The 6th Annual

ICRU
Iowa Center for Research
by Undergraduates

Fall
Undergraduate
Research
Festival

Wednesday, November 18, 2015
4:30pm-6:30pm

University of Iowa
University Capitol Centre
2nd floor South Atrium
Iowa City, Iowa

Program of Academic Abstracts
This event is hosted by the Iowa Center for Research by Undergraduates (ICRU), which promotes undergraduate involvement in research and creative projects at the University of Iowa, serving students, staff, and faculty.

The Fall Undergraduate Research Festival is proud to showcase poster presentations given by the University of Iowa’s student researchers. These students work in over 40 different departments and represent each of the freshman, sophomore, junior, and senior classes.

Students will stand by their posters for either the first or second hour and are free to visit fellow presenters’ posters during the other hour.

Odd numbered posters will present from 4:30-5:30PM
Even numbered posters will present from 5:30-6:30PM

*Please note that at 5:30, all of the boards will be turned around to show the even numbering and the second hour presenters’ posters*

We hope that you enjoy talking with these outstanding students and will see you again in April 2016 for the 12th Annual Spring Undergraduate Research Festival!

Many thanks to the over 100 graduate and professional students and post-doctoral fellows who have volunteered their time to serve as poster judges for this event. Their commitment to the undergraduate research community at the University of Iowa is largely what makes these festivals so successful.

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1 - Aparna Ajjarapu

**Major(s):** Biochemistry  
**Mentor(s):** Phoebe Qi (Dairy and Functional Foods Unit, Eastern Regional Research Center, United States Department of Agriculture, Wyndmoor, Pennsylvania)

**Physical and chemical changes in \( \beta \)-lactoglobulin and \( \alpha \)-lactalbumin caused by dry-heat induced interactions with sugar beet pectin**

- Protein-polysaccharide complexes have possible applications as fat replacers or texture modifiers in the food industry. They can also be used in stabilizing dairy beverages, in formulation of emulsion systems and in protein drug delivery. \( \beta \)-lactoglobulin (\( \beta \)-LG), \( \alpha \)-lactalbumin (\( \alpha \)-LA) (major dairy whey proteins) and sugar beet pectin (SBP) (a major heteropolysaccharide) are safe for human consumption and have high nutritional value. These qualities make \( \beta \)-LG with SBP and \( \alpha \)-LA with SBP interesting protein-polysaccharide complexes to study. The objective of this study is to investigate the physical and chemical changes of \( \alpha \)-LA and \( \beta \)-LG as a result of covalent complex formation with varying ratios of SBP. Water solubility and protein solubility assays were performed to assess physical properties of the protein-polysaccharide complexes. In order to study the chemical properties of the complexes, the pH was monitored, and DTNB (measuring total free \([SH] \)) and Ninhydrin (measuring soluble \([NH2 +NH] \)) assays were conducted. SDS-PAGE, with comassie blue for protein and carbohydrate staining, was used for compositional analysis of protein-polysaccharide complexes. Data was analyzed using student t test and ANOVA. Results from this study showed sugar beet pectin significantly influenced the physical and chemical properties of \( \alpha \)-LA and \( \beta \)-LG and improved protein functionality manifold.

3 - Preston Anderson

**Major(s):** Biochemistry & Human Physiology  
**Mentor(s):** John Engelhardt (Anatomy & Cell Biology) Kalpaj Parekh (Cardiothoracic Surgery)

**\( \alpha \)SMA Cells Regenerate Surface Airway Epithelium After Injury**

- Airway submucosal glands (SMGs) produce mucous and serous fluids that aid in airway clearance and innate immunity. SMGs also harbor epithelial stem/progenitor cells that regenerate the airway epithelium following injury. Myoepithelial cells are found in SMGs, and they are contractile cells that assist in secreting mucous and serous fluids from the SMG to the SAE, and are positive for alpha smooth muscle actin (\( \alpha \)SMA). Interestingly myoepithelial cells are also positive for CK14, which is a common phenotype of highly proliferative basal cells. In this experiment we sought to determine if glandular myoepithelial cells are stem/progenitor cells of the surface airway epithelium (SAE) following injury. Using a ROSA-flx-Tomato-STOP-flx-eGFP
transgene and an aSMA tamoxifen inducible promoter driven CreERT2 driver, we found that aSMA positive cells (potentially myoepithelial cells) contribute to repair of the SAE after injury. The study helps our understanding of myoepithelial cells and their possible use in stem cell therapies to repair SMG defects in lung diseases such as cystic fibrosis and asthma.

5 - Dorothy Armstrong

**Major(s):** Dance (BFA), English (BA)
**Mentor(s):** Rebekah Kowal (Dance)

**The Female Body in Motion: Embodied Experiences in Media and Mediation**

- In my research, I am investigating the work of avant-garde filmmaker Maya Deren. My interest lies in contextualizing Deren’s dance films through historical and feminist lenses while unpacking the aesthetics and messages of her films as related to propaganda and advertisements of the 1940’s. Using a close reading of Deren’s dance film Meshes of the Afternoon paired with the theories of embodied politics as articulated in Melissa McEuen’s book Making War, Making Women, I plan to examine the modernist aesthetics present in both propaganda and avant-garde film and the themes of fragmentation and subsequent (indirect) sexualizing of the body while interrogating their role in crafting images of femininity during the era. By setting my analysis of Deren’s Meshes in dialogue with McEuen’s theories, I will not only address how the female (dancing) body fits into the wartime rhetoric of codified, utilitarian beauty, but also connect these findings to current conversations regarding media and mediation. In addition, I will complement my research with inquiries into my personal embodied experiences as a female dancer: the final paper will afford a comprehensive dialogue between history, theory, and autoethnography.

7 - Eno-Abasi Augustine-Akpan

**Major(s):** Biomedical Engineering
**Mentor(s):** Azeez Butali (College of Dentistry)

**The prevalence of GRHL3 in nonsyndromic cleft and palate African populations**

- Mutations in GRHL3 have been identified as a gene responsible for syndromic clefts of the lip, and palate (SCLP). Non Sydromic Cleft Lip and Palate are common birth defects that affect 1/700 live births world wide. Our lab is currently conducted sequencing experiments to screen for mutations in the GRHL3 gene in the African population with nonsyndromic cleft palate only. To test this hypothesis, saliva and saliva sponges were collected from Ethiopian, Ghanaian, and Nigerian populations with confirmed syndromic cleft of lip. These samples underwent DNA processing. For sequencing, primers for GRHL3 were designed for 17 coding regions and were optimized polymerase chain reaction (PCR). Currently, PCR results are currently undergoing sequencing in Wisconsin using an ABI 3730XL. In the future, chromatograms will be base-called using PHREDPHRAP, assembled with PHRAP, scanned by POLYPHRED and viewed with CONSED program. Variants found will then be evaluated for functional effects.
9 - Jill Aunan

Major(s): Communication Sciences and Disorders
Mentor(s): Elizabeth Walker (Communication Sciences and Disorders)

Reliability of Acoustic Measures within Classrooms and Frequency of Hearing Aid Use for Children Who Are Hard of Hearing

- Hearing aids and FM systems are vital components to ameliorating the risks associated with poor language and academic outcomes for children who are hard of hearing (HH). Furthermore, children who are HH receive the most benefit from hearing aids when classroom acoustics are optimized. To ensure classrooms meet ANSI acoustic standards, educational audiologists can use the iPod application AudioTools to document noise levels and reverberation times. This study has three goals: 1) verify the reliability of reverberation time and noise levels measurements using AudioTools, 2) examine the frequency of amplification system use for children who are HH, and 3) determine how often amplification systems were functioning appropriately. Our findings indicated that the AudioTools reverberation time measure was reliable, whereas repeated measures of overall noise level in unoccupied classrooms were less consistent. Results also suggested that the majority of children who used amplification (hearing aids and FM) had equipment that was functioning appropriately. While over 90% of the children were wearing hearing aids, approximately 20% of the children who had access to FM technology were not using their FM systems. Therefore, AudioTools is effective in measuring classroom acoustics, but audiologists are advised to collect multiple measurements in classrooms.

11 - Christina Behrens

Major(s): Psychology
Mentor(s): Lori Ihrig (Belin-Blank Center)

Psychosocial factors present in talented and gifted middle school students in rural Iowa

- STEM Excellence and Leadership is an after school enrichment program to challenge high-ability rural students and prepare them for advanced coursework in math and science. The program began in the fall of 2015 in eleven rural Iowa middle schools. A talent pool of high-ability 5th grade students was identified at each school district. Students in the 5th grade talent pool were assessed—using an 8th grade-level test, the ACT Explore—to measure their English, Math, Reading, and Science aptitude. The preliminary results show that 5th grade students selected for the program, on average, place in the 48th and 59th percentiles in eighth grade level Math and Science. In addition, students took the ACT Engage test, which measures several psychosocial factors including Motivation, Social Engagement, and Self-Regulation. The preliminary Engage results show that the students in the program rank their perception of School Safety Climate in the 75th percentile. In addition, they have a strong sense of Academic Discipline, averaging in the 76th percentile. On the other hand, these high-ability students only average in the 56th percentile for Optimism.
AKT Inhibition Modulates Glycolysis through Post-Translational Modifications of Pyruvate Kinase M2

- The PI3K/AKT/mTOR signaling pathway, which regulates cell growth and survival metabolism, is frequently mutated in cancer. This pathway has been a target for chemotherapeutic intervention. For example, MK2206 is a non-ATP competitive AKT inhibitor that is currently in clinical trials. While AKT has previously been shown to regulate glycolysis, the effects of chemotherapeutic inhibition of AKT on cellular nutrient consumption are unknown. In this experiment, we sought to elucidate the mechanism by which MK2206 alters metabolism. We observed that AKT inhibition alters the phosphorylation status of pyruvate kinase M2 (PKM2) at Tyr105. Specifically, phosphorylated PKM2 decreases after an hour of treatment, is absent after 4 hours, and rebounds by sixteen hours in MCF7 breast cancer cells. Metabolite levels in culture media and intracellular extracts measured by NMR reveal changes that are consistent with PKM2 phosphorylation status. These findings suggest a novel regulatory mechanism of the PI3K/AKT/mTOR pathway on glycolysis through an AKT-regulated tyrosine phosphatase.

Loss of Mitochondrial Pyruvate Carrier 1 leads to Hypertrophic Cardiomyopathy via Hypoxia Inducible Factor

- Pyruvate is the central metabolite produced during glycolysis and is transported into mitochondria to enter the tricarboxylic acid cycle. The mitochondrial pyruvate complex (MPC) is the main transporter of pyruvate into mitochondria. Cardiomyocyte specific MPC1 knockout (CMPC1 KO) mice were generated by breeding MPC1 Floxed mice with αMHC-Cre transgenic mice. Phenotypic data revealed cardiac hypertrophy by 8 weeks of age. Seahorse analysis of isolated mitochondria in pyruvate/malate revealed decreased oxygen consumption rates in KO mice, indicating decreased pyruvate mediated mitochondrial respiration. No difference was observed in the presence of glutamate/malate, indicating normal non-pyruvate mediated function. Metabolomics analysis revealed increases in concentrations of pyruvate, alanine, and lactate, increased glycogen storage and decreases in malate and glutamate. This suggested activation of a compensatory pathway for energy production in mitochondria of KO mouse hearts. Concentration of 2-hydroxyglutarate (2-HG), which has been proven to inhibit degradation of hypoxia inducible factor (HIF), was also increased. Quantitative PCR analysis revealed increased mRNA levels of genes regulated by HIF. These data reveal that loss of MPC1 in cardiomyocyte leads to cardiac hypertrophy and induces compensatory mechanisms for ATP production. The increase in 2-HG and gene transcripts regulated by of HIF suggests HIF plays a central role in the cardiac remodeling of CMPC1 KO mice.
17 - Alyssa Cokinis

Major(s): English/Creative Writing Track and Theatre Arts
Mentor(s): Lisa Daily (International Writing Program (Graduate College))

Between the Lines of Cultural Diplomacy

- Writing is a means to promote cultural diplomacy amongst otherwise conflicting countries and ways of living. This presents itself in the International Writing Program’s two-week creative writing and cultural exchange program, “Between the Lines: Peace and the Writing Experience,” for teenagers aged 16-19 from Russia, Arabic-speaking countries, the United States and a special session in 2015 for Armenia and Turkey. Summer Preparations range from the administrative duties of securing international flights to the more academic: working with translators on BTL curriculum—always appearing in the native languages of its participants—and preparing a special Peace and Playwriting workshop for both sessions. / Once students arrived, they were immersed in Global Literature classes, afternoon writing seminars in their native languages, and evening activities to connect them and their love for writing further. Activities included translation workshops, a two-day Peace and Theatre Workshop with distinguished playwright Catherine Filloux for BTL Turkey/Armenia, day trips to the Maquoketa Caves and Davenport, as well as students’ own informal times to speak and spend time with each other. This program utilizes the art of writing and the way people connect through that in order to unite students, demonstrating the importance of cultural diplomacy in the millennial age. /

19 - Erica Cole

Major(s): Chemistry
Mentor(s): Justin Grobe (Pharmacology)

Angiotensin AT1A receptors are not expressed on microglia in the brain

- The renin-angiotensin system (RAS) has been implicated in control of resting metabolic rate and blood pressure through its action at the angiotensin AT1A receptor and thus may contribute to obesity-hypertension. Further, it has been shown that microglial activation is necessary for angiotensin-dependent hypertension and that there is increased microglia in the brain following high fat diet treatment. Taken together, we hypothesize that microglia express the AT1A receptor and that these cells contribute to obesity-hypertension. Brains from “NZ44” mice, which express green fluorescent protein (GFP) via the AT1A promoter, were sectioned and stained with IBA1 conjugated to red fluorescent protein (RFP) to costain for microglia. The presence of dual-fluorescent cells in the brain was examined to determine if microglia express AT1A. When mice were maintained on standard chow diet, we observed a substantial number of singly-fluorescent cells in the ventromedial hypothalamus (VMH), arcuate nucleus (ARC), median eminence (ME), paraventricular nucleus (PVN), dorsomedial hypothalamus (DMH), and subfornical organ (SFO). However, we did not observe any dual-fluorescent cells in these brain regions. After 8 weeks of high fat diet treatment, there was an increase in the number and activation of microglia in the ARC, however no dual-fluorescent cells were present. Taken together, these data support the conclusion that microglia do not express the AT1A receptor.
21 - Grace Coleman and George Daniel

Major(s): International Studies and Music / Biomedical Engineering
Mentor(s): Trevor Harvey (Music)

Society for Ethnomusicology Podcast

- The research we do explores the use of media technologies, specifically podcasts, to broaden public engagement with scholarly ethnomusicological research and the wide global impact of musical traditions. The podcast seeks to convey ethnomusicological concepts and research to a broader audience in an engaging and accessible way using stories and interviews surrounding a variety of ethnomusicological issues. We do this by creating short 15-20 minute podcast episodes featuring research, interviews, and narration. The episodes we have produced thus far study ethnomusicological issues from around the globe in a wide variety of social settings. Many aspect of culture and society are impacted by musical traditions and practices, and how these traditions are expressed differs widely across the globe. The podcast we create explores the impact of music and musical traditions on issues of racism, sexism, gender issues, economic influences, government policies, copyright laws, and many others. Through the production of a public podcast for the Society for Ethnomusicology that is online and freely accessible to anyone, we hope to convey the effects of ethnomusicological research studies more broadly in a global arena, and how this research is understood within a cultural context.

23 - Daniel Coulthard and Brandon Caswell

Major(s): Geoscience, Environmental Science / Geoscience
Mentor(s): David Peate (Earth and Environmental Science)

Geochemical and Petrographical Analyses of Off-Axis Volcanism on Snæfellsnes, Iceland

- Icelandic volcanism is dominated by lavas erupted from the decompression of the mantle underneath the mid-Atlantic rift. These magmas are well understood and the melt generation mechanisms are well defined. On the western portion of the island, however, there exist lavas that have erupted far from the rift. The source of these off-axis basalts has not been well defined nor have they been thoroughly studied, geochemically or petrographically. Compositional analysis of whole rock provides data that is used to describe the source rock that melted to generate the magma. Further analysis of the mineral compositions and sizes allow us to determine the number of phase populations, whether or not the magmas mixed before they were erupted and where the melts began crystallizing in the mantle. It is important to study this form of volcanism because off-axis melting is not well understood, and these systems can generate substantial flows that contribute significantly to the Icelandic volcanism.

25 - Chloe Daniel

Major(s): Anthropology, Psychological and Brain Sciences
Mentor(s): Russell Ciochon (Anthropology)

Ancestral Origins of Homo floresiensis
- The ancestral origins of the anomalous Homo floresiensis, discovered in 2004, have been debated over the past 11 years. The small size, both cranially and post cranially along with primitive features in the distal limbs suggests a relationship to late Australopithecines; however, no fossil evidence has been found outside of Africa. Dental patterns of H. floresiensis follow those of Homo sapiens, and dental traits similar to modern pygmies and aspects of the cranial morphology lead others to advocate that the specimens found are microcephalic H. sapiens. However, the early Homo features, a lack of a mental eminence on both mandibles found and the phenomena of insular dwarfism suggest the ancestral origin of H. floresiensis is Homo erectus. Whether the individuals found in Liang Bua, Flores descended from more primitive species or is the result of microcephaly there is still a significant amount of research to be done.

27 - Frank De Stefano

**Major(s):** Biochemistry B.A.

**Mentor(s):** Jessica Sieren (Radiology/Biomedical Engineering) Eric Hoffman (Radiology/Biomedical Engineering)

**Lung Airway and Vessel Measurement Analysis between Five Computed Tomography Protocols**

- Chest computed tomography (CT) is a powerful diagnostic imaging tool for lung disease detection and monitoring. However, cumulative ionizing radiation absorbance involved with CT imaging may be harmful to humans and should be minimized. A balance is required between radiation dose and image quality such that the dose is minimized without compromising the ability to detect and monitor lung disease. In this study, chest CT scans were acquired using the Siemens SOMATOM Force scanner on a single swine model, using five different protocols of varying radiation doses (0.33 mGy – 7.02 mGy) and reconstruction algorithms (with and without iterative reconstruction). Analysis of these scans using semi-automated lung analysis software programs (Vida and PASS) provided measurements of two specific airways and corresponding vessels in the accessory lobe of the lungs. Using these measurements, we can identify the optimal low radiation dose CT protocol which retains accurate airway measurements which compared to a high dose CT dataset (ground truth).

29 - Benjamin Donovan

**Major(s):** Physics & Astronomy

**Mentor(s):** Randall McEntaffer (Physics & Astronomy)

**Alignment of Off-Plane Reflection Gratings for Future X-ray Spectrometer Missions**

- X-ray grating spectrometers have been used onboard the Chandra X-ray Observatory and XMM-Newton for over a decade, providing astronomers with the tools necessary to study highly-energetic astrophysical processes throughout the Universe. While the current spectrometers have allowed scientists to learn much about these astrophysical processes, improvements can be made in both resolving power and effective area, setting the stage for a new generation of X-ray grating spectrometers. Off-plane reflection gratings can be used to provide high throughput and spectral resolution in the 0.3 - 1.5 keV band, making it an ideal technology for future X-ray spectrometers. A grating spectrometer consists of a Wolter-I telescope, which focuses the X-ray
radiation, with gratings modules inserted in the converging beam of the telescope to disperse the X-rays onto several detectors. Each grating will be aligned such that the diffracted spectra overlap at the telescope’s focal plane. Misalignments will degrade both the spectral resolution and effective area of the telescope. Analytical alignment tolerances have been calculated, so laboratory techniques to achieve these tolerances must be developed. We present the laboratory alignment results obtained thus far from our alignment fixtures and future plans for alignment.

31 - Nicholas Eginoire

Major(s): Biology
Mentor(s): Anna Malkova (Biology)

Break Induced Replication in G1 of the cell cycle

- Break induced replication (BIR) is a DNA repair pathway that repairs double stranded DNA breaks (DSB) which are extremely dangerous to the cell. BIR is a mutagenic repair pathway that leads to high mutation rates. These higher mutation rates are believed to be linked to different genetic diseases and cancer. BIR has been extensively studied in G2 of the cell cycle. But I’m studying it in G1 phase. The reason why I’m interested in studying BIR in G1 is because this is where most non dividing human cells spend their time. We postulate that if BIR is occurring in G1 it may operate differently and not be as detrimental to the cell. To do this we mutated a gene which holds the cell in G1 with the use of an inhibitor. From this we have gained preliminary data that we can hold the cell in G1 and induce a DSB. We are currently running Pulsed Field Gel Electrophoresis to determine the repair that is happening. From this we will obtain a better understanding if BIR does operate differently by comparing to studies done in G2

33 - Grace Ehlinger

Major(s): Environmental Policy and Planning
Mentor(s): Heather Sander (Geographical and Sustainability Sciences)

An assessment of the relationships between urban forests, biodiversity, and ecosystem delivery

- Urban forests and the trees that compose them execute many ecological functions thereby providing key ecosystem services and have been suggested to foster species conservation in urban areas. However, current understanding of these services and the ecological processes whereby trees provide them is lacking as is our understanding of how these services vary spatially across and among cities. This creates a critical knowledge gap that limits urban forest management aimed at achieving environmental objectives. This gap is particularly acute in cities embedded in agricultural landscape contexts, where research is nearly non-existent. This study seeks to fill this gap by quantifying relationships among urban forest structure, urban biodiversity, and the delivery of ecosystem services in cities in the American Corn Belt. To this end we are using standard survey techniques to measure urban forest structure and bird biodiversity on a series of survey plots located on sites arrayed along an urban-to-rural gradient in three Iowa cities. This study will increase our understanding of how urban forests influence
biodiversity and ecosystem services, facilitating management to both support species conservation and urban ecosystem functioning. This poster presentation will detail the methods, current state, and future directions of this ongoing project.

35 - Mengzhu Fu

Major(s): Psychology, Music
Mentor(s): Paul Windschitl (Department of Psychological and Brain Sciences)

Cross-Cultural Study of The Wishful Thinking Effect

- Purpose: Our study compares the magnitude of the desirability bias (also known as wishful thinking) between college students from American culture and Asian culture. Background: Previous studies have shown that the desirability of an uncertain event influences people's expectations about whether the event will occur. However, it is not clear whether this affect varies across cultures. Method: This study is computer based. An updated version of marked-card paradigm is used, which involves predictions about cards being drawn from decks. We expect to recruit at least 50 Asian students and 50 American students of the University of Iowa. The paradigm allows for a comparison of the Asian and American students on the sensitivity of their event predictions (what card is drawn from a deck) to differences in objective evidence (the contents of card decks) and to the manipulated desirability of events.

37 - Callie Ginapp

Major(s): Biology-Neurobiology track
Mentor(s): Gordon Buchanan (Neurology)

5-HT2A Receptors in Dorsal Raphe Nucleus are Responsible for CO2 Induced Arousal

- Arousal from sleep in response to increased carbon dioxide (CO2) is a vital protective mechanism against diseases such as obstructive sleep apnea, sudden infant death syndrome, and probably sudden unexpected death in epilepsy. Previous work from our lab indicates that chemosensitive serotonin (5-HT) neurons in the midbrain dorsal raphe nucleus (DRN) are responsible for arousal for both inspired CO2 and direct stimulation with acidosis. CO2-induced arousal occurs through a 5-HT2A receptor mechanism. The purpose of the current study was to locate the site of 5-HT2A receptor activation that leads to arousal in response to acidosis. Our hypothesis is that 5-HT2A receptor activation occurs at a downstream target site, such as frontal cortex. Adult male wildtype mice were implanted with EEG/EMG electrodes and microdialysis cannulae into the DRN. Systemic injection of the 5-HT2A receptor antagonist, MDL 11,939, during sleep prevented arousal from acidosis (artificial cerebrospinal fluid bubbled with 25% CO2) directly into the DNR. Application of the 5-HT2A receptor agonist, DOI, alone to the DRN induced arousal from sleep. These data suggest CO2-induced arousal occurs through activation of 5-HT2A receptors within the DRN.
39 - Emma Greimann

Major(s): Biology
Mentor(s): Laura Frey Law (Physical Therapy & Rehab Science)

The Association Between Physical Activity and Centrally-Mediated Pain Perception

- Central pain modulation reflects the net effect of central endogenous inhibition and excitability excitation. To further investigate these pain pathways, 70 healthy adults were recruited. Activity levels were self-reported and measured by an Actigraph accelerometer. Central inhibition is commonly evaluated through conditioned pain modulation (CPM). CPM is assessed with a painful stimulus, followed by another different pain stimulus. Participants completed two pressure tests followed by an ice water cold pressor test. Pressure tests were repeated immediately after. A decrease in pain from the initial stimulus after the second stimulus represents a net endogenous inhibition (CPM) response; pain inhibits pain. Central excitability was measured using a temporal summation (TS) paradigm and was tested with a pressure device. Temporal summation occurs when a repetitive noxious stimulus of constant intensity produces an increased pain. Lastly, a fitness test was performed to assess cardiovascular health. Thus far, we have concluded that cardiovascular fitness groups differ in time spent in vigorous activity, but there is little difference between total minutes active a day. Time spent in vigorous activity also highly correlates with differences in pain sensitivity. Further research is needed to establish the accuracy of Actigraph Accelerometer data to aid in analysis of collected data.

41 - Karen Grigsby

Major(s): History and Anthropology
Mentor(s): Mariola Espinosa (History) Jeffrey Cox (History)

Le Petite Mort- Changing Perceptions of Hysteria in film in the 1940’s and 50’s, during the decline of clinical hysteria

- I am researching female hysteria in the United States during the decline of its diagnoses by doctors, namely the 1940's-1950's. The first half of my research analyzes popular films from the time period that represent hysterical women. I am primarily looking at how this representation is changing over time both in how the women are acting and how they are treated socially and medically in the films. The second half of my research goes on to examine the larger picture of what is causing this change. My research thus far, has led me to believe that the major causes of change include women’s changing status in society due to WWII and the rapidly changing medical field, especially in terms of mental health and ideology.

43 - Bailey Hadnott

Major(s): Environmental Engineering
Mentor(s): Keri Hornbuckle (Civil/Environmental Engineering) Andres Martinez (Civil/Environmental engineering)
Study of Airborne PCBs in and Around New Bedford Harbor Area: A collaboration of the University of Iowa and Boston University Superfund Research Programs

- New Bedford Harbor is an 18,000-acre urban estuary with sediment highly contaminated with polychlorinated biphenyls (PCBs) and heavy metals. Due to this high level of contamination, the harbor in Massachusetts was placed on the EPA’s list of Superfund cleanup sites and is considered to be one of the nation’s largest PCB contaminated sites. Immediately adjacent to the Site is the city of New Bedford. Concerns have been raised about the Site itself as well as its clean-up, which includes dredging and disposal of the contaminated sediment in an on-site confined aquatic disposal (CAD) cell near a residential area. Dredging and disposal have already begun with Phase I and II of the EPA’s Lower Harbor Confined Aquatic Disposal Cell (LHCC) occurring from November 2013 and scheduled for completion in mid-December, 2015. In total, sediment from the Harbor will be dredged for several years and placed in the LHCC. The project will monitor the air in homes on both sides of the Harbor, with the use of Passive Air Samplers (PAS) that are deployed for three rounds of sampling for six weeks each, in the field and collect air onto polyurethane foam (PUF) disks for processing. EPA Region I has been monitoring air in this area during dredging since the 1990s and has found no significant air concentrations of PCBs. This project is a collaborative effort and together, we are engaging multiple stakeholders, in discussions to elucidate research questions and finalize sampling locations, measure out

45 - Xiaotian He

Major(s): Psychology
Mentor(s): Daryl Cameron (Psychological and Brain Sciences)

Examining the effect of sad images on empathy

- Previous studies have shown that a motivational process may lead people to actively avoid feeling empathy to avoid the consequences that feeling empathy may bring them. The purpose of the current study is to understand situational and personality-based influences on empathy. We ask the participants to complete measures of attitudes toward animals, and watch either a 10-second or 2-minute ASPCA video about animal suffering. We are interested in examining whether having favorable attitudes toward animals makes the participants more or less likely to avoid viewing suffering about animals. Also, the time people spend on the emotional video is a mediator in the study. We predict that as the time of people spend on the video increases, the degree of empathy they feel for them ironically tends to decrease. People who are high in empathy, and watch the 2-minute video, will donate less money to saving the animals, as compared to those who watch only 10-seconds.

47 - Megan Helms

Major(s): Biomedical Engineering/pre-med
Mentor(s): Arlene Drack (Ophthalmology)

The role of monocytes in mouse models of retinal degeneration
Humans with specific retinal degenerative diseases, including Bardet Biedl syndrome (BBS) and retinitis pigmentosa, have a visible cellular infiltrate in the vitreous of the eye. Rare patient vitreous samples reveal that some cells are monocytes. Due to high morbidity when obtaining human samples, we bred a mouse model of Bbs1M390R/M390R crossed with a cx3cr1-GFP mouse expressing GFP in monocytes and microglia. We obtained mice either heterozygous (unaffected) or homozygous (affected) for retinal degeneration and heterozygous for GFP expression. We performed micron retinal photography, optical coherence tomography, and electroretinograms (ERG) in vivo before performing whole mount retinal histology. These images and mounts demonstrated monocytes expressing GFP in both Bbs1M390R/M390R cx3cr1GFP/+ and Bbs1M390R/+ cx3cr1GFP/+ . After developing standards for quantifying intensity of GFP in vivo and numbers of monocytes in vitro, intensity for affected mice was 63 units compared to 46 for unaffected (p=5E-6). This suggests that mice with retinal degeneration due to Bbs1M390R/M390R have more monocytes than unaffected mice. By utilizing crosses with cx3cr1-GFP mice, we can study monocytes in mouse models of human retinal degeneration diseases. In future studies, we will treat with anakinra (Kineret) to determine whether immune suppression changes the appearance of monocytes, or the course of the disease.

49 - Jonah Heskje

Major(s): Biology - Neurobiology Track
Mentor(s): Daniel Tranel (Neurology)

Evaluating a Novel Intervention for Primary Caregivers of Persons with Dementia

As the US population ages, Alzheimer’s disease and other forms of dementia have become more prevalent and place a greater strain on the family members who often care for affected individuals. While these primary family caregivers provide an essential service, the negative psychological effects of their roles are numerous and range from general caregiver burden to stress, anxiety, and depression. It has also been found that caregiver burden is strongly associated with the degree of behavioral dysfunction expressed by the persons they care for (Coen et al., 1997). The present study evaluates the effectiveness of a novel two-day intervention that trains primary family caregivers to manage the behavior dysfunctions of dementia by using perspective-taking and improvisational techniques. Notably, many interventions for caregivers require weeks of participation (van der Lee et al., 2014), which is not always possible in this highly burdened population. Thus, the present investigation addresses the demand for a short and targeted training for caregivers with the potential for sustained effects.

51 - Dean Hester

Major(s): Earth and Environmental Sciences
Mentor(s): Jonathan Adrain (Earth and Environmental Sciences)

SYSTEMATICS, AFFINITY, AND BIOSTRATIGRAPHIC UTILITY OF THE EARLY ORDOVICIAN TRILOBITE AMBLYCRANIUM ROSS, FROM THE GREAT BASIN, WESTERN USA

Amblycranium has been known from two species described in 1951. Recent fieldwork in the Fillmore Formation, and Garden City Formation, has yielded abundant material of both species,
along with samples representing five newly discovered species. The genus is now known to occur through most of the Stairsian Stage (upper Tremadocian) of northern Laurentia. Most previous authors have assigned Amblycranium to the Family Hystricuridae, but prior to the current study nothing but cranidial material has been available. New collections reveal that most species had thoraces and pygidia with prominent triangular pleural spines on each segment. Phylogenetically basal species lack these features, but have small pygidia morphologically similar to contemporaneous members of the Family Dimeropygidae, including species of Heckethornia and Bearriverops. Hence we reinterpret the genus as a dimeropygid, and hypothesize that the spinose morphology of more derived species arose via paedomorphosis, as it resembles earlier stages in the ontogenies of dimeropygids. New collections reveal that unique species of Amblycranium occur in all but one of the recently established Stairsian trilobite zones, and that no species ranges between any zones. Combined with easily identifiable morphology, this pattern of species occurrence indicates considerable utility in the correlation of northern Laurentian Stairsian successions.

53 - Boi Lam Hong

Major(s): Electrical Engineering
Mentor(s): Anton Kruger (Electrical Engineering)

LED Printed Circuit Board Design to Further Ophthalmology Research

- In order to aid ophthalmology equipment research and development, capturing data of the eyes is essential since it will lead to better innovative technology. The approach is to design a printed circuit board (PCB) with a combination of visible and infrared LEDs, which will be mounted around a camera lens. This camera has sensors to capture data on how the eyes react to the LEDs. The design of the PCB has its own constraints. Primarily, the PCB has to be approximately two inches in diameter and contain several circuit components to light up the LEDs. Secondly, the components are required to have proper dimensions and characteristics in order to optimize the PCB function. To begin, a schematic of the PCB needs to be generated and converted into a Gerber file via the EAGLE CAD software. After making the board with a LPKF machine, the final procedure is the addition of the components. The results will be the finished PCB ready for camera mounting. While this project is still underway, I hope the prototype will have a positive impact on the gathering data for further research.

55 - Blake Johnson

Major(s): Human Physiology
Mentor(s): Janice Staber (Pediatrics)

Expression of von Willebrand factor via piggyBac-mediated gene transfer in mouse models of von Willebrand Disease and hemophilia A

- Von Willebrand disease (vWD), caused by a deficiency in von Willebrand factor (vWF), results in abnormal coagulation. vWF mediates the adhesion of platelets at sites of vascular injury and protects circulating factor VIII (FVIII) from proteolytic degradation. Hemophilia A results from a deficiency in FVIII and currently requires recombinant protein replacement therapy. These data
examine the utility of the piggyBac (PB) transposon system in correcting vWF levels in vWF null animals. Evaluation of vWF antigen in vWF null mice, post-delivery of PB carrying codon-optimized (co) vWF cDNA by hydrodynamic tail vein injection, revealed long-term expression of vWF. Secondarily, we explore co-delivery of vWF and FVIII cDNA to protect FVIII knockout mice from development of anti-FVIII inhibitory antibodies, a major complication of hemophilia A treatment. We constructed PB carrying both coFVIII and covWF cDNA. We continue to monitor development of inhibitory antibodies in hemophilia A mice receiving the PB-coFVIII/covWF construct. To date, we conclude that PB mediates long-term expression of vWF in vivo. Further studies are warranted to evaluate functional correction of bleeding phenotype in the vWF null mice and to determine long-term benefits in a hemophilia A mouse model.

57 - Rylee Kerper

Major(s): Anthropology
Mentor(s): Kristina Venske (College of Public Health)

The Relationship of Depressive Symptoms and Secondhand Smoke Exposure in a Sample of Romanian Adolescents

- The presence of depressive symptoms in adolescents has been found to be linked with exposure to secondhand smoke (SHS). The aim of this study is to assess the relationship of depressive symptoms in Romanian adolescents with their exposure to SHS. This analysis uses data from the SMART study, conducted in Romania throughout 2013-2014 on 307 adolescents. Descriptive statistics, X² tests of independence, principle component analyses (PCA), and univariate regression models were used on the data. Variables tested included presence of depressive symptoms, socio-demographics, and exposure to SHS. Of those surveyed, 24.9% reported to having felt sad and hopeless in the past 12 months. Using a scale developed through PCA (KMO = .779 p = .000 Cronbach’s α = .705), we found that 20.1% were exposed to SHS at least 30 minutes a day. Concerning depressive symptoms, a statistically significant difference was found between those who had high SHS exposure than others (X² = 35.1 p = .038). Univariate regression models showed depressive symptoms to be more likely in those who have been exposed to SHS (OR = 1.089 CI95%=1.029-1.151 p = .003). This evidence suggests a positive relationship between depressive symptoms and adolescents’ SHS exposure. Public health professionals should create intervention programs that promote cessation and prevent smoking uptake.

59 - Anya Kim

Major(s): Neurobiology, Spanish
Mentor(s): Michael Dailey (Biology/ Neuroscience)

The Effects of Adenosine on Microglial Cell Death in Simulated Ischemia (Oxygen Glucose Deprivation)

- In 2013, stroke was ranked as the fifth highest cause of death in the United States, accounting for approximately 130,000 mortalities. Although there has been a large amount of research done into potential neuroprotective agents for ischemic stroke, a very small percentage of them have translated into promising clinical therapies. However, microglia, the resident immune cells of the
brain, are promising targets for neuroprotective treatments. Although there is some debate over the role of microglia during ischemia, evidence has shown that a lack of healthy microglia following stroke can lead to more serious complications after ischemia in murine models. However, other studies have also found that stroke conditions can increase the rate of microglial cell death. Recently, our lab discovered an ATP receptor (P2X7), that has a significant effect on microglial cell death during ischemia. Due to these findings, I am currently testing the effects of adenosine, a metabolite of ATP, on microglial cell death in stroke-like conditions, using cultured BV2 microglia in simulated ischemic conditions (oxygen-glucose deprivation). Preliminary data has shown that adenosine does attenuate OGD-induced microglial cell death in BV2 cell culture, indicating one potential agent to help reduce microglial cell death before and after stroke.

61 - Ryan Kunkle

Major(s): History
Mentor(s): Rosemary Moore (History/Classics)

Hanc [Animam] Tu Exerce Optimis In Rebus: Cicero’s Use of a Platonic Rhetorical Framework to Provide a Spiritual Justification of His Political Philosophy

- This project examines Cicero’s philosophical influences from Plato, particularly the relationship between his political philosophy and his spiritual views on the afterlife. In an earlier paper, I argued that Plato’s eschatological myths in the Gorgias, Phaedo, Phaedrus, and Republic correlated with and ultimately justified his political teachings on the best and worst types of souls—with philosophers like himself on top of the moral hierarchy. Cicero adapts this rhetorical strategy of Plato’s for his own authorial purposes in De Re Publica and De Senectute, where he lauds the Roman rector rei publicae—the ideal statesman—as the wisest, most virtuous type of citizen, as well as the most divinely favored type of soul in the afterlife. By projecting his own political views, which exhort not only philosophical education but lifelong political engagement, onto a posthumous system of reward for those who devote themselves to their country and the res publica, Cicero stresses that it is wise yet practical-minded Roman statesmen like himself, not mere philosophers, who earn the greatest promise of bliss in the afterlife. In doing so, Cicero acknowledges his direct Platonic influences while establishing himself as a superior philosopher to his Greek predecessor.

63 - Yiman Lyu

Major(s): Mechanical Engineering
Mentor(s): Aju Jugessur (University of Iowa Micro Fabrication)

E-beam mode creating and ALD size shrinking efficiency

- For make the mode, use around 100nm PMMA as the chemical material coated on the silicon chips, and get 100nm wide and 200nm period structure after exposing by E-beam. Since the selectivity between PMMA and silicon is too small, coat about 22nm Cr on the top of the structures to improve it. So that the silicon can be etched to get the mode. In etching, use dry etch instead wet etching to get better structures on the mode because of the small size. Etch the silicon until around 100nm deep, remove the Cr, and then coat another aluminum oxide layer on
the structure by ALD to shrink 10% to 50% size of structure. Do imprinting to check the efficiency after size shrinking.

65 - Sophia Mallaro

Major(s): Computer Engineering  
Mentor(s): H.S. Udaykumar (College of Engineering Department of Mechanical and Industrial Engineering)

Protecting People and the Planet By Reducing Wood Consumption for Cooking

- Three billion people on earth cook over open fires, an act which has negative consequences on both the people cooking and the environment. While cooking over an open fire, women inhale large amounts of toxins. Often the children are present during this process, leaving them vulnerable for the lung and eye problems caused by the smoke. This research is aimed at testing alternatives to the traditional stove, known as the three stone hearth. These alternatives aim to reduce the amount of wood and time used to cook, the concentration of carbon monoxide in the smoke and the amount of smoke produced. The carbon calculations were done in our lab research. This specific study focuses on field work done in Tema, Ghana, funded by the UI-Stanley Foundation. The results showed a 34% reduction in wood used per meal. Additionally, the stove cut cooking time by 17%. The women of Ghana reacted very positively to this change. All but one user cited a very significant drop in smoke. On average, the women valued the implant at $2.32.

67 - Alexis Miller

Major(s): Biomedical Engineering  
Mentor(s): Fayyaz Sutterwala (Internal Medicine)

Probing caspase-1 with cardiolipin

- The inflammatory caspases -4, -5 and -11 are activated by cytosolic LPS through a direct interaction between Lipid A and the caspase activation and recruitment domain (CARD). However, caspase-1 does not display such interactions with Lipid A. Caspase-1 activation depends on the formation of an inflammasome – a supramolecular complex consisting of NLRP1, NLRP3, NLRC4, or AIM2, the adaptor molecule ASC, and caspase-1. We have found that the mitochondrial phospholipid cardiolipin regulates NLRP3 inflammasome activation and causes caspase-1 catalysis in vitro. Caspase-1 can directly interact with cardiolipin, independently of NLRP3 and ASC. We postulated that caspase-1 may bind to cardiolipin via its CARD domain, similar to the binding of Lipid A by other inflammatory caspases. Therefore, caspase-1 constructs with specific mutations in the CARD and other domains were generated for use in assays that will determine the precise domain responsible for the binding of caspase-1 to cardiolipin.
69 - Zachary Miller

Major(s): Geoscience  
Mentor(s): Emily Finzel (Earth and Environmental Science)

Provenance of Pennsylvanian Aged Strata from the Appalachian Foreland Basin in Eastern Pennsylvania and Western Maryland

- U-Pb ages of detrital zircons were derived from fluvial sandstones of the 1) Lower and Middle Pennsylvanian Pottsville Formation, 2) Middle and Upper Pennsylvanian Llewellyn Formation in eastern Pennsylvania, and the 3) Upper Pennsylvanian Conemaugh Group in southwestern Maryland. The detrital zircon signatures from the three Maryland samples (n=686) and four samples from Pennsylvania (n=401) exhibit similar characteristics. All samples contain a major peak from the interpreted to be of Grenville Orogen (~900-1300Ma). Also all samples showed minor peaks associated with a Granite-Rhyolite Province (~1300-1500Ma). The Pennsylvanian samples processed minor zircon populations from Synrift/Gondwana terrenes (~530-750Ma) and the Taconic Orogeny (440-490Ma). All samples showed minor populations zircons from the Acadian-Alleghanian (<380), which suggests little sediment flux from synorogenic sources. All detrital zircon signatures are typical of a Northern Appalachian Mountains Provenance. Detrital zircons with ages that correspond to Grenville and Taconic Orogenies may have been derived directly from the local igneous suites associated with those events or recycled from older passive margins of foreland strata. Existing Neoproterozoic grains (~530-750) are not contained in our synrift zircon signatures. This suggests that accreted Gondwanan terrenes were contributing sediment to the Appalachian foreland basin throughout the whole Pennsylvanian time.

71 - Ben Olson

Major(s): Math and Economics  
Mentor(s): Bill Hedgcock (Marketing)

Physiological Indicators of Projection Bias

- Studies have found asymmetries in people’ predictions of food consumption for the future versus what people consume when the future arrives. Generally, if hungry consumers can choose between healthy and unhealthy snacks to consume in one week, they choose more unhealthy snacks. Once the week passes and these consumers are asked again which snack they want to eat, if they are now satiated, they will choose healthier snacks. This forecasting and reversal-of-choice combination represents projection bias. This present study examines the relative sizes of snack options. This study took the form of a Qualtrics survey. I presented 10 snack options, five healthy and five unhealthy. For each snack, subjects looked at five pictures, each showing different cluster sizes of that snack. Subjects chose which cluster size they wanted to consume one week later. I used this study as a pretest for determining how to proceed in future studies. Regarding snack sizes, I found ceiling and floor effects for several snacks, and subjects did not have strong demand for the 10 snacks I chose. Preliminarily, however, I found some weak positive correlations between intensity of hunger and snack size chosen for the future, highlighting the forecasting portion of projection bias.
73 - Angela Olvera

Major(s): Biomedical Engineering  
Mentor(s): Renata Pereira (Internal Medicine) Satya Tadinada (Pharmacology)

The Role of AMPK on Fibroblast Growth Factor 21 Induction in Energy-Stressed Muscle Cells

- Previous studies from our lab and others have demonstrated that mitochondrial stress in skeletal muscle can trigger an adaptive response that ultimately improves whole body metabolism and protects mice from diet-induced obesity and insulin resistance, via induction of fibroblast growth factor 21 (FGF21), a potent anti-obesity and anti-diabetes hormone. The mechanisms underlying FGF21 induction in the energy-deficient muscle are incompletely understood. We hypothesized the AMP-dependent protein kinase (AMPK), an energy sensor that gets activated when the energy status of the cell is low, and AMP levels are elevated, plays a role in FGF21 induction in the energy-starved muscle. To test our hypothesis we used C2C12 myotubes, which are a mouse-derived muscle cell line extensively used to study skeletal muscle response to various stressors. To induce mitochondrial stress, we treated these cells with oligomycin (O), an inhibitor of complex V (ATPase) of the mitochondrial respiratory complex, for 12 hours. This protocol was sufficient to induce FGF21 mRNA expression as well as activation of AMPK. We then, used Compound C (CC), a pharmacological inhibitor of AMPK, to inhibit AMPK activation during oligomycin treatment. Compound C partially inhibited AMPK activity upon oligomycin treatment, which completely blocked FGF21 induction in the cells. In conclusion, our data suggest that AMPK activation is necessary for FGF21 induction in energy-deficient muscle cells.

75 - Jordan Perez

Major(s): Health and Human Physiology  
Mentor(s): Vitor Lira Ph.D (Health and Human Physiology) Meaghan Rowe-Johnson (Iowa Bioscience Academy)

Preliminary findings on complementary functions of ULK1 and ULK2 proteins in skeletal muscle autophagy

- Autophagy is essential for the degradation of cellular dysfunctional proteins and organelles and is robustly induced under low nutrient conditions. The proteins ULK1 and ULK2 are homologs of the yeast Atg1, the first identified autophagy protein, and are highly expressed in skeletal muscle; however their functions are incompletely understood. We hypothesized that the ULK proteins might have both redundant and different roles in autophagy regulation, and examined the impact of either ULK1 or ULK2 knockdown on muscle autophagy under non-fasted (basal) and overnight fasting conditions in adult mice. To do so we electroporated DNA plasmids coding for ULK1 or ULK2 micro RNAs (miRs) into the tibialis anterior (TA) muscle of one leg and DNA plasmids coding for a scramble miR to the contralateral leg. Such intervention resulted in ~50% reduction in either ULK1 or ULK2 protein levels. LC3-I to LC3-II conversion, a measure of autophagy activation, was significantly reduced under fasting conditions with ULK1 knockdown only. We then assessed p62 protein levels, a protein that is degraded during the autophagy process and is used as a marker of autophagy flux. Interestingly, only the knockdown of ULK2 caused p62 protein to accumulate (by ~2-fold) under both basal and fasting conditions. These
findings suggest that ULK1 may be required for normal autophagy activation, whereas ULK2 may be required for autophagy resolution and/or p62 degradation. / 

77 - Thomas Peterson

Major(s): Physics, Astronomy, and Math
Mentor(s): Randall McEntaffer (Physics and Astronomy)

Off-Plane X-Ray Reflection Grating Fabrication

- Off-plane X-ray diffraction gratings with precision groove profiles at the submicron scale will be used in next generation X-ray spectrometers. Such gratings will be used on a current NASA suborbital rocket mission, the Off-plane Grating Rocket Experiment (OGRE), and have application for future grating missions. The fabrication of these gratings does not come without challenges. High performance off-plane gratings must be fabricated with precise radial grating patterns, optically flat surfaces, and specific facet angles. Such gratings can be made using a series of common micro-fabrication techniques. The resulting process is highly customizable, making it useful for a variety of different mission architectures.

79 - Natalie Ross

Major(s): Biomedical Engineering
Mentor(s): Douglas Spitz (Radiation Oncology) Melissa Fath (Radiation Oncology)

Enhancing Toxicity in Breast and Lung Cancer Cells with DPEN via Mechanisms of Hydrogen Peroxide Production

- D-penicillamine (DPEN), a copper chelator, has been used in the treatment of Wilson’s disease. Recent evidence suggests that DPEN in combination with biologically relevant copper concentrations generates H2O2 in cells. Increased levels of copper are present in cancer patients; therefore, we hypothesized that DPEN in conjunction with copper could lead to selective toxicity in cancer cells. Generation of H2O2 in MB231 cancer cells was confirmed after 4 hours of treatment with varying DPEN doses and copper sulfate (Cu) using PeroxyOrange1 oxidation and flow cytometry analysis. Clonogenic survival assays demonstrated that DPEN-induced cancer cell toxicity was significantly enhanced by depletion of glutathione [using buthionine sulfoximine (BSO)] as well as inhibition of thioredoxin reductase [using Auranofin (Au)] prior to exposure. In addition, treatment with the H2O2 scavenging enzyme, catalase, inhibited DPEN-Cu toxicity confirming a peroxide mediated mechanism of action. Importantly, DPEN-Cu demonstrated selective toxicity by significantly killing human breast and lung cancer cells but not normal human lung or mammary epithelial cells. DPEN-Cu treatment shows an increase in cancer cell killing when combined with radiation (standard of care in many breast and lung cancers) supporting the speculation that DPEN could be used to enhance cancer therapy responses in vivo.
81 - Monisa Saravanan

Major(s): Human Physiology  
Mentor(s): Hanna Stevens (Psychiatry)

Molecular Effects of Prenatal Stress on Mitochondrial DNA in Developing Basal Ganglia and Cortex

- Stress during neural development can lead to adverse molecular and cellular effects. Prenatal stress has also been correlated with an increased risk for psychiatric disease including ADHD, autism, and schizophrenia. In this study, a mouse model of prenatal stress was used to study mitochondrial DNA (mtDNA) and its relationship to telomere length (TL) in both the cortex and basal ganglia of developing brain. Studying mtDNA changes can help with understanding how a cell may be changing its metabolism to cope with stress. Our lab has previously shown that males have no changes in TL after prenatal stress while females have a reduction in both basal ganglia (BG) and cortex. In this study, males showed no significant changes in mtDNA in BG after prenatal stress, but showed a significant reduction in cortex (p<.05). Females also showed no change in mtDNA in BG after prenatal stress and a decrease in cortex (p<.001). In females, we also found correlations between mtDNA and TL that were disrupted after prenatal stress in both brain regions. These findings suggest that changes in mtDNA and TL are repercussions of prenatal stress and may be important for understanding how prenatal stress increases risk for psychiatric illness.

83 - Brett Schneider

Major(s): Psychology and Biology (Neurobiology Track)  
Mentor(s): Daniel Tranel (Psychology)

Left Temporal Pole as a Bidirectional Convergence Zone in Proper Naming

- This experiment utilizes the lesion approach to try and correlate a specific brain region to the task of retrieving conceptual knowledge on specific entities. Participants were presented with slideshows of names of famous people, landmarks, and melodies. Participants then described in detail information that was unique to the people or landmark, and asked to sing, hum, or tap the melody just from the name. Participants rated familiarity with the item, ability to visualize the item, and asked to identify the correct item in a multiple-choice format. Upon data collection, three people were then given transcripts of the descriptions, and the recordings of the participant’s performance in the melody task, and asked to rate if they can identify each item. Data collection has just been commenced, and therefore no preliminary results have been identified. This data will then be compared to a normal comparison group. However, we hypothesize patients with lesions in the left temporal pole will have overall more identification problems in faces, landmarks, and melodies than both brain-damage and normal comparison groups. The experiment continues to help identify the neural regions associated with retrieving conceptual knowledge.
Regulation of LPL Activity by ANGPTL3 and ANGPTL8

- Hydrolysis of triglyceride-rich chylomicrons by lipoprotein lipase (LPL) is one of the central events of fat metabolism. Dietary fats are packaged as triglycerides into particles called chylomicrons for delivery to tissues of the body. LPL, normally bound to its transporter/anchor GPIHBP1 on the inside wall of capillaries, is required for lipolysis of these chylomicrons and the subsequent delivery of fatty acids to tissues such as heart, skeletal muscle and adipose tissue. Several proteins regulate LPL activity, including ANGPTL3, a circulating factor that regulates triglyceride metabolism and is thought to act by inhibiting LPL. ANGPTL8 also regulates triglyceride metabolism, but the mechanisms of this regulation are unclear. Our studies aim to identify the role ANGPTL3 and ANGPTL8 play in regulating LPL, by dissecting how they interact with each other and with LPL. We find that ANGPTL8 has little ability to inhibit LPL on its own, but is able to increase the inhibitory activity of ANGPTL3. We also find that the ability of ANGPTL3 to inhibit LPL is greatly attenuated when LPL is bound to GPIHBP1. Elucidation of these interactions will facilitate the targeting of triglyceride metabolism in the treatment of fat-related diseases.

Functional Analysis of Ceramic Sherds from Woodpecker Cave

- Four field seasons of excavations by the University of Iowa field school have recovered hundreds of ceramic pottery sherds from the Woodpecker Cave site. Previous typological analyses of the ceramic assemblage have supported the hypothesis that the site was host to long-term seasonal occupations spanning hundreds of years. Woodpecker Cave provides a unique opportunity to study variation in technologies used during ceramic production in eastern Iowa, spanning the Middle Woodland and Late Woodland periods. Further analysis of the ceramic assemblage can provide insight into production strategies within the region. Examining temper, vessel morphology, and carbonization within the collection of sherds allows for analysis of the technological choices made during vessel production and the actual function of the vessels after production. Attempts to partially refit vessels will aid in determining overall shape and size, and provide a better understanding of the soot and carbon patterns present in the collection.
Loss of Mitochondrial Pyruvate Carrier in Cardiomyocytes Leads to Cardiac Hypertrophy and Heart Failure

- Pyruvate is a central metabolite in the carbohydrate metabolic pathway. Both glucose and lactate require conversion to pyruvate and transportation into the mitochondria for further oxidation. Transport of pyruvate into the mitochondria is mediated by the mitochondrial pyruvate carrier (MPC) complex. The MPC complex is composed of two components, MPC1 and MPC2. We generated cardiomyocyte specific MPC1 knockout mice (CMPC1-/-) by crossing MPC1 floxed mice with αMHC CRE transgenic mice. The function of MPC1 in maintaining cardiac function was investigated in this mouse model. Western blot analysis confirmed deletion of MPC1 and revealed a decrease in MPC2, suggesting complete loss of the MPC complex in mouse hearts. Cardiac function determined by echocardiography indicated cardiac dysfunction starting at the age of 8 weeks in CMPC1-/- mice followed by heart failure. Quantitative PCR results revealed an increase in pathologic hypertrophic gene expression in CMPC1-/- hearts. Transmission electron microscopy in CMPC1-/- hearts revealed no mitochondrial morphological differences. Isolated working hearts showed a decrease in glucose oxidation and an increase in palmitate oxidation, which suggested fatty-acid oxidation compensated for loss of MPC. In summary, MPC1 deletion in cardiomyocytes leads to cardiac hypertrophy and heart failure without differences in mitochondrial morphology.

91 - Caroline Wadman

Major(s): Psychology
Mentor(s): Gerene Denning (Emergency Medicine)

A Dangerous Toy: All-Terrain Vehicle (ATV)-Related Deaths and Injuries

- U.S. all-terrain vehicle (ATV) crashes are a serious public health issue causing over 800 deaths and more than 400,000 injuries at a cost of $22.3 billion each year. Our studies using a unique statewide database showed four major issues related to promoting ATV safety in our state. First, this is not just a rural phenomenon, almost half of all crashes occurred in urban areas. In addition, children under 16 years of age represented 29% of all crash victims and over one-quarter of crashes of this off-road vehicle occurred on the road. Finally, fully 17% of operators over 15 years of age were under the influence of alcohol at the time of the crash. These findings continue to highlight the dangers of ATVs, particularly to children, and the lack of safety culture that leads ATV riders to engage in risky behaviors, like riding on the road and drinking and driving. Results from this research will be used in our educational and public awareness programs, as well as our advocacy efforts for improved ATV safety legislation. The long-term goal of this and future studies will be to save lives, protect health, and reduce the economic impact of ATV-related deaths and injuries.

93 - Abigail Weaver

Major(s): History
Mentor(s): Tyler Priest (History)

Establishing an Institution: The Public Library Movement in Iowa 1900-1920
As the world becomes increasingly digitally-oriented it is important for public libraries to reexamine their history as they formulate strategies to secure their place as an irreplaceable community institution. The ‘golden age’ of Iowa’s public library movement was from 1900-1920. During that period the work of Iowa’s Federation of Women’s Clubs, the Iowa Library Association, the Iowa Library Commission, and Andrew Carnegie’s library grants made it possible for Iowa towns to establish permanent free public libraries. Iowa was awarded 99 Carnegie library grants totaling $1,495,706 for 101 buildings. A case study of 13 different Iowan towns for Carnegie library grants helped to identify the common challenges that communities faced such as the location of the library, population size, tax requirements, and the final grant amount. It also highlighted the importance of community involvement and the support of political figures to overcome the challenges that towns faced.

**95 - Kasra Zarei**

**Major(s):** Biomedical Engineering  
**Mentor(s):** Bernd Fritzsch (Biology) James (Buchholz)

**Detailed Movement Pattern Analysis of Tadpole Swimming to Monitor the Effects of Ear/Gravity-Sensing Manipulations**

- **Purpose:** To demonstrate the use of an apparatus to monitor the effects of ear (gravity-sensing) manipulations on the C-start behavior of frog embryos through the 3D reconstruction of tadpole swimming and detailed movement pattern analysis.  
  **Methods:** A novel imaging apparatus was developed to perform movement pattern analysis. Standard techniques were applied to generate the zebrafish-ear transplants and one-ear frog embryos, and treat additional frog embryos with the pharmacological manipulation, vismodegib. The apparatus was validated by confirming the presence of the C-start response in controls. C-start data was collected for vismodegib-treated, one-ear, zebrafish-ear transplant tadpoles, and stage-matched control tadpoles. Four stimulus-response trials were conducted for each tadpole.  
  **Results:** For the preliminary validation, controls always exhibited the C-start response. There was no significant difference in C-start response time between control and vismodegib-treated tadpoles. At maximum response flexion, vismodegib-treated tadpoles did exhibit smaller head-to-tail angles compared to controls ($P < 0.01$). The one-ear and zebrafish-ear transplant tadpoles always moved in the direction of the manipulation while controls responded in both directions.  
  **Conclusions:** We have presented a novel apparatus to perform behavioral assays and the first detailed movement pattern analysis of tadpole swimming behavior using several tadpole models.

**97 - Danielle Zwiefelhofer**

**Major(s):** Biology: Genetics and Biotechnology  
**Mentor(s):** Nancy Downing (Nursing)

**Factors Associated with end-of-life care in Huntington’s disease**

- Huntington’s disease (HD) is a devastating neurodegenerative disorder that leads to cognitive, behavioral, motor, and functional decline and premature death. Palliative care, as broadly
defined to address disease symptoms that impact quality of life across the disease spectrum, has the potential to be of great benefit to people with HD and their families. The purpose of this study was to ascertain the factors associated with planning end of life care. An interview was conducted with 428 people with HD including a battery of questions. It was predicted that age, education, and concern with death and dying would be the highest ranked motivators for whether someone had an Advanced Directed. The t-tests agreed with that hypothesis with the only valid results belonging to age with a p<0.000, education p=0.041, concern with death/dying p=0.022 and also with meaning and purpose p=0.003. These interview gives us the data on where to proceed in determining how best the give people with HD the best care in the late stages and how best to help them prepare themselves and their families.

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**Second Hour Presenters**

**5:30-6:30PM**

(even numbers only – each board will be turned around)

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2 - Monica Ahrens

**Major(s):** Mathematics  
**Mentor(s):** Eric Foster (Biostatistics)

**The Consequences of Cluster Randomization in Phase III Clinical Trial Interim Analyses**

- During phase 3 clinical trials, interim analyses are performed in order to assess whether there is sufficient evidence for early stopping due to either efficacy or futility. Phase 3 cluster randomized clinical trials often make use of interim analysis methods designed for subject-level randomization. Such interim analyses do not account for the within-cluster correlation that occurs because of cluster randomization. Our research investigates the consequences of using these traditional methods in the cluster randomization setting. Via simulation we compared the type I error within cluster randomized sampling versus that within individualized random sampling. We also examined the probability of rejection at each interim analysis. The simulation revealed that, when applying traditional interim analysis methods to the cluster randomized setting, we are conservative when deciding whether or not to continue a trial.

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4 - Seima Al-Momani

**Major(s):** Psychology/ Pre-Medicine  
**Mentor(s):** Timothy Weng (Department of Psychological and Brain Sciences)

**Acute Effects of Moderate Intensity Aerobic Exercise on Brain Function during a Working Memory Task**
Growing evidence suggests that physical activity improves working memory performance, but little is known about the underlying neural mechanisms that support this heightened performance. The purpose of this study was to investigate the effects of one session of moderate intensity aerobic exercise on working memory task-related brain activity. Investigating the short-term effects after one session of exercise might help us understand how repeated exercise benefits the brain and cognition. We predicted that moderate intensity aerobic exercise would increase brain activity in regions involved in working memory. A within-subjects design was employed where 20 participants performed two conditions of exercise on separate occasions: an active moderate intensity aerobic cycling and a passive motor-driven cycling. Each exercise lasted for 30 minutes. Before and immediately after each exercise, participants performed a working memory task while in a functional Magnetic Resonance Imaging (fMRI) scanner. Results show greater task-related brain activity after the active exercise compared to the passive exercise. We hope to find that these brain changes correlate with changes in performance on the working memory task. These findings might suggest that one way that physical activity affects the brain is by increasing the activity in brain regions involved in working memory.

6 - Maya Amjadi

Major(s): Biology, Spanish
Mentor(s): William M Nauseef (Internal Medicine) Mallary Greenlee-Wacker (Immunology)

Ectosomes from human neutrophils laden with Staphylococcus aureus induce a pro-inflammatory response in macrophages

Diseases caused by Staphylococcus aureus (SA) typically manifest as mild skin infections but also cause life-threatening diseases. Neutrophils (PMN) are the first responders to staphylococcal infection. Phagocytosis of SA by PMN (PMN-SA) induces PMN production of ectosomes, particles 100-1000 nanometers in diameter that bud off the plasma membrane. We hypothesize that ectosomes arising from PMN-SA contribute to local inflammation. Differential ultracentrifugation isolated ectosomes from human PMN-SA. As previously reported, ectosomes were positive for membrane protein CD66b, azurophilic granule protein myeloperoxidase, and PKH67, a fluorescent probe that detects lipids. Immunoblotting showed that ectosomes from PMN-SA contained gp91phox and p22phox, components of the NADPH oxidase. In contrast, the SA proteins sortase A and protein A were not detected, suggesting that the ectosomes are made of host-derived components. The ectosomes also contain DNA. Ectosomes from PMN-SA stained positive for SYTO13 Green Fluorescent Nucleic Acid Stain, and purified DNA was resolved on agarose gel as a band 12kb. Macrophages were treated with ectosomes from PMN-SA. Cytokines were measured by ELISA. We found that ectosomes induce the release of pro-inflammatory cytokines IL1-β and IL-6 by macrophages. These data support the hypothesis that ectosomes from PMN-SA are pro-inflammatory and contribute to exuberant inflammation during staphylococcal infection. /
Mentor(s): Rebekah Kowal (Dance)

Rediscovering Asadata Dafora Through Spatiality

- Under the guidance of Professor Rebekah Kowal’s research for her current book project, Dancing the World Smaller: Importing Dance in Mid-Century America, I am helping to investigate the significance of dancer and choreographer Asadata Dafora’s presence in New York City circa 1930. Dafora emigrated from Sierra Leone in 1929, and was quickly described as a “leading African choreographer” within the United States by the New York Times. Yet, Dafora has virtually disappeared from historical records. Working with primary sources from the Schomburg Center for Research in Black Culture, I seek to gain an understanding of Asadata Dafora’s existence in New York City using the concept of “Thirdspace,” or the idea that the spaces in which we live comprise the essential spatiality of human life, and should be used as a third lens with which to research in conjunction with historical and social lenses. By tracing Dafora’s performance tours, I am able to identify the spaces in which Dafora gained notoriety. Thus, I am to understand how to apply the theory of “Thirdspace” to Dafora, effectively placing him in time and space to understand his significance in the 1930s and his disappearance since.

10 - Alec Archer

Major(s): Electrical Engineering
Mentor(s): Anton Kruger (Electrical and Computer Engineering)

Automatic Accelerometer Calibrator

- We place accelerometers on trees to measure the acceleration and forces that a tree withstands. The method of hand calibration is tedious with today’s technology. Our research is to design a more efficient, robust, and practical calibration system for accelerometers. Our research involves using an automatic system powered by a microcontroller, which will automate the calibration of each accelerometer. The design involves a keypad and LCD that allows the user to set a desired calibration sequence that will run and stop when the calibration sequence is complete. The calibration method involves the use of stepper motors that will turn the accelerometer in the X, Y, and Z plane. The uncertainty of the stepper motors accuracy leads to inaccurate calibration of the accelerometer. Our test procedure involves determining the accuracy of our stepper motors. Using this test data, we can determine the error of our stepper motor leading to a more accurate calibration. Therefore, with error reduction, we will be able to accurately calibrate each accelerometer. The research is sponsored by the National Science Foundation, Award 1238246.

12 - Amin Bagheri

Major(s): History, Philosophy
Mentor(s): Catherine Komisaruk (History)

The Illusion of Religious Ignorance

- Studies on the effect of pre-Hispanic Nahua religious beliefs onto the native’s acceptance of Christianity usually assume indigenous ignorance in order to explain the religious phenomenon
of the time. In this research project, I analyze the first three books of the Florentine codex, which concerns issues pertaining to Nahua god(s), morality, religious beliefs and ceremonies. The Florentine codex is a series of twelve books compiled and written by Bernardino de Sahagun, a Franciscan friar and his disciples in a Franciscan monastery situated in Tenochtitlan. By way of examining Nahua gods, their origins and the moral implications I hope to reach a deeper understanding of the indigenous faith(s). With comparing the pre-Hispanic religious notions with those of Europeans I hope to shed light on the effect that the prior had on the acceptance of the latter, if any. By drawing out examples from the primary sources I will try to suggest the contrary to what the previous historiography suggested in terms of Nahua understanding of Christianity. Nahua’s understanding of Christianity was not of ignorant nature neither was it a product of intentional blending of ideas but rather it was an intelligently based belief.

14 - Brady Behling

**Major(s):** Human Physiology  
**Mentor(s):** David Gordon (UIHC Department of Pediatric Hematology/Oncology)

**Ewing Sarcoma Tumors and the High Expression Levels of the Neuropeptide Y Receptor Y1 (NPY1R)**

- Ewing sarcoma is an aggressive bone and soft tissue tumor that affects children and young adults. There is an urgent and unmet need in Ewing sarcoma treatment to identify target-specific therapies that can improve outcomes while reducing toxicity. Due to the lack of an appropriate model system to study the EWS-FLI1 oncogene, we had to develop our own model. We used differentiating human embryonic stem cells to model the initiation and development of Ewing sarcoma in a genetically defined and isogenic system. From this system, we were able to identify EWS-FLI1 as a target gene. One of the most highly upregulated genes in the data set is the neuropeptide Y1 receptor (NPY1R). NPY1R is a transmembrane receptor that binds neuropeptide Y (NPY) with high affinity and specificity. We used RT-qPCR, and siRNA knockdown approach, to show that NPY1R is highly expressed in multiple Ewing sarcoma cell lines and is highly specific. Furthermore, we used flow cytometry and fluorescence microscopy to demonstrate that Ewing sarcoma cell lines internalize a fluorescently labeled NPY peptide. NPY1R has significant potential as a molecular target that combines the need for both diagnostic and therapeutic (theranostic) capabilities into a single target.

16 - Kathryne Brown

**Major(s):** Psychology  
**Mentor(s):** Jodie Plumert (Psychological and Brain Sciences)

**Perceiving and Acting on Joint Affordances: How Children Cross Roads Together**

- Children have many interactions in their life with their peers, and peers can influence a child’s behavior when completing many different tasks. We examined how 12-year-olds cross a single lane of continuous traffic in a virtual environment when a peer was present or alone. When crossing with a peer, 12-year-olds took similar gaps, crossed the street more quickly, the right peer cut in more closely to the car and therefore had more time to spare than solo crossers. We
would expect to see pairs take larger gaps when crossing together but that was not the case. This suggests children did not adjust gap decisions in joint actions but preferred to adjust crossing actions to match their risky decisions.

18 - Andrea Caceres

Major(s): Biomedical Engineering
Mentor(s): Donald Anderson (Orthopedic Biomechanics)

A Finite Element Analysis of the Effect of Glenoid Version on Scapular Notching in Reverse Shoulder Arthroplasties.

- Reverse shoulder arthroplasties (RSAs) are becoming a popular choice for treating patients with rotator cuff tears and arthritis. Despite scapular notching being the most common problem found in reverse shoulder arthroplasties, the relationship between glenoid version rotation and scapular notching has yet to be examined. A segmented CT image of a scapula bone from the Visible Female Project was marked perpendicular to the plane spanning the medial tip to the wing of the glenoid to indicate the neutral plane. Surfaces for the CT image, along with 5 glenoid component models differing in glenoid version (5° retroversion, 0° neutral, 5° anteversion, 10° anteversion, and 20° anteversion) were created using TrueGrid. Abaqus/Explicit was used to simulate extension/flexion and external/internal motions until impingement occurred in each model. Neutral version gave the highest impingement free range of motion. As version angle deviation from 0° increased, the chance for impingement increased. Impingement was observed to increase as the humerus moved posteriorly, and reduced when moved anteriorly in all models. This result provides evidence that version angle plays a significant role in the amount of impingement produced, with 0° posing the least risk of scapular notching.

20 - Alyssa Cady

Major(s): Biology, Genetics and Biotechnology Track
Mentor(s): Sandra Daack-Hirsch (College of Nursing)

Perception of Role Of Genetics And Running In The Family In People With A Family History Of Type 2 Diabetes

- As part of a larger mixed-methods study to elucidate the personalization process of risk for diabetes, we used qualitative methods to explore the role of genetics and what running in the family means to individuals at increased risk for Type 2 Diabetes (T2D) due to a positive family history. Participants, age 18 – 60, were interviewed and asked “Do you think diabetes runs in families? If so what makes diabetes run in families?” and “What role, if any, does genetics play in your family history?” Interviews were recorded, transcribed, and analyzed using qualitative content analysis. First, text from each transcript was coded broadly into Running in the Family and Role of Genetics. Each of these broad topical categories was then sub-coded into more specific categories. Causal model summaries were built for each individual and patterns and additional categories were identified. Genetics was described as a predisposing factor; an inherited risk factor; a personal, non-inherited risk factor; and a determinant of race. Running in the family was described as inheriting genes and as inheriting family and/or cultural heritage.
that accounted for shared behaviors. In summary, most people described T2D as multifactorial, and definitions of what is running the family varied.

22 - Sarah Camp

**Major(s):** BFA Painting  
**Mentor(s):** Cindy Opitz (UI Museum of Natural History)

**Taxonomy and distribution of insect specimens in UIMNH collections**

- By the end of spring 2015, the University of Iowa Museum of Natural History will finish state- and NSF-funded projects to catalog and rehouse 26,000 specimens in historic UI insect collections and digitize associated data, and to catalog and rehouse an additional 15,000 insects recently acquired from the UI Biology Department. Summer 2015 ICRU funding will support student Sarah Camp’s project to georeference locality data of those additional 15,000 insects, which were not part of the NSF-funded project, and to update the taxonomy of all 41,000 specimens contained in the UIMNH insect database. Ms. Camp will research historic specimen collection locations and insect identifications, with the goal of classifying and reorganizing collections and enhancing digital data stored in the UIMNH database and published to the InvertNet online research portal. Updating taxonomy and associating accurate latitudes and longitudes with UIMNH insect specimens will enhance their value to global biodiversity research. The research Ms. Camp conducts on UIMNH insect holdings will also be used to create an annotated digital map of UIMNH insect specimens and describe and promote the value of the insect collections to global researchers.

24 - Yingyi Chang

**Major(s):** Psychology B.S. & Communication Studies B.A.  
**Mentor(s):** Steve Duck (Communication Studies)

**Body Accessibility Towards Different Targets in the Current Society**

- **Purpose:** The study seeks to replicate, expand, and update Jourard’s body accessibility study in the context of today’s mores and standards. Background: Jourard showed that body-accessibility could be reliably measured using a bodily contact map, which divides a human body image into 24 sub-regions. Participants were asked to select body areas where they have touched or have been touched in their social interactions with different targets: parents and closest friends of both genders. However, Jourard only focused on the closest relationship interaction, and this standard touching pattern has not been updated for over 50 years. **Method:** The current study uses an online questionnaire with the same body contact map, focusing on participants’ attitudes and perceptions instead of their past experiences. This questionnaire also adds new targets: acquaintances of both genders. We expected to recruit approximately 400 undergraduate students aged 18-22. Participants’ responses will be compared based on gender and cultural background.
Caught in the Thick of It: Determining Microrheological Mucus Properties from Porcine Cystic Fibrosis Models

- Cystic fibrosis (CF) is a genetic disorder caused by mutations in the cystic fibrosis transmembrane conductance regulator (CFTR). Morbidity and mortality in people with CF arise from recurrent airway infections, inflammation and progressive loss of lung function. In advanced CF airway disease, airway mucus is distinctively abnormal with altered viscoelastic properties. Passive microrheology is a technique that explores the viscoelastic properties of small volume materials such as airway mucus. By interrogating probe particles motion induced by thermal fluctuations (Brownian motion), we can determine the viscoelastic properties of the surrounding medium (in this case CF or non-CF mucus). We collected mucus from both CF and non-CF pigs and homogenized it with either 1 or 0.2 microns fluorescent particles. Using confocal microscopy, we tracked the Brownian motion of probe particles and calculated mean square displacement (MSD). By plotting MSD versus lag time, we determined that pig airway mucus exhibit non-Newtonian viscoelastic properties. This technique allows the measurements of local rheological properties of both CF and non-CF mucus.

Investigating the Role of Srs2 Helicase in Break-induced Replication (BIR)

- Double Strand Break (DSB) is the most detrimental type of DNA damage. DSBs often result in cell death, chromosomal rearrangements, and other genetic instabilities, which can lead to human disease. Therefore, repair of this damage is indispensable for the organism to survive. Break-induced Replication (BIR) is a one DSB repair pathway which is responsible for repair of one-ended DNA breaks that can result from replication collapse or telomere erosion. However, BIR is a mutagenic pathway, whose actions can often lead to chromosomal rearrangements, formation of mutations, and loss of heterozygosity. Therefore, it is important to understand the mechanism of BIR and identify participating proteins. One protein I identified through my analysis of a gene called SRS2. I examined the role of Srs2 in BIR both genetically and by physical analysis using Pulse Filed Gel Electrophoresis (PFGE). At the moment I interrogate the role of each domain of Srs2 in BIR using separation of function mutations. This will allow me to determine which function of Srs2 is a necessary part for precise BIR. Role of this protein in BIR may reveal potential anti-cancer drug targets.
Racial Consciousness in the Iowa Territory and Its Impact on the Potawatomi People

- The common perception of Iowa and its history is one of exceptionalism, a territory that avoided racial violence that occurred in other states with violent Native American and Euro-American clashes. This vision of Iowa as a homogeneous state devoid of ethnic and racial divisions is taught in classrooms across the state. However, the arrival of the Potawatomi people in 1837 and 1838 to the Council Bluffs region disproves this cordial image through the interactions of American government officials, European Catholic missionaries, and mixed-race merchants on the Missouri River. Removed from Chicago and the surrounding Lake Michigan region in the 1830s, the Potawatomi faced barriers based on government policy and racial perceptions of the antebellum United States. As a result, their residency in Council Bluffs consisted of poverty and violence that only worsened over time. The subsequent removal of the so-called Prairie Band of Potawatomi to their present location in northeastern Kansas has left a lasting legacy of racial discord in Iowa in subtle ways, leaving only place names and other minor remnants of the Potawatomi in Iowa.

32 - Roxanne Dudovitz and Shawna Dudovitz

**Major(s):** Health and Human Physiology / Health and Human Physiology  
**Mentor(s):** Leonard Macgillivray (Chemistry)


- Pyrimidine derivatives are known to participate in [2+2] photocycloadditions in solution and have been studied to elucidate the mechanisms of DNA damage by UV irradiation. Among these derivatives, 5-Fluorouracil (5-FU) has been used almost ubiquitously as a chemotherapeutic agent in the treatment of many forms of cancer (e.g. colon, pancreatic, breast). Solution phase [2+2] photocycloadditions have been exploited in order to synthesize prodrugs and drug conjugates for controlled delivery of 5-FU. However, the crystallographic landscape of 5-FU is underdeveloped and, as yet, there are no known examples of its photoreactivity in the solid state. Recent reports have described the behavior of 5-FU as a building block for cocrystals involving N-based aromatic heterocycles, providing a basis for its continued investigation in the organic solid state. Here we explore the solid-state behavior of 5-FU in a series of cocrystals of 5-FU formed with bipyridine cocrystal formers. The hydrogen-bonding motifs of 5-FU within the cocrystals are similar to those of the pure 5-FU polymorphs. Additionally, the photoreactivity of the cocrystals was studied and a [2+2] cross-photodimerization observed.

34 - Taylor Finch

**Major(s):** History  
**Mentor(s):** Landon Storrs (History)

"Powerless, with a Guitar": Music and Student Protest at the University of Iowa 1965-1971
• The years 1965 - 1971 were tumultuous ones for students at the University of Iowa. The national climate, steeped in conflict over the struggle for Civil Rights, resistance to the Vietnam War and the draft, and the free speech movement, culminated to bring widespread protest across campus. A large portion of the student radicals who participated in the protests were among the avant-garde community of artists, writers, directors, and especially musicians within Iowa City. Mickey Hart, drummer for the famous psychedelic jam band The Grateful Dead, once said, “We’re not the whole event, but we’re what the event sounds like.” This sentiment speaks to the role these musicians and their music played in student protest at the University of Iowa. As the protest movement shifted from nonviolence to militancy and from global revolution to local revolt, the genre, message, setting, and role of rock music that was being consumed and produced in Iowa City shifted as well. My research aims to focus these protests and the music that captured them in our cultural and historic lens. I will illustrate exactly how music captured the spirit of student protest at all of its phases. I will also explore why this narrative should matter to contemporary readers.

36 - Timothy Fuqua

Major(s): Biology - Genetics and Biotechnology
Mentor(s): Albert Erives (Biology) Elizabeth Stroebele (Biology)

Decoding Notch-target Enhancers in Drosophila Melanogaster

- Organisms grow and develop through molecular signaling pathways and the interactions they have with our DNA. DNA regulation occurs within its non-coding regions called enhancers. An enhancer regulates gene expression through the use of transcription factors (TFs), which are a class of proteins which bind to the enhancer and regulate transcription. TF’s are localized in different concentrations throughout the cells of an organism, and allow enhancers to regulate gene expression in specific patterns and compartments throughout the organism. Our lab studies enhancers in the model organism Drosophila melanogaster, and the interactions they have with Notch signaling pathway. Notch regulates many enhancers through the use of a specific TF called Suppressor of Hairless [Su(H)], which binds to a specific motif in the enhancer. We created a dataset of new enhancers which utilize Su(H) in a variety of ways, both repressing and activating genes. The screen also identified a new enhancer for the hedgehog gene (Hh). The Hh gene and the Notch signaling pathway are all responsible for many important growth and developmental pathways in both flies and humans. By studying their enhancers, we hope to be able to translate our research to understand those pathways and how enhancers work.

38 - Amanda Harwood

Major(s): Theatre
Mentor(s): Melissa Turner (Theatre Arts)

Streamlining Stage Management with a New Kind of Database

- In my short brush with stage management from my production experience as an undergraduate theatre student at Iowa, one of the most tedious tasks I found as a stage manager was typing the same information over and over again while formatting and re-formatting everything into
different documents to send to different members of the design team. Stage managers, especially student stage managers have plenty to document and keep track of, and unfortunately the endless copying and pasting of information was an unavoidable waste of precious time for me and many other stage managers until this past summer. When Melissa Turner approached me with the task of assisting her with the creation of a database to eliminate this problem, I was all over it. In my work with Melissa this summer our biggest obstacle involved translating traditional stage management documents to a multidimensional database format, or a way in which all the information put into the database would connect to each other. Our database allows stage managers to type in costume pieces, scenic information, rehearsal information, and line notes on one entry page and with the click of a button, the program populates the corresponding documents with the designated information. We hope that this database system will allow our stage managers to be even more efficient and, in turn, help our productions run more smoothly behind the scenes.

40 - Elizabeth Helfenberger

Major(s): Physics, Math
Mentor(s): Usha Mallik (Physics)

B-tagging at ATLAS: Data and Monte Carlo Comparison

- At CERN’s LHC, I compared data collected by the ATLAS detector during Run 2 (at 13 TeV) to the Monte Carlo simulation, generated by Pythia 8 for dijet events. The purpose of the data/MC comparison was to assess the performance of the Monte Carlo, which was constructed using Run 1 data. I examined both track jets and calorimeter jets, working with the ATLAS b-tagging group. B-tagging is the process of locating jets which originate from the decay of a B hadron. This is achieved by exploring the fact that B hadrons have a significant lifetime and therefore travel a certain distance in the detector before they decay. The b-tagging algorithms are designed for calorimeter jets, but I sought to determine how accurate they were when applied to the track jets. I considered kinematic variables such as the transverse momentum of the jets, the impact parameters and z-coordinates of tracks, as well as several multivariate analyses. I concluded that the data/MC agreement was not significantly different for the track jets and the calo jets. However, more selections must be made to the events to obtain better data/MC agreement.

42 - Jacob Isbell

Major(s): Physics, Astronomy
Mentor(s): Jasper Halekas (Physics and Astronomy)

SIMULATING PARTICLE MOTION IN THE MAGNETOSPHERE OF EUROPA

- Europa is perhaps the most interesting moon in the Solar System; its position within the Jovian Magnetosphere drives the mechanisms that produce a probable subsurface ocean which in turn supplies complex interactions between the pair’s magnetic fields. This project aims to simulate individual particles in the plasma stream that engulfs Europa and interacts with its electromagnetic fields. The model was written in Python and uses an adaptive time step Runge-
Kutta algorithm to solve the Lorentz Force equations at the specified particle’s location. By modeling these particles within an existing model of the electromagnetic field strength, we can monitor location, velocity, kinetic energy, and pitch angle. Moreover, by testing many charged particles, we can get an idea of the plasma density as a function of location. All of this information together will give a fuller picture of particle interactions with the Galilean moon, shedding light on atmospheric and plasma composition. Additionally, it will give an indication about what an actual instrument located at Europa would read, allowing astronomers to extrapolate back to describe the magnetic field, and ultimately to ascertain whether or not Europa has a saltwater ocean.

44 - Victoria Johnson

Major(s): English
Mentor(s): Claire Fox (English)

Assessing Contemporary Models of Post-colonial and Transnational Themes and Ideologies

- I assisted Dr. Claire Fox, my research mentor, this summer by helping read a wide variety of novels and pieces of criticism and theory in order to develop a narrowed down syllabus for an upper-level post-colonial/transnational course she will be teaching in spring of 2016. I identified a wide-ranging issue of topics that pervaded all of my reading, while also noting ideas that were unique to a specific piece of work. Because the post-colonial genre is expansive in what it includes, I worked to find universal themes within a diverse set of texts that could act as cohesive markers for guiding an advanced course. My secondary goal was to critically engage in thinking about how the genre self-imposes limitations by being a part of the Western literary cannon, and whether the novels themselves can be viewed as acts of political tourism.

46 - Tamar Kavlashvili

Major(s): Biology
Mentor(s): Shujie Yang (OB/Gyn) Kimberly K Leslie (OB/Gyn)

Inverse relationship between Myc and Progesterone Receptor in Endometrial Cancer

- As a tumor suppressor in endometrium, progesterone and its synthesized analogue progestin have a long history as a treatment for endometrial cancer. Loss of progesterone receptor (PR) in endometrial cancer leads to therapeutic failure and our group has identified several mechanisms underlying PR loss. These mechanisms include ligand-dependent post-translational protein degradation, miRNA mediated translational repression, Polycomb Repressive Complex mediated transcriptional repression and permanent suppression by DNA methylation. We use epigenetic modulator drugs to restore PR expression. We have noticed a positive correlation between upregulation of PR and downregulation of oncogene Myc that plays a crucial role in cell cycle control, apoptosis and cellular transformation. Addition of PR ligand progesterone further decreases Myc expression on both mRNA and protein levels. In addition, several PR binding sites have been found in Myc promoter region which suggests that PR has a direct effect on Myc transcription. Our data suggests that the use of epigenetic modulator drugs for molecularly
enhancing hormonal therapy restores functional PR product that is possibly responsible for downregulation of oncogene Myc in endometrial cancer.

48 - Nick Koehn

Major(s): Human Physiology  
Mentor(s): Jessica Sieren (Biomedical Engineering- Radiology)

Longitudinal Analysis and Comparison of Four Mathematical Prediction Models of Solitary Pulmonary Nodules Imaged on CT

- Numerous mathematical prediction models (MPMs) have been produced to offer clinicians an objective assessment of the probability of malignancy associated with a solitary pulmonary nodule (SPN) imaged by computed tomography (CT). These independently developed MPMs (Mayo, VA, PU, and Brock models) consider many variables including patient’s medical and familial histories and radiological features of the SPN. We have retrospectively collected patient medical history and radiological information from 50 subjects who were found to have a SPN measuring 3-30mm on initial CT imaging. Forty-seven of 50 SPNs were later pathologically confirmed as benign or malignant through needle biopsy or surgical resection; the remaining 3 were shown to be stable for >2 years resulting in 25 benign and 25 malignant SPNs. Each CT scan from detection to diagnosis was considered a new time point with the malignancy probability calculated by each model for each scan. The Mayo model yielded the highest sensitivity (100.00%) but lowest accuracy and specificity (62.73%, 18.00%). When considering the time point closest to diagnosis, the Brock model demonstrated the best performance with accuracy (specificity, sensitivity) of 74.00% (48.00%, 100.00%). This model would successfully identify all malignant SPNs and avoid invasive procedures in almost half of the benign cases.

50 - Kathryn Langenfeld

Major(s): Environmental Engineering and Mathematics  
Mentor(s): Craig Just (Civil and Environmental Engineering)

Stable Isotope Enabled Pathway Elucidation of 2,4-Dinitroanisole Metabolized by Rhizobium lichtii

- The environmental fate of 2,4-dinitroanisole (DNAN), a component of new insensitive munitions explosives (IMX) formulations, is an emerging global issue. The new IMX formulations – which all contain DNAN – are replacing old formulations at a rapid pace. However, DNAN has a relatively unknown fate and ecosystem toxicity. DNAN is a nitro-substituted aromatic compound that is similar to, but more soluble than, 2,4,6-trinitrotoluene (TNT). TNT and other nitroaromatics have been shown to cause harm to human health and ecosystems, leading to concern over the impacts of widespread DNAN use. This research has focused on the metabolism of DNAN by Rhizobium lichtii isolated from willow tree tissues. Using liquid chromatography mass spectrometry (LC-MS/MS), R. lichtii was shown to degrade DNAN after 24 hours when additional sources of carbon and nitrogen were present. The findings also demonstrate the utility of stable isotope labeling in elucidating novel metabolites by discovering previously unknown sulfonated and acetylated DNAN derivatives confirmed by high resolution liquid chromatography and LC-
MS/MS. The results also confirm para-nitro-reduction of dinitroanisole to 4-amino- (and 4-hydroxylamino-) 2-nitroanisole, a formerly unseen phenomenon.

52 - Lincoln Lewerke

Major(s): Microbiology
Mentor(s): Craig Ellermeier (Microbiology)

Regulation of RsiV Cleavage by Signal Peptidase: A Role of the Signal Peptide

- Bacteria are capable of responding to extracellular environments by altering the genes they express using Extra-Cytoplasmic Function (ECF) sigma factors. The ECF sigma factor σV allows transcription of genes responsible for resistance to lysozyme, an antimicrobial enzyme of the innate immune system. σV is inhibited by the anti-sigma factor RsiV, a single-pass transmembrane protein, in non-lysozyme conditions. In the presence of lysozyme RsiV is proteolytically degraded. This process is initiated by the binding of RsiV to lysozyme which triggers cleavage of RsiV by the signal peptidase SipS. SipS has no known regulatory mechanism and constitutively cleaves many proteins. We hypothesize features of RsiV allow it to avoid cleavage by signal peptidase in the absence of lysozyme. To test this hypothesis and identify the features of RsiV involved, we replaced the RsiV signal peptide with α-amylase signal peptide. We found that changing the signal peptide resulted in constitutively cleavage of the chimera in the absence of lysozyme. This suggests the signal peptide must contribute to protection of RsiV from SipS cleavage in the absence of lysozyme. This raises the possibility of signal peptides contributing to regulation of other systems and expands the potential role of signal peptidase in bacterial cells.

54 - Zoe Linn

Major(s): Communication Sciences and Disorders
Mentor(s): Karen Bryant (Communication Sciences and Disorders)

Inter-rater Reliability of Novice and Expert Listener Judgments in Identification of Deviant Speech Characteristics in Patients with Parkinson’s Disease after Deep Brain Stimulation

- Speech and voice impairments are common in patients suffering from Parkinson’s disease. Deep brain stimulation (DBS) is a well-established surgical treatment for limb function; however, it does not appear to improve speech and voice symptoms and may even make them worse. The two most established targets for DBS -- subthalamic nucleus (STN) and globus pallidus internus (GPI) -- may result in different speech outcomes. Auditory perceptual judgments are the gold standard for diagnosing a motor speech disorder. Judgment of severity level, selection of management options, and assessment of a patient’s response to treatment are all based on ongoing auditory perceptual judgments. This study will examine the inter-rater reliability of auditory perceptual judgments based on a single study population, PD with STN- or GPI-DBS. Expert and novice judges will be asked to listen to audio recordings of patients with PD with their DBS on and off and make auditory perceptual ratings across three speech parameters: voice quality, articulatory precision, and prosody. These judgments will serve three purposes: (1) investigate the reliability of novice and expert judgments, (2) determine whether novice listeners
are able to detect speech abnormalities, and (3) identify and contrast speech changes following STN- and GPI-DBS. /  

56 - Nicholas McCarty  
**Major(s):** Biochemistry, Microbiology  
**Mentor(s):** E. Dale Abel (Internal Medicine and Biochemistry)  

**MicroRNAs as Potential Regulators of Glucose Metabolism within Anucleate Thrombocytes**  
- Thrombocytes are anucleate cellular fragments derived from megakaryocytes which function as an integral component of the circulatory system. Diabetes mellitus is characterized by heightened levels of circulating glucose, thrombocyte hyperactivity, upregulation of pro-thrombotic proteins, and suppression of fibrinolysis. This is known as atherothrombosis, and subsequent myocardial infarction often follows. Ongoing investigations demonstrate the existence of a functional microRNA pathway within anucleate thrombocytes. Thrombocytes express two glucose transporters (GLUTs) - GLUT1 and GLUT3. An understanding of the mechanisms linking platelet metabolism and thrombus formation could serve to reduce the high cardiovascular mortality observed within diabetics. We have generated a mouse model with platelet-specific deletion of GLUT1. Bioinformatics approaches have elucidated putative microRNAs which could serve as post-transcriptional regulators of metabolic mRNAs. Additional investigation will serve to enhance our understanding of the various mechanisms by which metabolic proteins are regulated within anucleate cell types.

58 - Alyssa Mendenhall  
**Major(s):** Biomedical Engineering  
**Mentor(s):** Edward Sander (Biomedical Engineering)  

**Quantification of Collagen Production in Young and Old Dermal Fibroblasts**  
- Collagen is the main component of the extracellular matrix (ECM) of skin. As we age, our skin becomes thin and fragile because the fibroblasts in the dermis no longer maintain the ECM, possibly because these cells no longer “feel” basal levels of tension in the ECM due to age-related ECM fragmentation. To test this hypothesis, we quantified ECM production by human dermal fibroblasts from 14, 16, 23, 62, and 93 year old donors in fibrin gels. ECM production was measured as hydroxyproline content (i.e., collagen) after 10 days of culture. Gels containing 1e6 cells/mL were maintained at 37°C, 5%/95% CO2/Air, and in DMEM supplemented with 10% FBS, 50 μg/mL ascorbic acid, and 1 ng/mL TGF- that was regularly replaced until harvest. To simulate a tension-free, aged-dermis, some gels were detached from the tissue plastic. To simulate a tension-filled, young-dermis, some gels remained attached in order to generate a basal level of tension. Hydroxyproline levels in harvested gels were roughly twice as high in young compared to old cells but no difference was observed due to whether the gels were attached or detached. These results suggest aging affects the cells more than the ECM.
60 - Drew Miles

Major(s): Physics, Astronomy
Mentor(s): Randall McEntaffer (Physics & Astronomy)

Off-Plane Diffraction Grating Performance and Applications

- Blazed off-plane reflection gratings are being developed to meet the high throughput and spectral resolution requirements of future X-ray missions. We examine absolute efficiency measurements made in the 0.3 – 1.5 keV energy band at the Physikalisch-Technische Bundesanstalt (PTB) BESSY II facility for three holographically-ruled off-plane gratings, two of which are blazed. Each blazed grating was tested in both the Littrow and anti-Littrow configurations in order to test alignment sensitivity with regard to throughput. The experimental results are generally consistent with theory and demonstrate that the blaze does increase throughput to one side of zero-order. However, the total efficiency of the non-blazed, sinusoidal grating is greater than that of the blazed gratings, which suggests that the method of manufacturing the blazed profiles fails to produce facets with the desired level of precision. We also outline previous and upcoming missions that will include off-plane gratings.

62 - Kylie Moore

Major(s): Psychology
Mentor(s): Michael O'Hara (Psychology)

Depression and High Risk Behavior in Young Adults

- Young adults experience stressors in their life that may lead them to experience symptoms of depression. Furthermore, in an effort to relieve stress, young adults in college might engage in high risk behaviors such as substance abuse and sexual risk taking. Previous research has found a positive association between risk behaviors and depression. However, the mechanisms behind this relationship is unclear. In this study, I examined hopelessness as a mediating variable and gender as a moderating variable between high risk behavior and depressive symptoms. It was hypothesized that higher levels of depression would be correlated with higher levels of hopelessness, which would lead to increased high risk behavior. Also, it was expected that women who reported higher levels of high risk behavior would be more likely to report higher levels of depression than men. To test this hypothesis, correlations, independent samples t-tests, and multiple regression analyses were run. No relationship between hopelessness and depression and risk behaviors was found. However, sexual risk was associated with symptoms of depression as measured by the Inventory of Depression and Anxiety Symptoms in women. Future research on gender differences in the relationship between high risk behaviors and depression is encouraged.

64 - Devon Moose

Major(s): Biochemistry
Mentor(s): Bridget Lear (Biology)
Regulation of a Sodium Leak Channel in the Drosophila Circadian Pacemaker

- Sodium leak channels regulate neuronal activity through alterations in the electrochemical gradient across the membrane. Mutation in the conserved regions of these channels are associated with a decrease in mental function, arthrogryposis, and hypotonia. Narrow Abdomen (NA) is a Drosophila nonspecific leak channel that is permeable to both sodium and calcium. It functions in the circadian pacemaker neurons to regulate activity and produce the diurnal behavior. NA forms a complex with Unc-79, Unc-80, and Nlf-1. Unc-80 and Unc-79 act as scaffolding proteins and Nlf-1 functions as a chaperone protein for NA. Loss of expression in Unc-80, Unc-79, Nlf-1, or NA has a dominant negative effect on the protein expression of the others. A current model suggests that the rhythmic expression of Nlf-1 transports NA to the membrane, and that is the cause of diurnal activity. However, our preliminary data suggests that the complex is stable and that it is unlikely that the turnover rate for NA is less than 24 hours. To test this model, I am using a temperature sensitive GAL4-GAL80 system to limit the expression of RNA interference that knocks down na and Nlf-1 either in adulthood or development.

66 - William Narhi

Major(s): Psychology
Mentor(s): Susan Lutgendorf (Psychological and Brain Sciences and Obstetrics and Gynecology and Urology)

Quality of Life in Long-term Advanced Stage Ovarian Cancer Survivors

- Ovarian cancer is an extremely lethal disease with a five-year overall survival rate of 45%, which drops to 27% for advanced stage (stages III and IV) disease. The ten-year survival rate is about 16% for advanced stage patients. Past research has investigated quality of life (QOL) in long-term (> 5 years) ovarian cancer survivors diagnosed with early-stage disease and thus have a better survival rate. To our knowledge, however, the QOL of advanced stage long-term ovarian cancer survivors has not been previously investigated. The present study investigates QOL, depression and resilience in 61 long-term (>10 years) advanced stage ovarian cancer survivors. These women completed online questionnaires including the Functional Assessment of Cancer Therapies – Ovarian Form (FACT-O), the Center for Epidemiologic Studies Depression Scale (CESD) and the Psychological Well-Being Scale (PWB). We examined differences in these factors between survivors with 0-1 recurrence and those with multiple recurrences since their initial diagnosis. Preliminary results indicate that long-term survivors with multiple recurrences have poorer functioning in several aspects of QOL but show equivalent levels of depression and well-being. These findings may be useful for determining potential mental health and QOL issues in long-term survivors who may benefit from additional intervention.

68 - Carl Olson

Major(s): Computer Science, Statistics
Mentor(s): Aaron Stump (Computer Science)

Structured Navigation and Manipulation with Parse Trees
Structured editing of programming languages aids a programmer's understanding and efficiency. Many languages are created with a grammar to parse programs. By parsing a program one can supply parse information for constructing a tree representation of the program being edited. Using the constructed parse tree one can navigate and manipulate a program. From a grammar this can all be done without much additional work. Using the GNU Emacs text editor, we have implemented this functionality for multiple languages. So far we’ve shown that selection, navigation, inspection, syntactic highlighting, indenting, and error reporting are possible. Now we are exploring possibilities that greater feedback from our tools could provide, such as type information.

70 - Yuefeng Pan

Major(s): Marketing and Finance
Mentor(s): Cathy Cole (Marketing)

Does Adding Calorie Information Change Choices For All Consumers?

- Consumers make food choices every day, and their preferences changes significantly from eating tasty to eating healthy. Not only because the regulations and policies force fast food chains to declare nutrition facts, but also the whole society is moving forward a healthier eating style. This research examines a cross impact between two criteria: nutrition facts on the menu and nutrition knowledge of consumers.

72 - Adiceson Peppels

Major(s): Psychology
Mentor(s): Ryan Lalumiere (Psychology)

D1 and D2 receptors in the infralimbic and medial orbitofrontal cortices differentially mediate the reinstatement of cocaine seeking in rats

- Previous studies have shown that the medial prefrontal cortex (mPFC) plays a vital role in mediating drug-seeking behaviors. The infralimbic cortex (IL) and medial orbitofrontal cortex, both components of the mPFC, have been shown to mediate cocaine-seeking behaviors. Dopaminergic neurons innervate both of these structures, but the precise role that dopamine plays in mediating the reinstatement of cocaine seeking is unknown. These experiments looked at whether D1 and D2 receptor activation within the IL and the mOFC are involved in cocaine seeking during reinstatement tests. Male Sprague-Dawley rats underwent cocaine self-administration followed by extinction training and reinstatement tests. Directly preceding reinstatement testing, rats received microinjections of the D1 antagonist SCH 23390, the D2 antagonist sulpiride, or vehicle. D1 receptor blockade in the IL reduced cued reinstatement. In contrast, D1 receptor blockade in the mOFC reduced all 3 reinstatement types. Additionally, blocking D2 receptors in the mOFC had no effect on any reinstatement type. Contrary to previous work indicating that IL activity is involved in suppressing cocaine seeking, our findings suggest that D1 and D2 receptor activation in the IL promotes cocaine seeking.
74 - Peter Schumacher

Major(s): Geoscience, English
Mentor(s): David Peate (Earth and Environmental Sciences)

Examining Plagioclase Populations and What They Indicate for the Volcanism of the Berserkjahraun Lava Flows of Snaefellsnes, Iceland

- The volcanism of Iceland’s western peninsula is unusual compared to the rest of the island. Icelandic magmatism is mostly due to extensional melting from the Mid-Atlantic Ridge and magma upwelling from the local hot spot. This does not appear to be the case in the Snaefellsnes Peninsula, which exhibited volcanism that occurred too far away from the rift zone to be extensional. In addition, lavas on Snaefellsnes are compositionally different from the rest of the island (Snaefellsnes lavas are more alkaline), and the magma had to have risen through exceptionally thick basaltic crust to erupt at the surface. The Berserkjahraun lava flows are located on Snaefellsnes, and contain enough diversity within the samples to categorize them into four distinct compositional groups. This project analyzed the plagioclase content and composition from various samples of each of the four groups as part of a larger study on the Berserkjahraun flows as a whole. Many of the plagioclase grains exhibit sieve texturing, suggesting magma mixing or the ripping up of cumulates during magmatism. Electron microprobe analysis revealed a trend of less anorthite content in plagioclase cores to greater anorthite content in their rims, suggesting a more-evolved composition mixing with a less-evolved composition.

76 - Luke Stroth

Major(s): Anthropology
Mentor(s): James Enloe (Anthropology)

Hot Rocks 2: Rocks a-Popping: Applications of XRF data in understanding the integrity of an archaeological site

- This poster explores the potential applications of using XRF data to assess site integrity and inform the taphonomic processes that go into site formation, particularly those associated with a hearth feature. One such application is to facilitate refit analysis, by grouping elements into potential refit groups based on similarities in chemical composition. The subject of the refitting analysis was the fire-cracked rock assemblage from the University of Iowa Field School at Woodpecker Cave (13JH202), a site known to have been disturbed by previous excavation. Two distinct cultural horizons were present, separated by roof spal. Overall, XRF analysis was demonstrated to be a technically effective, if time-consuming, method. A further application of XRF data is presented, in the form of projecting chemical data in three-dimensional space. The lower horizon, associated with a hearth feature, was predominately calcium and iron outliers, while the upper horizon, associated with 1956 backdirt, was predominately chlorine and potassium outliers. Through experimental burning and taking samples from the cliff face, differences in chemical composition could be linked to human activity and help explain the site formation process.
**WWI Iowa Anti-German Sentiment: A Comparative Study**

- From 1840 to 1910 America welcomed several million German-speaking immigrants. By the end of the 19th century two Iowa communities, Davenport and Burlington had 40% German-American populations. Many historians have noted the occurrence of anti-German sentiment before, during and after the First World War in cities across Iowa. Early research revealed there were marked differences of Anti-German sentiment in both Davenport and Burlington. Davenport German-Americans experienced more discrimination and acts of violence, while Burlington suffered far less in comparison. Differences of anti-German sentiment between these two Iowa communities are the focus of this research. To comprehend these differences comparative data will be examined from population fluctuations, religious preferences, learning and literacy, industrial development, state and national election results, and newspapers published from 1914 to 1920. I feel this work is important because it re-evaluates how we consider the history of anti-German sentiment one hundred years after the war.

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**Sex specific postnatal changes in telomerase expression after prenatal stress**

- In the embryonic and adolescent brain, many factors contribute to proper development. Our lab has shown that prenatal stress (PS) decreases telomere length (TL) in females and increase telomerase reverse transcriptase (TERT) expression in males at postnatal day 0 (P0). PS may affect TERT expression, causing a decrease in TL in females and a compensative increase in TERT expression in males. It is hypothesized that PS affects telomere biology in neurodevelopment, and in this study, we aim to examine the prolonged effects on telomere biology into adulthood. We looked at TERT protein levels using immunohistochemistry. We sought to rescue the TL through pharmacological intervention, namely TA65, which acts to “increase” TERT activity. P28 female mouse brains, categorized into four groups: PS/gruel, PS/Ta65, non-stressed/gruel, and non-stressed/Ta65, were examined. Sectioned brains were stained with anti-TERT. Photographs of stained brain sections were analyzed; fluorescence was quantitatively measured using Image J. We found the PS females have lowered levels of TERT in caudate putamen (p < .05), but TA65 doesn’t affect the TERT levels. We plan to evaluate the possible differences between males and females in regards to changes in TERT levels at P28 caused by PS and TERT rescue via TA65.
Role of Interleukin-1 in Traumatic Brain Injury Pathogenesis

- Traumatic brain injury (TBI) is the leading cause of death and disability in children in the US. Current treatment is supportive with no existing targeted pharmacologic therapies. Inflammation is a secondary response to TBI that may worsen tissue injury and outcome. Neuroinflammation is mediated in part by the interleukin-1 family of cytokines. We aim to characterize the IL-1 response to experimental TBI using the lateral fluid percussion injury (FPI) model in mice, and using genetic blockade of IL-1β, will isolate and further characterize its role. Using real time PCR, IL-1β expression was measured following TBI. Motor and cognitive outcome were assessed using an accelerating rotarod assay and the Barnes Maze assay respectively. Lesion volume was measured by microscopy. Following TBI, IL-1β expression was significantly increased at 2 hrs in the ipsilateral parietal cortex (3.16 FPI vs 1.40 sham,) and at 6 hrs in ipsilateral parietal cortex (15.11 FPI vs. 1.29 sham,), ipsilateral hippocampus (76.29 FPI vs. 1.07 sham), and brainstem (56.42 FPI vs. 1.01 sham). There was significant cortical tissue loss following injury (9.05%). Preliminary data suggests that IL-1β knockout mice may have less motor and cognitive impairment after injury. Studies are ongoing using pharmacologic and genetic blockade to determine if this trend is significant and if this pathway represents a potential therapeutic target.

84 - Rebekah Truhan

Major(s): Anthropology
Mentor(s): James Enloe (Anthropology)

THE HIDDEN STRATIGRAPHY OF WOODPECKER CAVE: A GIS DERIVED, MODEL-BASED APPROACH TO ESTABLISHING STRATIGRAPHY IN VISUALLY HOMOGENEOUS ARCHAEOLOGICAL DEPOSITS.

- The sediment stack at Woodpecker Cave (13JH202) does not possess an easily discernible stratigraphic sequence. Woodpecker Cave’s deposits are visually homogeneous colluvium derived from glacial loess mobilized from above the rock shelter. The lack of visible stratigraphy has necessitated the creation of a digital model from which to analyze the spatial provenience of a variety of mapped objects in order to differentiate between sections of the sediment stack that may have originated from different anthropogenic or geologic inputs. Of principal interest to this study are the spatial positions, orientations, and densities of plotted finds, two-shot plotted finds, and mapped roof spall. This study suggests that while the matrix composition remains the same throughout the sequence at Woodpecker Cave, patterns of intrusive geologic and anthropogenic materials change through time and space and are detectable in GIS.

86 - Steven Tucker

Major(s): Environmental Sciences
Mentor(s): Tori Forbes (Department of Chemistry)

Synthesis and Characterizations of Lanthanum (III) Sulfate Compounds
The synthesis and characterizations of novel lanthanum sulfate compounds is essential for thin film technology that is used for the purification of H2O. Thin film is manufactured to remove harmful chemicals and minerals out of groundwater so water can qualify as drinkable according to the Environmental Protection Agency (EPA) standards. Lanthanum (III) oxide is an inorganic compound that can act as a catalyst for other ferroelectric reactions and as an ingredient for optical materials. The methods we use to synthesis the new compounds are hydrothermal reactions that use a pressure sealed “bomb” that is heated at over 200 degrees Celsius for several days, room temperature evaporation of the solution from scintillation vials, and vacuum filtration. Solvents such as pyridine, concentrated sulfuric acid, hydrochloric acid, and others react with lanthanum (III) nitrate hexahydrate to form crystal structures that can be used as nanotubes for thin film technology. We manipulate the ratio of lanthanum to solvent from 1:1, 1:2, 1:3, and vice versa. With different solvents, new molecular interactions with lanthanum form with other elements which, in effect, forms frameworks that affect the tertiary structures of the crystals produced. Overall, we have discovered four novel structures of lanthanum sulfate compounds so far in Tori Forbes’s laboratory that have the potential to become new building blocks for thin film technology that can become more environmentally-friendly to the public.

88 - Hannah Tykol

Major(s): Nursing
Mentor(s): Melissa Lehan Mackin (Nursing)

Evaluating the Knowledge of Sexual Health Among Adolescents With and Without ASD

• Autism Spectrum Disorder (ASD) is a developmental disorder with significant behavioral and social deficits. Many youth with ASD have few opportunities for sexual education due to exemption from health classes, lack of extensive peer networks, and unavailability of resources specific to their needs. In order to reduce risks to sexual health and safety of those affected with ASD, it is important to identify the sexual health knowledge within this population. The Assessment of Sexual Health Knowledge (ASK) Measure was created by the research team and is based on the National Sexuality Education Standards (NSES). The ASK Measure evaluates sexual health knowledge in adolescents with and without ASD. Participants included in this study were between 12-20 years old and completed an in-person interview at the University of Iowa College of Nursing. Consent from parents, minors, and adult participants were obtained prior to participation in this study. Current data shows that every participant except one (n=5) had the minimum levels of knowledge of sexual health. Data collection in progress and will continue through the end of the year with a goal of recruiting 120 participants. Findings from this study will be used to develop targeted education interventions for adolescents and young adults with ASD.

90 - Ivy Vance

Major(s): Chemistry
Mentor(s): Sarah Larsen (Chemistry)

Adsorption of Cu2+ on Electrospun Hematite Nanofiber/Mesoporous Silica Core-Shell Material
The use of electrospun hematite nanofibers coated with a mesoporous silica shell was probed as a potential adsorbent for heavy metals from wastewater. The hollow pores that make up the mesoporous silica shell result in very high surface areas and very good adsorption properties. Electrospun hematite nanofibers consist of fine, nano-scale rods of iron oxide (hematite form). Electrospun hematite nanofibers with a mesoporous silica shell of sixty nanometer thickness were successfully synthesized and functionalized with propylamine groups. Both the parent and the functionalized material were characterized using powder X-ray diffraction, nitrogen adsorption isotherms, Fourier transform infrared spectroscopy and thermogravimetric analysis. A series of adsorption studies were performed using copper as a model heavy metal ion to determine the effects of functionalization of the core-shell material had on adsorption capacity. It was determined that the amine functionalized mesoporous silica core-shell material showed an increase in adsorption capacity compared to the bare hematite nanorods.

92 - Josh Volker

Major(s): Biomedical Engineering
Mentor(s): Rhonda Souvenir (Internal Medicine) Dale Abel (Internal Medicine)

Altered mitochondrial dynamics in platelets results in a prothrombotic phenotype

- Thrombosis is a characteristic of many cardiovascular diseases, and it is often associated with platelet hyperactivity. Preliminary findings revealed an increase in transcripts for mitochondrial dynamics proteins including Optic Atrophy-1 (OPA1) in obese mice, which correlated with increased thrombosis risk. This project seeks to determine through a mouse model if changes in mitochondrial dynamics, i.e. the fusion/fission cycles of mitochondria, will induce platelet dysfunction and promote thrombosis. Mitochondrial dynamics was altered by platelet-specific deletion of the critical fusion protein OPA-1. Mitochondrial oxygen consumption, glycolysis rate, ATP production and respiratory capacity were reduced by 50% as assessed by Seahorse XF-24 extracellular flux. Reduced mitochondrial fission protein 1, complex I, II, IV, and increased mitochondrial fusion protein mitofusin 2 (P<0.05) were observed in OPA-1 knockouts as detected by western blotting and native polyacrylamide gel electrophoresis. P-Selectin binding and integrin αIIbβ3 externalization in response to agonists was significantly increased (P<0.05) in knockout mice. These findings, coupled with shortened time to stable occlusion of the carotid artery following photochemical injury (36.4min vs 18.6 min), lead to the conclusion that mitochondrial dysfunction that develops on the basis of impaired mitochondrial fusion promotes platelet hyperactivity and thrombosis in mice.

94 - Zachary Wehrspan

Major(s): Biochemistry, Economics
Mentor(s): Ronald Weigel (Surgery) Mikhail (Surgery)

Loss of TFAP2C Leads to Warburg Effect in Breast Cancer and Opens New Opportunities for Cancer Treatment

- TFAP2C displays regulatory functions that influence tumor development in HER2 breast cancer from luminal to basal phenotypes. Current therapies are ineffective at targeting basal HER2
breast cancer cells, so understanding TFAP2C shows promise to develop more effective
treatments to remedy aggressive cancers with poor prognosis. TFAP2C controls the expression
of ER(alpha), and knockdown of TFAP2C leads to the EMT (Epithelial-Mesenchymal Transition),
ingcreasing the proportion of cancer stem cells. This transition also comes with a metabolic and
morphological shift demonstrated in MCF7 sKD-NT (knockdown nontargeting) and sKD-C
(knockdown TFAP2C) cell lines. The metabolic shift was characterized by the reduction in
OXPHOS usage coupled with an increase in aerobic glycolytic activity measured by the rate of
cellular oxygen consumption versus extracellular acidification rate. This increase in aerobic
glycolysis is known as the Warburg Effect, the transition from glucose to lactate production in a
cell. Loss of TFAP2C increases chemoresistance in CS like cells due to the degradation of the
balance of internal and external pH. By understanding the mechanism behind how TFAP2C
regulates the luminal phenotype, new treatments can be developed to function in the altered
pH and metabolic states of the basal phenotype of HER2 cells.

96 - Alexander Wolff

Major(s): Biochemistry
Mentor(s): Daniel Weeks (Biochemistry)

Non-Pathogenic, Biologically Functional Amyloids: A Potential Solution to a Fundamental
Problem in the Early Embryonic Development of Xenopus laevis

- A trademark of Xenopus oogenesis is the mass deposition of maternally derived proteins and
nucleic acids in preparation for fertilization and early embryonic development. This pool of
maternal molecules controls early development until zygotic gene transcription is initiated at the
4,000-cell stage. While amyloid aggregates have been historically associated with
neurodegenerative diseases and other pathological conditions, we hypothesize that the mature
Xenopus oocyte takes advantage of biologically functional amyloids in storing maternally
deposited proteins in preparation for early embryogenesis. We have observed both cytosolic
amyloids and a variety of non-membrane bound, amyloid-containing nuclear particles in mature
Xenopus oocytes through staining with a commercially available, amyloid-specific dye, Thioflavin
T, and with anti-oligomeric or anti-fibrillar amyloid antibodies. The next steps for our laboratory
are (1) the design of novel antisense DNA oligonucleotides targeting endogenous mRNA of
molecular chaperones and disaggregases, and (2) the development of an assay to isolate
amyloid-containing particles from mature Xenopus oocytes and embryos. We are evaluating
the efficacy of an antisense oligonucleotide targeting the TRiC chaperonin, TCP-1 (t-complex 1).
Additionally, we are synthesizing a biotinylated, methoxy-protected analog of X-34, an amyloid-
specific dye that will allow for the capture of amyloid-containing particles via streptavidin-
coated magnetic beads.

98 - Fangren Yu

Major(s): History
Mentor(s): Shuang Chen (History) Newall Ann Van Auken (Chinese)

Going back to Anhui: Formation of Huizhou Culture
This paper is about formation of local cultural identity and its contribution to localism. In 1934, the Chinese Nationalist government put one county of Huizhou (Wuyuan) under the jurisdiction of Jiangxi Province. This policy severely irritated natives of Huizhou. From 1934 to 1947, Huizhou people never stopped their efforts on behalf of the “Going back to Anhui” movement. By setting the “Going back to Anhui Movement” as a starting point, this essay aims to discuss Huizhou culture’s formation through anti-Jiangxi sentiment’ development, kinship connection among its six counties, and commercial activities in late Imperial China.