie Dunning, Samantha Maphis, Ashab Ahmed, Onyinyechukwu Ibekwe  
Mentor: Nathan DeWall  

*Effect of Tylenol on Temptation to Cheat*

Acetaminophen relieves not only physical pain but also social pain (DeWall et al., 2010; Eisenberger, 2012). This experiment examined the effect of acetaminophen on cheating. It was hypothesized that acetaminophen would increase cheating via diminishing the painful feeling of guilt. 129 students from the University of Kentucky participated in this study. In this double-blind study, participants consumed either 1000 mg of acetaminophen or a cornstarch placebo. First, participants completed a battery of personality questionnaires in the laboratory. After one hour, participants completed a scale that primed feelings of luckiness. Next, participants rolled a die 30 times. Each die roll number was multiplied by 10 cents. Participants could earn up to $20 in this study, but without cheating, the mean amount earned would be $10.50. Participants reported how much money they earned. Overall, participants in the study did steal money from the laboratory. However, there was not a significant difference in money earned or stolen between the two groups. Although participants did steal money from the laboratory in this study, the amount of money stolen was small (about 50 cents). A new ongoing study includes modifications that increase temptation to cheat.
Poster Abstracts

55A. Lindy Howe
Mentor: Jonathan Golding

The Effect of Defendant Demeanor on Jury Perception in a Murder Trial

The Casey Anthony trial of 2011 has been marked with controversy ever since she was acquitted of the death of her daughter Caylee (Stevens, 2011). Because of the overwhelming evidence against Ms. Anthony, the not-guilty verdict rendered by the jury created controversy of why this decision was reached. One possibility was that the jury was influenced by the sad emotions expressed by the defendant during the trial (Colarossi & Pavuk, 2011). The present study was designed to examine how certain emotions shown in the courtroom (either crying or the absence of crying) can affect a juror’s perception of the defendant and eventual verdict in the case. It was hypothesized that (1) participants that were shown photos of the defendant crying throughout the trial would lead to more not-guilty verdicts than the not-crying condition, and (2) females will be more likely to rule not-guilty versus the verdicts of male participants. The study was a 2 (Emotion: crying or no crying) x 2 (Participant gender) between-participant design with 112 undergraduates who were jury-eligible. Participants would read a trial summary online, which included 4 pictures of the defendant during trial in which the defendant was either (1) clearly crying or (2) not crying. After reading the summary, participants then answered questions about the trial (e.g. verdict). Results showed some support for hypothesis 1, showing more not-guilty verdicts (56%) were rendered in the crying condition versus guilty verdicts (44%). However, similar results were found in the not-crying condition, which also lead to more not-guilty verdicts (59%) versus guilty verdicts (41%). Additionally, there was no significant finding between the male (42% guilty 58% not guilty) and female verdicts (51% guilty and 49% not guilty). This research will assist the legal community in how emotional demeanor of a defendant may affect the verdict in a trial.

55B. Lauren Johnson
Mentor: Jonathan Golding

Perceptions of Elder Physical Abuse: The Impact of Type of Criminal Charge

In the United States, one in four elders are at risk for abuse, showing that elder abuse is more common than one might consider (Cooper, 2008). Previous research has examined juror decision making in physical elder abuse cases (Kinstle, Hodell, & Golding, 2008) and found that females were more likely to render a guilty verdict than males. In these prior studies the charge against the defendant was always a general charge of assault. The present experiment investigated how mock jurors perceived different criminal charges for the same case of elder physical abuse. Hypothesis 1 stated that a charge that explicitly mentioned elder abuse (KRS 209.020) would lead to more guilty verdicts compared to a typical charge of assault (KRS 508.020). Hypothesis 2 stated that there would be more overall guilty verdicts from female participants as opposed to male participants. This experiment used a 2 (criminal charge: assault in the second degree vs. reckless abuse of an adult) x 2 (participant gender) between-participants design. Male and female community members (N = 173) read a fictional description of a criminal trial and then were asked to make judgments about the case. The results showed a pattern opposite to that predicted by Hypothesis 1. There were more guilty verdicts for a charge of assault (76%) compared to a charge involving elder abuse (62%). As for Hypothesis 2, there was no difference in the percentage of guilty verdicts for females and males (68% each). These results were discussed in terms of the implications for prosecuting elder physical abuse cases in court.
Poster Abstracts

55C. Natalie Malone
Other Authors: Becky Mirsky
Mentor: Susan Barron

Spatial Learning Deficits in a Novel Mouse Model of Fetal Alcohol Spectrum Disorders

Consumption of alcohol during pregnancy causes a variety of behavioral deficits. Fetal Alcohol Spectrum Disorders results in life-long implications including such symptoms as inhibitory deficits, impaired attention, and poor learning and memory. Similar deficits have also been observed in rodent models. Fetal ethanol (ETOH) exposure can be modeled by providing ETOH to pregnant C57BL/6J mice (Boehm et al, 2008), an alcohol-preferring strain who will voluntarily drink ETOH. While the sequence of brain development is similar across species, when birth occurs can vary. In mice, the period of CNS development that overlaps the human third trimester “brain growth spurt” occurs after birth. Our study utilized a voluntary consumption model to assess the effects of ETOH either during pregnancy (modeling the first and second trimester) and/or neonatal ETOH exposure (as a model of third trimester) to assess ETOH-effects on a spatial learning task. Prior to and throughout pregnancy, dams were randomly assigned to receive 4 hr daily access to a 20% ETOH solution or water during their dark cycle. Following birth, pups received either ETOH exposure (3 or 4g/kg ETOH on PND 3-10) or controls. During adolescence, subjects were tested in a circular water maze to find a hidden platform. Offspring exposed to the highest dose of ETOH showed deficits in acquisition and retention of this task. These offspring also showed deficits when the task was changed. These findings suggest that spatial deficits in rodents following ETOH exposure may be sensitive to dose and timing of exposure.

56A. Lillian McGhiey
Other Authors: Thomas Priest
Mentor: Peggy Keller

Recollection of Negative Family Events in Adult Children of Alcoholics and Non-Alcoholics: Implications for Their Mental Health

Adult children of alcoholics are at risk for a variety of mental health problems, including anxiety, depression, and substance use. Children of alcoholics (COAs) may be at special risk as they are making the transition from adolescence to adulthood, during the college years. This is a period of time marked by increased stress and risky behavior, particularly alcohol use. A key question for research is how experiences from childhood influence this transitional time. The current study explores the self-reported memories of college students who are children of alcoholics and compares them to those of students who are not children of alcoholics. Implications for mental health are also examined. 200 college students were recruited based on their responses to a screening survey sent to students in Psychology 100, 215, and 216, which included 6 questions from the Children of Alcoholics Screening Test (CAST). Those students indicating yes to at least three of the CAST questions were considered COAs. Students indicating no to all questions were considered non-COAs. Both groups were sent invitations to participate, and came into the laboratory for data collection. Following informed consent and completion of questionnaires assessing mental health, participants were given the mood induction interview. Participants were asked to recall their worst memory from childhood and then were asked a series of questions to assess their feelings and how frequently they think about the memory in the present. Transcripts of interviews were coded for mention of alcohol, parentification, involvement in the event, feelings of guilt, parental separations, and participant insult of family members. Data analyses will compare COAs and nonCOAs in terms of the frequency of these variables and how these variables are associated with mental health.
**Poster Abstracts**

**56B. Brienna Meffert**  
Mentor: Richard Milich, Elizabeth Lorch

*Depressive Symptoms Moderate Emotion Dysregulation and Teacher-Reported Attention-Deficit/Hyperactivity Disorder Symptoms*

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common childhood behavior disorders in the United States. Prior research demonstrates a significant relationship between ADHD, emotion dysregulation (ED), and depressive symptoms, but the nature of the relationship has not been clearly determined. Due to the elevated risks children with co-morbid ADHD and depressive symptoms experience, it is important to understand the nature of the relationship. This study incorporates behavioral tasks and teacher-report to examine a moderating relationship of depressive symptoms with ADHD and ED. Children (N = 371), ages 8-10 (M = 8.89, SD = 0.81), completed self-report measures of depressive symptoms (Child Depression Inventory-2) and participated in a same-sex playgroup of 5-10 children in which behavioral observations were recorded for global ED. Parents and teachers reported ADHD symptomatology using the Disruptive Behavior Scale (DBD). Additionally, parents reported ED using the Emotion Regulation Checklist (ERC). Results indicated that depressive symptoms moderated emotion regulation and teacher-reported ADHD symptoms. Examination of the moderation showed that at low levels of ADHD symptoms, children with high depressive symptoms experienced more ED than children with low depressive symptoms. At high levels of ADHD symptoms children with both high and low levels of depressive symptoms experienced relatively the same amount of higher ED. These results suggest that depressive symptoms appear to make more of an impact on ED at low levels of ADHD symptoms than high levels of ADHD symptoms, as children with both high and low levels of depressive symptoms were impaired at high levels of ADHD symptoms. This novel exploration of ADHD, ED, and depressive symptoms suggests youth that depressive symptoms may increase ED at low levels of ADHD. Future research is needed further understand the mechanisms underlying depressive symptoms and ED at low levels of ADHD symptomatology.

**56C. Kaitlin Moore**  
Mentor: Jonathan Golding

*Public Approval of Plea Bargaining in Cases of Rape*

Plea bargaining is often used in order to quickly move cases through the court. A plea bargain is an arrangement made between the prosecutor and the defense in which the defendant admits guilt and gives up his or her right to trial in exchange for leniency during sentencing. However, research shows that the public does not always approve of plea bargaining (Herzog, 2003). The current study explores the relationship between plea bargaining and public attitudes in cases of rape. It was hypothesized that (1) people would be more upset when the rape victim was a child as compared to an adult, (2) people would be less approving when the reason given for the plea was to save time rather than to protect the victim from further trauma, and (3) people would be more upset when the defendant was given probation rather than a reduced sentence. A 2 (victim age: 6 vs. 26 year old) X 2 (reason for plea: save time vs. protect victim from trauma) X 2 (sentence: probation vs. reduced jail time) X 2 (participant gender) mixed factor design was used. The present study included 81 participants (30 males, 51 females) who read a case summary in which a man either raped a 6 year old girl or a 26 year old woman. The results of the study confirm all three hypotheses. For example: (1) participants were most upset when the victim was 6 years of age (M = 5.71) versus 26 years (M = 5.20), (2) participants were more upset when the reason given for the plea was to save time (M = 5.53) versus to protect the victim from further trauma (M = 5.38), and (3) participants were most upset when the defendant received probation (M = 5.87) versus reduced sentence (M = 5.04).
**Poster Abstracts**

**57A. Christa Newman**  
Mentor: Peggy Keller

*Associations between School Start Times and Standardized Test Scores in New Mexico Public Schools*

Early school start times have been identified as a risk factor for poor sleep in adolescence. It is believed that puberty-related changes in the way the brain regulates sleep prevent adolescents from coping with early school start times by going to bed earlier. Therefore, the National Sleep Foundation and the American Academy of Pediatrics have undertaken efforts to delay middle and high school start times. This process typically results in elementary schools starting earlier. However, there has been very little research on the possible effects of early start times on elementary aged children. One study found that earlier elementary school start times were associated with lower standardized test scores among public elementary schools in the Commonwealth of Kentucky. A follow-up study also found that earlier elementary school start times were linked to greater behavioral problems. Additional research is needed to confirm these findings, especially in other states. The current project will test associations between school start times and standardized test scores in the state of New Mexico. New Mexico has one of the lowest levels of educational attainment in the US, making it an ideal state to examine. Public data on standardized test scores, as well as demographic features of schools (such as minority distribution and teacher-student ratio) have been obtained. School start times will be collected by visiting school websites or calling schools if information is not available on the website. Data will be analyzed using multi-level modeling to account for the nesting of different grades within schools. The focus will be on associations between start times and grade-level rates of proficiency in math, reading, and science, controlling for school demographic variables. Given the diversity of the population of New Mexico, the percent of the students who are Hispanic or Native American will be considered as moderators of associations.

**57B. Kilon Peden**  
Mentor: Jonathan Golding

*How Guilty Are You?*

One of the major decisions for a defendant in a trial is whether to testify or not. This decision is the result of the Fifth Amendment, which gives all individuals the right against self-incrimination (U.S. Const. am. 5.). Even if innocent, a defendant may choose not to testify, because once on the stand evidence can be presented about the defendant’s past, that may not have be directly relevant to the case at hand, but may suggest some connection. There is a lack of research investigates the impact of a defendant testifying in court. Thus, present study was designed to investigate the impact of a defendant testifying or not in a child sexual assault trial as a function of the strength of evidence in the case. It was hypothesized that (1): when the defendant did not testify there should be a greater likelihood of a guilty verdict because the defendant will be seen as hiding important information and (2): strong evidence should always lead to a greater likelihood of a guilty verdict than weak evidence. We used a 2 (evidence strength: strong, weak) x 3 (testimony: yes, no, no w/judge instruction) x 2 (participant gender) between-participants design. The present study included 323 community members who read a trial summary online and then answered trial questions about the case. Both hypotheses were supported. For Hypothesis 1, there were 56% guilty verdicts when the defendant did not testify compared to 32% when he did testify. For Hypothesis 2, strong evidence led to more guilty verdicts (77%) than when weak evidence was presented (48%). This study will allow for the legal community to better understand the impact of not having a defendant testify in a child sexual assault case.
57C. Rachel Rosado  
Mentor: Elizabeth Lorch, Angela Hayden Boyd  

Factors Influencing Individual Improvement in Response to a Narrative Comprehension Intervention  

The current study examined the effects of a 15 lesson after-school intervention, where goal structure is a central part of instruction, on the improvement of use of goal structure and comprehension self-efficacy in children at risk for attention-deficit hyperactivity disorder (ADHD). Performance during the intervention and self-efficacy across the intervention was examined as well. Seventy-two male and female third graders who were in the bottom half of his or her class for narrative comprehension and who displayed symptoms of inattention and hyperactivity participated in the study. Half of the participants received the intervention first (Instructional Group 1), while the other received normal school instruction only. The other half received the intervention after the first group (Instructional Group 2). Story creation, inclusion of goal structure, and comprehension self-efficacy were assessed before and after intervention.

58A. Mackenzie Shanahan (DeMuth)  
Mentor: Ruth Baer  

The Influence of Self-Critical and Self-Compassionate States on an Implicit Association Test for Non-Suicidal Self-Injury  

Non-suicidal self-injury (NSSI), the intentional harming of bodily tissue without suicidal intent, is a damaging health behavior with lifetime prevalence rates of 35% among undergraduates (Klonsky, 2007). Self-criticism, negative self-evaluation, has been shown to be linked to NSSI as well as a variety of other negative health outcomes (Loesch, 2015; Blatt et al., 1982). Oppositely, self-compassion, or being kind and nonjudgmental towards one’s own inadequacies, has been shown to be linked to many positive health outcomes (Neff, 2003). In this study, we examined whether being in a self-compassionate or self-critical state would influence implicit thoughts about NSSI. Using a writing induction, participants (n = 121; 75.2% female) were induced to feel self-critical, self-compassionate, or neutral. Additionally, participants took an implicit association test (IAT) for NSSI both before and after the induction (Nock and Banaji, 2007). It was hypothesized that participants induced to feel self-critical would identify themselves more with NSSI on post-induction IAT scores and that participants induced to feel self-compassionate would identify themselves less with NSSI on post-induction IAT scores. A one-way repeated measures ANOVA analysis was conducted to identify if the induction groups differed significantly in their two IAT scores. This analysis was not significant (p = 0.476) indicating that the self-critical, self-compassionate, and control induction groups did not differ in their IAT score changes. The insignificant findings may be attributed to the ineffectiveness of the inductions. Additionally, there was not a significant correlation between IAT scores and a history of self harm (r = 0.048, p < 0.603) calling into question the ability of the IAT for NSSI to measure self-injurious implicit associations. Future work should attempt to validate this task further in undergraduate samples.

58B. Danica Tschauner  
Mentor: Jonathan Golding  

The Perception of Stalking in Criminal and Civil Trials  

According to KRS 508.140 stalking is defined as engaging in unwanted intentional behavior that alarms, annoys, intimidates, or harasses and leads to mental distress of the victim. This type of crime has been in the media recently with the case of sportscaster Erin Andrews. Stalking can lead to withdrawing from daily activities including work and school, and often times can lead to fear for one’s life. The purpose of
this study was to determine if men and women differ in how they perceive different types of stalking (e.g., individual civil, third party civil, or criminal). We hypothesized that 1. Women would deliver more pro-victim decisions (guilty verdict or plaintiff decision) than men regardless of condition, and 2. Civil trials would lead to more pro-victim decisions than criminal trials. We used a 2 (participant’s gender) x 3 (type of trial: criminal, individual civil, third party civil) between-subjects design. The participants were 188 members of the community who were compensated for their participation. The participants took an online survey where they read through one of the three trials and then answered questions about the trial while also giving a guilty vs. not guilty verdict and an explanation for their verdict. Females (68%) were slightly more likely than males (61%), to give a pro-victim decision, however these results were not significant. There was a significant main effect of type of trial: more pro-victim decisions were given in civil trials (71%) than criminal trials (53%). This research will be helpful in prosecuting future stalking cases.

58C. Courtney VanWay
Mentor: Jonathan Golding

Elder Financial Abuse: Examining Valuables and the Context of Thefts

Elder financial abuse (EFA) is a significant crime that often goes undetected in the United States criminal justice system. Often times in cases of EFA, money is stolen from the victim. For instance, a previous study investigated the number of guilty verdicts assigned during a trial simulation when a son stole money from his elderly mother (Golding, Hodell, Dunlap, Wasarhaley & Keller, 2013). However, EFA can also occur in the form of other valuables. The present study was designed to examine whether the role of the person stealing jewelry and the context of the theft affected participant’s perception of guilt. The present study used a 2 (participant gender) x 2 (Defendant: worker vs. son) x 2 (Location of theft: retirement community vs. home) between-participants design. Male and female community members (N=207) read a trial in which a man allegedly stole an antique diamond ring from an elderly victim. There were three hypotheses. Hypothesis 1 stated that the son would be found guilty more often than the worker. Hypothesis 2 stated that participants would be more likely to find the defendant guilty when the theft occurred at home than when it took place at the victim’s retirement community. Lastly, hypothesis 3 stated that females would be more sympathetic toward the victim and thus would render more guilty verdicts than males. The hypotheses were generally not supported: (1) There was almost no difference between guilt of the worker (35%) and guilt of the son (34%); (2) defendant guilt was slightly higher when the theft took place at the institution (37%) versus at home (33%); and (3) females (36%) did render more guilty verdicts than males (31%), but these results were not significant. The results are discussed in terms of the impact of EFA on elders.

59A. Alexandra Wade
Mentor: Jonathan Golding

Jury Decision-Making in Cases of Elder Overmedication

Elder abuse affects more than 5 million Americans each year. One form of abuse is the use of chemical restraints. Caregivers may chemically restrain an elder by overmedication of psychoactive medications that keep the elder sedated. Because little research has investigated cases of overmedication in the courtroom, the purpose of the present study is to examine juror decision-making in these cases. The present experiment is a 2 (Caregiver-Elder Relationship) x 2 (Victim Health Status) x 2 (Participant Gender) between-participants design. Male and female participants were presented with one of four conditions: a daughter overmedicating a physically disabled elder, a daughter overmedicating a cognitively impaired elder, a female nurse overmedicating a physically disabled elder, or a female nurse
overmedicating a cognitively impaired elder. A trial summary was presented and participants rendered a verdict and rated the caregiver’s and elder’s credibility, believability, etc. Given that caregiver stress is often a contributing factor to abuse and because the daughter likely spends more time with the elder, we predicted that participants would view the daughter as more stressed and thus guilty of abuse. However, we found no significant difference between guilty verdicts of the daughter (35.9%) and nurse (40.8%). We also predicted more pro-victim judgments when the elder was physically disabled compared to when she was cognitively impaired because victims who are cognitively impaired are viewed as providing less reliable accounts of the abuse. As predicted, physically disabled victims (71.5%) were seen as significantly more credible than cognitively impaired victims (64.1%). Finally, we predicted females would be more pro-victim than males, based on other victimization research. Likewise, our results showed females (45.8%) reach a guilty verdict significantly more often than do males (30.7%).

59B. Sylvia Wilson
Mentor: Christia Spears Brown

*Elementary School Students’ Perceptions of Diverse Adoptive Families*

Family structures have grown increasingly diverse in the United States in recent years. Everyday children encounter other students whose family dynamic is not identical to their own. The present study examines elementary school students’ perceptions of families that come together through adoption. The study will focus on two aspects in adoptive families: race and gender. To study the first aspect, vignettes were included about adoptive families that consisted of parents who were not the same race as the child. To study the second aspect, other vignettes that consisted of same-sex parents who adopted a child of the opposite sex were used. The controls in this study were families where the parents adopted a child of the same race or where same-sex parents adopted a child of the same sex. It was hypothesized that there will be a difference in the perceptions held by students between the control groups and the racially or sexually diverse families. The participants in this study consisted of public elementary school students in grades K-5. They completed the survey individually with a research assistant, during a sponsored after-school program at their school. The survey consisted of nine vignettes each with a family photo, similar family descriptions, and questions about the participant’s feelings toward the child and the family as a whole. Data preparation is ongoing and the results are not yet available. The results will provide a better understanding of children’s attitudes and will assist parents and teachers in creating accepting environments that allow for students to better develop and grow.

59C. Georgie Wolbert
Mentor: Jonathan Golding

*The Impact of Type of Threat and Prior Domestic Violence on Attitudes toward Spousal Rape*

Marital rape is a prevalent form of violence against women. Research estimates that between 10-14% of women have been raped by their husbands (Russell, 1990). Although marital rape is criminalized in all states, research shows that marital rape is often viewed as a lesser crime (Bergen, 2006); some question whether a man can actually rape his wife (Whatley, 2005). The purpose of the present study is to measure whether or not participants think a situation in which a husband threatens his wife to have sex is rape. The study is a 2 (History of Abuse) x 3 (Type of Threat) mixed-factor design where the between-participant manipulation is whether a participant receives a survey that involves prior spousal abuse or not and the within-participant manipulation is the type of threat given by a husband in order to have sex with his wife. The three types of threats given include taking the kids, taking away his wife’s money, and physical abuse. The study involved three hypotheses. First, female participants should have higher pro-victim judgments (e.g. situations of rape, wife did not consent, wife did not want sex) than male participants. Second, scenarios that included prior abuse should have higher pro-victim judgements than scenarios that
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did not include prior abuse. Third, the physical-abuse threat should have the highest pro-victim judgements than taking away his wife’s money or taking the kids. Results indicated no significant differences in pro-victim judges between genders. We did find significance for prior abuse history having higher pro-victim judgements than situation with no prior abuse. And lastly, the physical-abuse threat was significantly highly rated with pro-victim judgements. Overall, the study seeks to contribute to the knowledge and awareness on the issue of spousal rape.

Radiation Medicine

60A. Meghana Kudrimoti
Mentor: Vivek Rangnekar

_Chloroquine Sensitizes Melanoma Cells to the Action of Ionizing Radiation_

Melanoma is the second most common cancer in men and women ages 15-29 across the world. Melanoma is a highly metastatic cancer that can be potentially fatal, and patient mortality is often associated with tumor resistance to therapy. In an effort to repurpose FDA-approved drugs, we identified Chloroquine (CQ) as an inducer of the proapoptotic tumor suppressor protein Par-4. We next determined whether CQ sensitizes melanoma cells to the action of ionizing radiation. BRAF-inhibitor PLX4032-sensitive melanoma cells or PLX4032-resistant melanoma cells were exposed to ionizing radiation and various doses of CQ. Our findings indicate that the combination of CQ and ionizing radiation exhibits synergistic growth inhibition of both PLX4032-sensitive and PLX4032-resistant melanoma cells. Further studies in pre-clinical mouse models of melanoma will determine the translational relevance of these findings.

Rehabilitation Sciences

60B. Lina Ghazala
Mentor: Esther Dupont-Versteegden, Amy Confides

_Myonuclear Number is Decreased in Aged Diaphragm of Satellite Cell Depleted Mice._

Satellite cells (muscle stem cells) are required for skeletal muscle regeneration, but their role in muscle adaptation and maintenance, particularly in diaphragm muscle, is not clear. Since the diaphragm muscle is active throughout life, as opposed to hind limb muscles, the role of satellite cells needs to be explored, particularly under a stressor, such as exercise. Female Pax7-DTA mice were satellite cell depleted using tamoxifen at 4 months of age and were either provided with running wheels for 8 weeks or remained sedentary at 6 or 20-22 months age. Mice were sacrificed at 8 (young) or 22-24 months (aged) of age. Diaphragm muscle was dissected, digested into single muscle fibers, stained with DAPI, and analyzed for myonuclear number and fiber width. There were no age-related differences for either width or myonuclear number. In aged sedentary, but not running mice fiber width was decreased with tamoxifen, but no difference was observed in the young. Interestingly, myonuclear number was not different with satellite cell depletion in young mice in either sedentary mice or in runners, but in the aged mice there was a main effect for satellite cell depleted diaphragm muscle to have a lower myonuclear number which was more pronounced in the runners. We conclude that satellite cell depletion causes a decrease in myonuclear number in diaphragm muscle of aged, but not young mice independent of running activity.
**Poster Abstracts**

**Sanders Brown Center on Aging**

**60C. Nicole Martin**  
Mentor: Elizabeth Head

*Nanoparticles and the Detection of Alzheimer’s Disease*

Millions of Americans today live with Alzheimer’s disease (AD): the most common cause of dementia in the elderly. Numbers of cases continue to rise, and it has become the 6th leading cause of death. No cure exists to date, and there is no way to definitively diagnose a person with AD until autopsy. For this reason, brain magnetic resonance imaging (MRI) has become of great importance for early diagnosis and eventually will help us develop effective treatments. The current study tested the hypothesis that specially formulated nanoparticles, which can be used in MRI scanners, can be used as a tool to detect AD in people. Thus, we compared the brains of 5 AD autopsy cases to 5 age-matched control cases. We incubated frontal cortex samples in a nanoparticle formulation (ET621) and compared binding to an immunostain that detects plaques in AD (6E10). These plaques indicate the presence of AD, and after the experiment, placing the tissue under a microscope allows us to see plaques. We observed, first, that a significant amount of nanoparticles binding to the brains of AD cases but no binding to age-matched control cases. Second, the ET621 nanoparticles only bound a subset of plaques, compared to 6E10 binding of all plaques. This raises the question as to what causes ET621 nanoparticles to only bind to certain plaques. A double label study, with both 6E10 and ET621 will help answer our question. The study of ET621 looks promising because of its detection of plaques in AD tissue, which could lead to better imaging and earlier detection of AD using MRI.

**Sociology**

**61A. Brianna Damron**  
Mentor: Mairead Moloney

*The Medicalization of Sleeplessness*

In capitalist America, there is a tendency to medicalize for profit. Medicalization is the process of embracing non-medical issues as medical. This ideology thrives in the context of sleep, where money can be made through a multitude of services and technology. In our productivity-driven culture, restfulness services are in high demand and sleep consultants are a newly popular profession. Sleep consultants work primarily with the parents of newborns or young children. Offering in-person, phone, or email support, they work to develop customized sleep schedules and sleep environment critiques. This study asks, “How do sleep consultants contribute to the medicalization of sleeplessness?” Utilizing the websites of the International Association of Child Sleep Consultants and the Association of Professional Sleep Consultants, data were collected on sleep consultants across the United States of America (n=85). Information on specialist credentials, as well as the types and prices of their services, were recorded. Preliminary content analysis and thematic memo writing are underway. Emergent findings suggest that sleep consultants may actually contribute to the de-medicalization process, as they frame child sleep issues as behavioral and not medical. However, they contribute to capitalist culture in the following ways: a) creating a new and profitable market in response to a social issue b) portraying themselves as “professionals” despite their limited and varying levels of training and c) reproducing various forms of social inequality. The vast majority of sleep consultants are married, middle or upper-class white women with children and Bachelor’s degrees. Their websites are designed to replicate class privilege and attract wealthy clients, using an abundance of female-specific, classist, and heteronormative language. In sum,
sleep consultants de-medicalize sleep issues in young children, even as they promote the notion that “good” parents should spend large amounts of money to ensure their child(ren) get a good night’s sleep.

61B. Aiko Lovejoy  
Mentor: Claire Renzetti

*Public Perceptions of Human Sex Trafficking: What is the Prototype?*

Public understanding of a crime’s prototypes may have an impact on the decisions made by jurors when considering a case. Given the complexity of sex trafficking (ST) as a crime, there is no universal model on which the public can rely. It is therefore possible that the information a juror uses as a base for his or her understanding of ST is inaccurate. This study served to analyze the public’s ST prototype with a focus on four hypotheses: 1) Participants would expect that the victim was forcibly abducted, rather than knowing the trafficker. 2) Participants would expect the trafficker to use physical force. 3) Participants would perceive ST as more of a transnational crime with foreign victims, and 4) Participants’ perception of the likelihood of ST occurring in their community would depend on the type of area in which they reside, with those in urban areas perceiving a higher possible right. Survey participants were asked to respond to an open-ended question, then rate the likelihood of certain victim, trafficker, and circumstance characteristics. We examined the characteristics named in the participants’ open responses and developed prototypes of the victim, perpetrator, and crime as patterns emerged. As more research into human trafficking is conducted, a clearer understanding of the crime will begin to develop, potentially influencing the way prosecutors handle ST cases.

61C. Nora Mattingly  
Mentor: Mairead Moloney, Tony Love

*iClouded Judgement: Techniques of Neutralization in “The Fappening”*

“The Fappening” occurred on August 31, 2014 when hundreds of nude celebrity photographs were hacked and posted online. Sociologists Mairead Moloney and Tony Love have been analyzing tweets collected in the thirty days immediately following the day of “The Fappening”. The current project includes qualitative coding of 7500 tweets for Techniques of Neutralization. Deviant behavior scholars Gresham Sykes and David Matza first introduced these techniques in 1957. Sykes and Matza observed the justifications made by criminals after they had committed illegal acts. They uncovered five techniques often used by deviants as a way of absolving themselves from pressures of social control, making it easier for them to justify their past behavior and also continue engaging in deviant behavior. The five Techniques of Neutralization are: Denial of Responsibility, Denial of Victim, Denial of Injury, Appeal to Higher Loyalty, and Condemning the Condemners. Using this framework, we explore how people justify participating in “The Fappening”: illegally obtaining private, nude photographs. Preliminary analyses reveal that the most frequent neutralization techniques used were Denial of Victim, (e.g., “If she didn’t want her nudes leaked she shouldn’t have taken the pictures.”), and Denial of Injury, (e.g., “It isn’t harming anyone.”). Not only are we able to apply the original Techniques of Neutralization to “The Fappening” tweets, we have found a common theme that enables all of these Techniques of Neutralization. People blame technology, Apple’s iCloud especially, for breaches of security and also blame people for putting their trust in technology in the first place. These findings, among others, have supported the continued relevance of the original findings of Sykes and Matza and have identified the ways in which these Techniques of Neutralization have evolved for use in virtual public spaces.
Posters

**Spinal Cord and Brain Injury Research Center**

**62A. Christina Pistilli**  
**Other Authors:** Kavi Dayaram, Madison Sands  
**Mentor:** James Geddes, Chen-Guang Yu

*Use of Flubendazole to Limit Neurodegeneration Following Spinal Cord Injury*

Neurodegeneration following spinal cord injury (SCI) is due, in part, to inflammation and immune responses. Flubendazole is a benzimidazole anthelmintic used to attack parasitic worm infections, and is approved for human use. It binds to tubulin and impairs microtubule-dependent mechanisms, including the proliferation of rapidly dividing cells such as B lymphocytes. Activation of B lymphocytes and production of autoantibodies contributes to neurodegeneration subsequent to traumatic SCI in humans and in animal models. The aim of this research was to determine whether post-SCI treatment with Flubendazole decreases neurodegeneration and improves functional outcomes when administered post-SCI in a rat model. Spinal cord injury was modeled at thoracic level T10 using a computer controlled impactor at the 180 kdyn force setting. Flubendazole was administered at a dose of 10 mg/kg/day via intraperitoneal injection beginning 3h postinjury and then daily for four weeks. Locomotor behavior was evaluated using an open field test and kinematic analysis. The extent of neurodegeneration was estimated measuring tissue sparing and lesion volume. Flubendazole improved open field locomotion (p<0.05) and appeared to improve tissue sparing, although this did not reach statistical significance with the small sample size (n=6/group) utilized in this study. The kinematic assessment of locomotor function is ongoing. Overall, the results support the hypothesis that post-SCI administration of Flubendazole is neuroprotective. Flubendazole is well tolerated at therapeutic doses and represents a potential therapeutic to limit neurodegeneration following SCI.

**Theatre**

**62B. Brenton Watts**  
**Mentor:** Herman Farrell

*The Climate Change Theatre Project*

The purpose of the Climate Change Theatre Project is to present an accurate, honest, and authentic reflection of the current crisis facing our planet and our species. After conducting research into the many ways documentary dramas have been created and presented throughout history, as well as research into the actuality of climate change itself, all project contributors took on the role of performance-writers and created moment work to give shape to what would eventually become the production. Student contributors guided their work under concepts of content and form, and worked to create an organizing principle under which the play was to take place. Through collaborations with Dr. Paul Vincelli from the Department of Plant Pathology in the College of Agriculture and Dr. Alice Turkington from the Department of Geography in the College of Arts and Sciences, Dr. Herman Farrell, and the student contributors were able to bring to life on stage the world in which we live; a world of tumultuous change and uncertainty, in which activists, politicians, deniers, skeptics, scientists, average people from all walks of life, and even Mother Earth herself struggle to persevere despite the threat of global warming lurking just around the corner. Most importantly, the creators brought to life a world in which hope and the potential for creation are just as imminent and possible as a global warming doomsday, and invited the audience to share in that hope and to be a part of the solution that just might save us all.
The Oswald Research and Creativity Program was established in 1964 by then-President John Oswald as part of the university’s Centennial Celebration. While the program’s objective has remained the same throughout the years, the number of categories has increased to include biological sciences; design, including architecture, landscape architecture, and interior design; fine arts, including film, photography, painting, sculpture; humanities, from creative and critical-research approaches; physical and engineering sciences; and social science. In the science categories and the Humanities/Critical Research category, students generally submit research papers done for class or on their own. For the Humanities/Creative category, students submit short stories, original plays, or poetry. The Fine Arts category is appropriate for musical compositions, paintings, sculpture, videos/films, or photographic essays. Many fine works of art and serious research papers are recognized by the program each year. This competition is unique to the University and provides an excellent opportunity for undergraduates to test their skills and to see their academic work in a serious, professional light.

Any undergraduate who does not already have a four-year degree is eligible to enter the program. Awards are $350 for first place in each category, and $250 for second place.

**Biological Sciences**

*Taylor Jordan*, First Place
Mentor: Carol Mushett
*The Opportunity for Effectiveness with the Integration of Suspension Training into Therapy for Chronic Lower Back Pain Treatment*

*Jeremy Frederick*, Second Place
Mentor: Catherine Linnen
*An Examination of Reproductive Isolation in Sympatric Populations of the Redheaded Pine Sawfly (Neodiprion lecontei)*

*Ava Vargason*, Honorable Mention
Mentor: Thomas Dziubla
*Endocytosis and Exocytosis of Poly(trolox ester) Nanoparticles in Endothelial Cells*

**Design**

*Erin Taylor*, First Place
Mentor: Lindsey Fay
*The Translation and Communication of Design Research*

*Caitlin Porter*, Second Place
Mentor: Patrick Lucas
*The Block*

**Fine Arts**

*Elmer Lopez*, First Place
Mentor: Bobby Scroggins
*Unidentifiable Man*
Oswald Winners 2015

Felipe Rodriguez, Second Place
Falling Violence

*Humanities: Creative*

Joshua Irvin, First Place
The Teenage Militia

Sam Stromberg, First Place
Mentor: Erik Reece
Dear Myself

Kelsey Potter, Second Place
Mentor: Frank Walker
I Am Their Vessel

*Humanities: Critical Research*

Rosie Picone, First Place
Mentor: Pearl James
Transmutation and the Philosopher's Stone: Alchemy's Presence in Blood Meridian

Madison Stewart, Second Place
Mentor: Matthew Giancarlo
Misrepresentation in Sir Gawain and the Green Knight

*Physical & Engineering Sciences*

Daniel Ma, First Place
Mentor: George Quintero
Combining Microelectrode Surface Area Produces Greater Sensitivity while Maintaining Comparable Interference and Limit of Detection in a Biosensor

Thomas Barron, Second Place
Mentor: Heide Gluesing-Luerssen
Every $n$-ary semigroup is binary-subderived

Deborah Ferguson, Honorable Mention
Mentor: Susan Gardner
Milky Way Tomography using K and M Dwarfs from the Sloan Digital Sky Survey

*Social Sciences*

Rebecca Faith VanMeter, Second Place
Mentor: Peggy Keller
Global coding for support and comfort in investigative interviews of alleged child abuse victims: Comparing the NICHD and MoGP Protocols
Posters-at-the-Capitol Presenters 2016

Cheyenne Davis and Davis Whaley  
Mentor: Robert Lorch  
Recognition of Dissonance in Simple Science Texts During Reading

James Donovan, Brenda Vanegas, Robert Neeley, and Benjamin Gadbois  
Mentors: Steven Arthur, Andrea Friedrich and Jacob Case  
I Didn’t Know This Was Cheating: Differences in Perceptions Between Students and Instructors About Academic Dishonesty

Sabita Dumre  
Mentor: Luke H. Bradley  
Screening of a Peptide Library for a Neuroprotective Binding Target

Anna Eastman  
Mentor: Deborah Reed  
Health Status of Kentucky’s Senior Farmers

Elaisy Gonzalez  
Mentors: Susan Barron  
A Novel Approach to Study Fetal Alcohol Syndrome; a 3-Trimester Model

Charles Conyers Harpole  
Mentor: Emily Beaulieu  
The Mountain Divide: Education Quality Discrepancies between Kentucky and Central Appalachia

Karl Hempel  
Mentors: Anne-Frances Miller and John Patrick Hoben  
Producing Reactive Intermediates via Photodriven Electron Transfer

Timothy Hoey  
Mentor: Pradeep Kachroo  
Role of Circadian Rhythm in Plant-Virus Interaction

Josephine M. Kim  
Mentor: Sylvie Garneau-Tsodikova  
Enzymatic Evidence for a Revised Congocidine Biosynthetic Pathway

Amir Kucharski  
Mentor: Peter Kekenes-Huskey  
Understanding Ion Binding Anity and Selectivity in Beta Parvalbumin Using Molecular Dynamics and Mean Sphere Approximation Theory

Hannah Maddox  
Mentor: Kevin J. Pearson  
Maternal Smoking and Offspring Risk for Developing Obesity

Courtney McKelphin  
Mentor: Mark Crocker  
Optimization of Microalgae Lipid Extracts for the Production of Fuels
Kristin Mulliniks
Mentors: Sundar Authimoolam, David Puleo, and Thomas Dziubla
*Cross-Linking of Polymeric Micelles in Bulk Solution for Regenerative Medicinal Applications*

Kaelyn M. Short, John Schaller, Hannah Oates, Kylie Krupilski, Sierra Hedrick
Mentor: Thomas E. Wallace
*Exploring Health and Health Care: Examining our Health Care Crisis and Potential Solutions for Kentucky and the Nation*

Ashley Stevens
Mentors: Arthur Hunt and Daniel Howe
*Alternative Polyadenylation in Sarcocystis neurona*

Erin Taylor
Mentor: Lindsey Fay
*The Translation and Communication of Design Research*

Clay Thornton, Abby Shelton, Scotty Reams, and Annah Baykal
Mentor: Buck Ryan
*On Jobs, Values, and Misguided Polls: An Analysis of Young Voters ‘Bowling Alone’ in Kentucky’s 2014 Midterm Elections*

Ava Vargason
Mentors: Thomas D. Dziubla, J. Zach Hilt, Kimberly W. Anderson and Carolyn Jordan
*Quantification of the Internalization of Poly(trolox ester) Nanoparticles*
Undergraduate Research Resource Fair

Education Abroad
Education Abroad is the University of Kentucky's comprehensive resource for study abroad, research abroad, intern abroad, and other educational experiences worldwide. Their goal is to provide academically sound international experiences that promote intercultural competence, disciplinary scholarship, and foreign language acquisition for all students.

Nationally Competitive Awards
Nationally competitive scholarships and fellowships are awards that are funded by sources independent of the University of Kentucky including non-profit groups, government agencies, and companies. Criteria for scholarships vary but generally include academic performance, financial need, community affiliations, and unique elements important to the sponsoring organization. The primary goal of this office is to recruit and prepare UK students with strong academic and extracurricular records to help them be successful in pursuing national competitive opportunities.

Presentation U!
Presentation U! is part of Transformative Learning, a unit in the Division of Undergraduate Education. They are a state-of-the-art multimodal communication center offering tutoring for students and support services for faculty to increase oral, written, and visual communication competence both inside and outside of the classroom, as part of UK's Quality Enhancement Plan.

SPUR
The Society for the Promotion of Undergraduate Research (SPUR) is a student organization whose mission is to introduce students to scholarly inquiry by engaging them in the research process and facilitating the discovery of new knowledge through mentorship and collaboration.

Student Sustainability Council
The Student Sustainability Council was formed to supervise the distribution of the Environmental Stewardship Fee in order to responsibly advance the theory, practice and reality of Sustainability at the University of Kentucky. Any member of the University of Kentucky community can submit a proposal for funding support.

UK Libraries – UKnowledge
We will have information about several UK Libraries (http://libraries.uky.edu/) services and resources, particularly those of interest to undergraduate scholars. Did you know you can post your scholarly work, sponsored by a UK faculty member, in UKnowledge? UKnowledge is a digital collection of unique scholarship created by University of Kentucky faculty, staff, students, departments, research centers, and administration. UKnowledge captures, stores, organizes, and provides open and stable worldwide access to UK's intellectual capital, and also facilitates reuse of deposited materials to the extent warranted by copyright law or by the licensing terms of the concerned materials. http://uknowledge.uky.edu/