2015 Undergraduate Research Symposium

March 18th
Reitz Union
Grand Ballroom

Sponsored by:

University of Florida
Center for Undergraduate Research
# TABLE OF CONTENTS:

- Welcome: 2
- Agenda: 3
- Best Paper Award Winners: 4
- Student Abstracts: 6
- Faculty Mentors: 135
Welcome

Welcome to the 16th Annual University of Florida Undergraduate Research Symposium. Undergraduate research is one of the five areas of opportunity, (along with internships, service, leadership, and international experience), which students are encouraged to participate in during their undergraduate career.

This has been a busy year for undergraduate researchers presenting their research efforts. Brandon Krishna Lam has been selected to represent UF at the 20th Annual Posters on the Hill event, sponsored by the National Council on Undergraduate Research, April 22-23, 2015 in D.C. His poster will be one of 60 that were selected from close to 500 applications. His poster title is: SOCS1 critically regulates lupus like skin pathology; implications for a SOCS1 like peptide intervention. Congratulations to both Brandon and his research mentor Dr. Joseph Larkin, Assistant Professor, Department of Microbiology and Cell Science.

CUR has provided travel awards to 26 undergraduates who have made research presentations at professional conferences across the country, and 61 students presented their work at the 6th Annual Florida Undergraduate Research Conference (FURC) in Daytona Beach. Additionally, over 1600 students have taken advantage of the opportunity to earn credit for their researcher efforts by registering for research credit in the fall semester.

The symposium is organized to showcase this year’s undergraduate research efforts from across campus and is hosted by the Center for Undergraduate Research. This year 260 posters and original performance pieces are highlighted. Students representing over 100 departments will present their work.

Each of these students has benefitted from mentoring provided by exceptional faculty and graduate student researchers. We thank them for their efforts on behalf of these students. Faculty mentors are listed following the abstracts.

We encourage you to share in this project as you visit the presentations and read the collection of abstracts.

Enjoy,

Anne E. Donnelly

Director, Center for Undergraduate Research
# Undergraduate Research Symposium

**March 18, 2015**  
**Reitz Union Grand Ballroom**  
**Program in Brief**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>9:00am – 9:15am</td>
<td>Group 1 Poster Set Up</td>
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| 9:15am - 9:30am | Welcome  
Dr. Bernard Mair, Associate Provost for Undergraduate Affairs |
| 9:30am – 10:30  | Poster Session 1 (even numbers)                                      |
| 10:30am -11:30am | Poster Session 2 (odd numbers)                                       |
| 11:30pm -11:45pm | Group 1 Poster Breakdown                                             |
| 12:30pm – 12:45pm | Group 2 Poster Set Up                                               |
| 12:45pm – 1:00pm | Best Research Paper Contest Winners Presented, Dr. Creed Greer, III, Program Director, University Writing Program |
| 1:00pm – 2:00pm | Poster session 1 (even numbers)                                      |
| 2:00pm - 3:00pm | Poster Session 2 (odd numbers)                                       |
| 3:00pm         | Poster Session B ends, Breakdown                                      |
1. **Predictive Processing in Semantically Constraining Sentences**, Nicholas Feroce and Dr. Edith Kaan, Associate Professor, Department of Linguistics, College of Liberal Arts and Sciences, University of Florida

The idea that people are actively predicting upcoming words as they read or listen to sentences is one that has gained an increasing amount of attention in recent years (Van Petten & Luka, 2012; Kaan, 2014). In this experiment, the topic of semantic prediction was explored via event-related potentials and examination of the N400 effect (a pronounced negative wave that has been found to reflect anticipatory processing in language) in sentences of varying semantic constraint. 21 native English speakers silently read sentences as brainwaves were recorded from electrodes atop their scalps. Sentences were either designated high-cloze (highly constraining, such as “The barber cut my ___ hair”) or low-cloze (lowly constraining, such as “I don’t like my ___ hair”) and were presented to participants one word at a time. To further investigate if there is evidence of semantic prediction, a delay paradigm was employed, whereby the presentation of a word was sometimes delayed by 300ms. In both the delay and no-delay conditions, there was a larger N400 for low-cloze sentences than for high-cloze sentences. This was interpreted as there being a lack of any specific prediction in the low-cloze condition. Additionally, the N400 appeared to be unaffected for low-cloze sentences between delay and no-delay conditions, but in high-cloze sentences the N400 was smaller in the delay than in the no-delay condition. This smaller N400 in the high-cloze delay condition suggests that the presentation delay may strengthen a reader’s prediction.

2. **Phenotypic Analysis of Gene Loci Identified as Risk Factors for Type 1 Diabetes**, Serena Martin. Research Mentor Clive Wasserfall, Assistant in Pathology, UF Department of Pathology, Immunology and Laboratory Medicine, College of Medicine, University of Florida

Type 1 diabetes (T1D) is an autoimmune disorder linked to the degradation of pancreatic β cells. These cells are responsible for producing insulin, a hormone that regulates blood sugar. Genome wide association studies have linked multiple loci as risk factors for the development of T1D. This study analyzed single nucleotide polymorphisms (SNPs) representative of loci that are immune specific (IL-2 receptor α (CD25)) as well as metabolism and pancreas related (insulin/insulin-like growth factor 2 (INS/IGF-2) and Cathepsin H (CTSH)). While prior research identified T1D risk loci, there was limited evidence available on the phenotypic consequences of these genotypes. The hypothesis of this study is SNPs within CD25 and INS/IGF-2 loci will stratify serum levels of soluble CD25 (sCD25) and IGF-2, respectively. A secondary hypothesis is SNPs within the CTSH locus will stratify serum levels of sCD25 and CTSH. To test these hypotheses, genotyping assays were used to determine the SNPs and enzyme-linked immunosorbent assays (ELISA) were used to measure the serum levels. Results included data from 309 samples of the following cohorts: controls (n=68), subjects with T1D (n=126), subjects with new onset of T1D (n=27), first degree relatives of those with T1D (n=87) and subjects with type 2 diabetes (n=1). This study analyzed healthy control versus T1D effects as well as genotype versus phenotype effects. This study has revealed a trend for lower IGF-2 levels at onset of disease in those with the AA INS/IGF-2 SNP. Higher circulating levels of sCD25 were associated with the TT SNP for the CD25 allele irrespective of disease status. Future work includes using alternative methods to measure CTSH levels in serum and utilizing larger cohorts to increase the statistical power. Understanding mechanistic pathways is critical to understand progression and ultimately intervention for T1D and other chronic conditions, which place undue burdens on affected individuals, their families, and society in general.
3. Effects of Leaf Mass on Plant Competitive Ability, Brandon Peterson¹, Jessica Langebrake², Scott McKinley¹, and Jeremy Lichstein² (¹Department of Mathematics, University of Florida, ²Department of Biology) College of Liberal Arts and Sciences University of Florida

An important question in ecology and plant physiology is how leaf functional traits, such as leaf mass per area (LMA), relate to plant life-history strategies. LMA, a trait that depends on the thickness and density of leaf tissues, is correlated with other plant functional traits, including a negative correlation with photosynthesis per-unit leaf mass and a positive correlation with leaf lifespan (LL) (Wright et al., 2004 [2]). However, there is limited understanding of the mechanisms that relate LMA to the life-history strategies of plants, such as whether a species is fast-growing and short-lived (deemed “early-successional”) or slow-growing and long-lived (“late-successional”).

One way to gain a clearer understanding of how LMA relates to plant successional strategies is to recognize that LMA is a composite trait, reflecting the mass per area of multiple types of tissue (Poorter et al. 2009 [1]). We focus on two separate components of LMA: photosynthetic tissue, which contributes solely to photosynthesis, and structural tissue, which contributes to the longevity of leaves (LL). We analyze a mathematical model of competition between plant species that differ in their investments to these two components to determine the optimal LMA components of early-successional and late-successional plants. We hypothesize that (i) the LMA of the most competitive late-successional species will be dominated by structural rather than photosynthetic tissue, and (ii) the LMA of the most competitive early-successional species will be dominated by photosynthetic rather than structural tissue.

4. Pulmonary Vascular Pruning in Response to Radiation, Matt Wilhelm¹, Dustin Begosh-Mayne², Walter O’Dell³, College of Liberal Arts and Sciences, Department of Biology¹ College of Medicine², Department of Radiation Oncology³, University of Florida

The lungs are highly sensitive to radiation. Following irradiation, acute endothelial cell damage and inflammation leads to blockage of the lumen of small arterioles. Prolonged occlusion leads to resorption (pruning) of these microvessels can lead to downstream radiation pneumonitis and long-term fibrosis. This cascade of events is hypothesized to occur in patients receiving radiation therapy (RT) for lung cancer. Quantification of vascular pruning due to the loss of small arterioles is important in evaluating current and future treatment plans for the estimated 221,200 new cases of lung cancer in 2015. Using in-house software, extraction of the vascular structure from three-dimensional (3D) X-ray computed tomography (CT) scans and quantification of the morphological features of the vascular tree can be used to compute the changes over time in the total vascular structure post-RT. After scanning and analyzing several representative patient data sets of 3D CT scans, a trend was discovered in the pruning of the vascular tree post-RT beginning 2-3 months post exposure that progressed through 7-8 months, followed by a partial recovery shortly starting from 9-10 months. These results demonstrate for the first time the ability to measure changes in vascular anatomy non-invasively in humans following radiation exposure. This new information can be applied to further research and development of treatment planning, in addition to an increase of quality-of-care for lung cancer patients receiving RT.
Enhancing the Efficacy of Dendritic Cell Vaccines in Immunotherapy for Glioblastoma (GBM) with Tetanus Toxoid

Glioblastoma (GBM) is a brain tumor that is currently treated with toxic, non-specific chemotherapy and radiation. Dendritic Cell (DC) vaccines are an immunotherapeutic approach to treating GBM in which host-derived DCs are pulsed with tumor-specific RNA and reintroduced into the patient. In a clinical trial, it was demonstrated that priming the injection site of a DC vaccine with a tetanus (Td) vaccine leads to increased migration of DCs to the lymph nodes, which in turn leads to a greater anti-tumor response and superior overall survival. This phenomenon was later confirmed in murine models, and is thought to be a Td-mediated memory response. The purpose of this study was to characterize the DCs and T cells that are influenced by Td priming. Mice were immunized with 2 doses of Td vaccine, and primed with Td 24 hours prior to a DC vaccine. Controls were primed with saline. The results indicate that Td toxoid enhances the migration efficiency of DC vaccine to lymph nodes, but does not affect the degree to which they remain in the lymph nodes a week after vaccination. Td priming appears to cause a localized increase in CD4+ T cells relative to CD8+ T cells in the lymph nodes, but not in the spleen. T cells isolated from the lymph nodes of Td primed mice demonstrated enhanced antigen-specificity and reactivity. Further experiments will be performed to isolate the antigen-specific T cells and identify particular phenotypic differences elicited by Td toxoid priming.

Exploring Novel Materials for an Aerospike Nozzle

An aerospike nozzle is one of the most efficient rocket nozzles to date. Instead of the flow being constrained by the walls of a traditional bell shape nozzle (which is designed for a specific altitude), an aerospike has the flow on the outside of the walls, so the flow is able to expand to the atmosphere as the rocket goes up in altitude. It isn't used in industry because it is difficult to manufacture, expensive, heavy, and it doesn't have a high enough Technology Readiness Level. Exploring novel materials other than the traditional metal superalloys (i.e. Inconel) may make using an aerospike nozzle more feasible. A cement carbon fiber mesh was explored as a potential new material. Several different processing techniques and different types of carbon fiber and cement were attempted. The mechanical properties were characterized through Finite Element simulations and in house testing using an Instron machine.
Understanding the Barriers to ART Initiation for HIV-Positive Children 2-18 Months of Age in Swaziland

One third of HIV-positive infants are expected to die before the age of one without antiretroviral therapy (ART). However, fewer children are enrolled in antiretroviral therapy (ART) than adults in Swaziland, Southern Africa. The purpose of this study is to identify barriers to initiating HIV-positive infants (aged 2 to 18 months) on ART in Swaziland. The study also seeks to quantify the losses of HIV-positive infants along each point in the continuum of pediatric HIV care, which starts from HIV diagnosis through a DNA PCR sample collection to ART initiation and retention. The study revealed that socioeconomic barriers as well as the caregiver's health-seeking behaviors and socio-cultural beliefs have an impact on ART initiation among children. Caregivers of control patients seem to engage in better reproductive practices than caregivers of cases, which suggest the need to improve preventive and antenatal services among HIV-positive women to potentially increase pediatric ART initiation. The findings of this study will be used to implement interventions to improve national programs for HIV-positive children within Swaziland.

An Empirical and Numerical Study of Heat Exchangers in Automotive Applications

The cooling system in automotive applications plays a key role in engine sustainability and efficiency, as well as overall vehicle performance. This is especially true in high-performance automotive applications, such as in the Formula SAE Series. Using empirical measurements of air flow through the radiator from UF’s 2014 FSAE vehicle along with computational fluid dynamics (CFD) software, a porous media model is constructed to compute the air mass flow rate through the radiator. These simulations allow for more accurate cooling system modeling and provide the ability to iterate multiple design concepts simultaneously.
The Effect of Therapeutic Alliance on Treatment Outcome in Pediatric Obsessive-Compulsive Disorder

Obsessive-compulsive disorder (OCD) has been classified as one of the top 10 most debilitating medical conditions. Cognitive-Behavioral Therapy with Exposure and Response Prevention (CBT-E/RP) is currently identified as the first-line course of treatment for pediatric cases of OCD, however 20-40% of affected youth are estimated to be treatment non-responders. One treatment-related factor that has emerged as a reliable predictor of treatment response is Therapeutic Alliance (TA). No study has comprehensively examined the relationship between TA and treatment outcome in pediatric OCD. To measure this relationship over the course of CBT-E/RP, patients completed the Working Alliance Inventory to assess overall child-rated TA, therapists completed the Therapeutic Alliance Scale for Children-Revised to measure therapist-rated TA, patients’ dimensional symptom severity was measured using the Dimensional Yale-Brown Obsessive Compulsive Scale. We found a differential effect of TA on symptom severity across dimensions. In the more stigmatized dimensions of harm, sexual/religious, and miscellaneous symptoms higher TA was associated with greater symptom reduction. No effect was observed in other dimensions. These results suggest that it may be important for therapists to consider alliance based on the dimension that they’re working on. Limitations include small sample size and lack of alliance variability.

The Dual Effect of HIV-1 Tat and Methamphetamine on Dopamine Transporter Function

Human immunodeficiency virus (HIV) infected individuals often display cognitive deficits associated with changes in dopamine neurotransmission in the brain. These effects are believed to be partially due to the HIV peptide Tat. Previous studies indicate Tat targets the dopamine transporter (DAT). DAT regulates dopamine levels in the brain by clearing the released dopamine via reuptake mechanism. DAT is also the primary target for the drug of abuse methamphetamine (METH). METH increases dopamine levels in the brain by altering DAT function, leading to both the rewarding and addictive effects of METH. Importantly, there is a high prevalence of METH abuse in HIV patients, although the influence of this comorbidity on dopamine neurotransmission is unknown. In this study, we investigated the dual effects of METH and Tat on dopamine clearance via DAT. Using a fluorescent DAT substrate, we measured uptake in DAT-expressing cells exposed to Tat and METH. Both Tat and METH alone decreased DAT-mediated uptake. Combined presence of Tat and METH, augmented the effect of METH, decreasing uptake significantly below baseline. These findings suggest that HIV-Tat by itself affect brain dopamine level and METH use in HIV infected individuals may further increase the deleterious effects of METH and brain dopamine neurotransmission.
**Influence of Fatigue on Lower Extremity Mechanics During Forward Lunge**

Soft tissue injuries to the knee stabilizers most often occur during landing and cutting types of activities where the knee flexes under eccentric control of the quadriceps muscles. Fatigue of the stabilizing muscles is also thought to contribute to an increased injury risk. During rehabilitation, lunge exercises are often used as a safe exercise to train the muscles in a manner that mimics the lower extremity mechanics observed during injury. However, we do not know how fatigue may affect the ability to safely perform lunge exercises. Thus, the purpose of this study was to investigate which, if any, biomechanical changes occur during a fatigued state when completing a forward lunge task. Eight healthy males and females completed several lunges until a maximum state of fatigue was reached, defined as a 9 out of 10 on the modified rating of perceived exertion scale. The first and last two trials were used to analyze pre- and post-fatigue data. Results revealed that fatigue caused increased variability in frontal hip and ankle angles and decreased variability in frontal knee angles. The results of this study demonstrate a decreasing trend in stability at the hip and ankle joints, which could potentially lead to injury.

**Synthesis of Single-source Precursors for Growth of WOx Thin Films**

WOx thin films have a variety of uses including charge-injection layers in Organic Light Emitting Diodes (OLEDs) and Organic Photovoltaics (OPVs) due to their high work function, high transmittance, and semiconductance. Chemical Vapor Deposition (CVD) has the capability of fabricating thin films of controlled nanostructure and thickness given the right metal organic precursor. CVD relies on the vaporization of the precursor, and as such the precursors therefore must be volatile or highly soluble in a suitably volatile organic solvent; they must also be thermally stable. Complexes of the type WO(OR)3L \( [R=CH3, \ C(CH3)3, \ L=acac, \ dpm, \ acac] \) have been successfully synthesized and characterized for growth of high purity WOx by CVD. Synthesis of these complexes follows displacement of alkoxide by bidentiketonate ligand at the coordination sphere of WO(OR)4. Analysis by sublimation and thermogravimetry shows that evaporation occurs between 70-80 °C (250-300 mTorr), suggesting that these compound are suitable candidates for growth of WOx by CVD.
Euclid Galaxy Cluster Searches

As the most massive virialized structures in the universe, galaxy clusters are important probes for studying structure evolution and cosmology. This project tested two different methods for the detection of high-redshift galaxy clusters based on the capabilities of the future Euclid space telescope. We use mock data created from dark matter halo merger trees of the Millennium Simulation, with photometry derived from three Euclid NIR bands (Y, J, H in the range 0.92-2.0 μm). The first method we tested used color and magnitude cuts in our sample of objects to remove the bulk of sources at lower redshifts, then search for the most significant overdensities of galaxies above the local background, and determine these to be high-z cluster candidates. Because the Euclid bands are of shorter wavelength than the optimum, this method has primarily been effective in identifying only the most massive high-redshift clusters, with a completeness of ~60% for halo masses greater than 5 x 10^{14} solar masses. The second method uses statistical analyses of the photometric redshifts to search for overdensities, which is a higher fidelity approach, but requires the addition of ground-based data to derive photometric redshifts. In particular, we have been working to optimize the determination of cluster locations, redshifts, and richnesses for this method.

Florida Real Estate Market: International Buyer Trends

The United States’ global reputation of success has influenced international investors to seek U.S. capital, and specifically, U.S. real estate in recent years. Although international investors are purchasing real estate all throughout the U.S., international buyer trends in the Florida real estate market is more relevant for my role as a licensed Florida Realtor®. My research consisted of secondary data that was previously obtained by the National Association of Realtors®. I studied two types of reports annually published from 2008 to 2013: “Profile of International Home Buyers in Florida” and “Profile of Home Buyers and Sellers in Florida” reports. Although I primarily gathered information regarding international buyers, I also collected overall Florida market data as a basis of comparison with domestic trends. My research focused the following international buyer trends: realtor transactions, countries of origin, property type, sales price, purchase method, Florida region, location type, decision factor, and price comparison.
Trehalose Induced Autophagy as a Possible Treatment of Peripheral Neuropathies

The peripheral neuropathy, Charcot-Marie-Tooth disease type 1A (CMT1A) is one of the most commonly inherited neurological disorders. CMT1A is characterized by nerve demyelination in the peripheral nervous system, muscle weakness, and eventual muscle tissue loss. An established model of CMT1A is the Trembler J (TrJ) mouse, which harbors the same leucine-to-proline (Leu16Pro) mutation in peripheral myelin protein (PMP22) that has been identified in human CMT1A patients. Our previous studies have identified the autophagy pathway to have potential in alleviating CMT1A phenotype by removing the abnormal PMP22 and improving myelin quality. Trehalose, a natural disaccharide used as a dietary supplement, has been shown to induce autophagy in a number of models however its effect on Schwann cells or peripheral nerves is unknown. In this study we are testing the effects of Trehalose (50 and 100 mM) on Schwann cells in vitro, and in male and female wild type (Wt) and TrJ mice. Cohorts of 2-mo old mice were assigned to water or 1% Trehalose in water and are being weighed weekly and tested monthly on the rota rod for neuromuscular behavior. Post-treatment, we will analyze peripheral nerve morphology, nerve myelin content and nerve-muscle junctions. These studies will provide insights if trehalose could be proposed as a dietary supplement for neuropathic patients.

New Multivariate Programs for the Comparative Analyses of Natal Sex-Biased Dispersal in Mammals

The unique existence of a common ancestor imposes co-variation among traits of even distantly related species, which must be accounted for while studying the evolution of these traits. In this study, a new computer algorithm is presented that enables the multiple regression of species’ characters under an evolutionary model of Brownian motion. Specifically, subject data is made statistically independent using phylogenetic correlations and Felsenstein’s independent contrasts, from which a multivariate model is derived having (mostly) optimized assumptions. Further minimization of multicollinearity and standard error also permits biologically interpretable results and improves model reproducibility. Using this methodology, separate multivariate models are currently being developed for males and females across species in mammals to test whether seven life-history traits important to ecological literature are responsible for the known sex-specific differences in mammalian natal dispersal. Special care is given to regression through the origin and the treatment of outliers as independent contrasts mandates a non-trivial approach. Finally, all experimental analysis is conducted using R, and the ability to automate model selection is discussed.
"The Feasibility of Solar-Powered Aquifer Storage and Recovery: A Cost-Benefit Analysis from St. Kitts and Nevis"

In 2014, The World Economic Forum, The White House, and The World Health Organization published independent reports highlighting the need to find a long-term solution to address the growing problem of water scarcity. "The Feasibility of Solar-Powered Aquifer Storage and Recovery: A Cost-Benefit Analysis from St. Kitts and Nevis", analyzes the economic feasibility of using photovoltaic (PV) energy to supply the island with potable drinking water. The cost-benefit analysis compares the net present value (NPV) of a PV-powered ASR system to that of a grid-operated one by using an incremental cash-flow analysis. Three sensitivity analyses evaluated the robustness of the assessment, by evaluating how fluctuations in key variables affect the economic feasibility of the project. It was shown that the system powered by renewables would generate substantial savings over the useful life of the project, which includes significant decreases in quantifiable metrics such as the annual operating costs, but also qualitative environmental benefits such as a reduction in greenhouse gases. Utilizing solar technology to supplement the islands traditional water resources is therefore an attractive alternative, which generates substantial economics benefits and allows for a sustainable supply of potable water.

Autophagy Induction in AC-16 Human Cardiomyocytes: Effects of Resveratrol and Rapamycin

Mitochondrial dysfunction and increased oxidative stress have emerged as key contributors to the deterioration of heart function. Autophagy is a physiological process by which damaged components are removed from cells thus increasing efficiency. The up-regulation of autophagy could reverse detrimental effects of aging. We hypothesized that resveratrol (plant polyphenol) and rapamycin (immunosuppressant) induce autophagy in AC-16 human cardiomyocytes (AC-16 HC) independently and produce a synergistic effect in combination. AC-16 HC cells were incubated for 24 hours with resveratrol (50uM), rapamycin (1uM) and a 1:1 combination of the treatments and then analyzed. Though minimal, autophagy was up-regulated with the treatments thereby supporting the initial hypothesis but the combination data was not statistically significant, thereby suggesting lack of synergistic effect. This prompted the investigation of (1) different doses (75uM and 1.25uM) of resveratrol and; (2) different durations (16 hours and 36 hours) of treatments. This, however, did not enhance the modest autophagy induction in AC-16 HC. Resveratrol and rapamycin independently showed modest up-regulation of autophagy in AC-16 HC cells, but the combination did not yield additive effects. Since the increased doses and varied incubation times did not enhance the effects, we tentatively concluded that only modest autophagy induction can be provoked.
The Effect of Glycerol Addition on Growth of Scenedesmus in Landfill Leachate

Microalgae have a rapid growth rate and possess the ability to accumulate intracellular lipids. Algae also have significant potential for wastewater bioremediation. Algae can be grown in three modes: autotrophic using light energy, heterotrophic using organic carbon sources, or mixotrophic using a mixture of both. Currently, heterotrophic and mixotrophic growth of algae is limited primarily due to the cost of procuring an organic carbon source. Glycerol is a waste by-product of biodiesel production. This resource could potentially be utilized as a carbon source to grow algae. The objective of this research was to investigate the effect of crude glycerol addition on biomass growth and lipid content of algae grown in landfill leachate. Scenedesmus cf. rubescens, a locally isolated strain with demonstrated ability to produce lipids, was selected as the test organism. Scenedesmus cf. rubescens was grown in Bold’s Basal Medium. Algal growth experiments were conducted in 125 ml Erlenmeyer flasks (100 ml active volume). Subcultures were inoculated with exponentially growing mother cultures at a volumetric ratio of 20% (v/v). Cultures were illuminated at 300 µmol photons/m2/s on a 12:12 photoperiod. All experimental trials were conducted in triplicate. Algal growth was monitored by spectrophotometry using absorbance at 680nm.

Microdrives for High-Density Electrode Arrays

A central goal of neuroscience research is linking neural activity to behavior. In order to accomplish this, researchers need technology to observe hundreds of neurons in the brains of behaving animals over long time periods of weeks to months. This research project describes the design, development, and optimization of such mechanical devices, or “microdrives,” which help to fundamentally understand the brain. Specifically, the “Jaren-drive” models the Neuronexus n-drive design, which involves shuttling silicone probes linear arrays into a brain region of interest. The “Jaren-drive”, however, is approximately 96 percent more cost efficient than the commercial product. Moreover, to our knowledge, the “Jaren-drive” is the first computer aided design for positioning silicone probes into the brain, in which a moveable shuttle is constructed during the printing process. Compared to the Neuronexus n-drive, the “Jaren-drive” provides approximately fifty-three percent more insertion range than the commercial product, 12.8 mm versus 6.0 mm, respectively. As a result, this research project has enabled the lab of Dr. Burke to readily and simultaneously record in different brain regions, reduce costs for the mechanical devices necessary to collect the electronic signals, and reach greater depths in the brain.
Impact of Coping Mechanisms on Black Students who experienced Race-related Stress

The purpose of this study is to explore how coping mechanisms impact Black college students who have experienced race-related stress. This qualitative study looks at the perceptions of 6 undergraduate students that self-identify as a African/Black person. Participants were asked to get involved in a semi-structured interview that explored their thought of being a Black student in a predominately White institution, their experiences with racial discrimination, their coping strategies from these experiences, and how prayer and meditation is used in these situations.

Modulation of the BK Potassium Channel by a Targeted Peptide Alters Sound Evoked Neuronal Activity

Peptides are naturally occurring small molecular chains of amino acids that perform important biological functions. Designer peptides can be used to target specific ion channels that govern neural excitability, thus effectively modulating the action potential firing of neural groups located within specific brain regions. In our study, we've shown that there are possible therapeutic uses of custom peptides in modulating auditory dysfunctions associated with the BK-channel, a large conductance Ca-activated K+ channel that is vital for auditory processing. We tested two different types of custom peptides: 1) openers which increase the frequency an ion channel is in the open state, and 2) closers, which increases the frequency which the channel closes. Our experiments are the first demonstrating successful modulation of auditory processing, in vivo, via use of custom peptides. Our testing significantly increased neuronal responses to auditory stimuli. We used current source density to show ion-current flow through the extracellular space of the measured region. This allows us to assess the effective excitation and inhibition produced during sound activation. Our results from the inferior colliculus, a key hearing center in the brainstem, indicate that modulation of the BK-channel via custom peptides alter encoding of sound over a significant time period.
Rotational Diffusivity of Nanoparticles and Biological Fluid Viscosity in Concentrated Protein Solutions

Magnetic nanoparticles have found many applications in drug delivery, where particles are exposed to highly crowded biological environments. The crowding modifies the particle dynamics in application, which must be better understood and modeled in order to effectively use nanoparticles for treatment. Magnetic particles can be used as viscosity probes for fluids, which can be applied to biological systems for analyzing fluid dynamics. This work used magnetic nanoparticles in concentrated protein solutions to analyze particle rotational diffusivity, viscosity of biological fluids, and how well models predict viscosity of protein solutions. PEG-silane coated magnetic nanoparticles were used and bovine serum albumin was the model protein, where solutions of pH 2.7-10 and concentrations up to 350 g/L were tested. Viscosity and diffusivity was determined using susceptibility measurements, and compared to several models. Results show change in the rotational diffusivity of the particles and viscosity of BSA solutions as a function of protein concentration. The relationship could be well described by the Stokes-Einstein equation, even at high concentrations. The particle rotational diffusivity was inversely related to viscosity, having implications for particle dynamics in biological fluids. Finally, standard models fit experimental data, accounting for BSA conformation change at different pH values through shape parameters.

microRNA-375 Promoter Methylation in Oral Squamous Cell Carcinoma

Irregular DNA methylation within gene promoters contributes considerably to tumorigenesis. MicroRNA-375 (miR-375) is exceedingly under-expressed in oral squamous cell carcinoma (OSCC). This short non-coding RNA acts as a tumor suppressor inhibiting gene expressions essential to oral cancer cell survival. It has been previously demonstrated that chemotherapeutic drugs that prevent cell proliferation and stimulate cell death can also reactivate miR-375. However, the mechanisms of miR-375 induction and its relationship to proliferation or cell death are not fully elucidated. A CpG-rich island was identified in the miR-375 promoter region, indicating that DNA methylation could be an important mechanism controlling miR-375 expression. In this study, duplicate samples of OSCC cells were administered chemotherapeutic drugs. miR-375 level changes were quantified by RT-qPCR, and bisulfite sequencing was performed in order to detect the changes in DNA methylation pattern between untreated cells and drug-treated cells that express higher levels of miR-375. The aim of this project is to determine whether aberrant DNA methylation is an underlying mechanism in miR-375 underexpression in oral squamous cell carcinoma and whether chemotherapeutic drugs can change the methylation status of miR-375 gene.
Can Measured Muscle Synergies Reconstruct Unmeasured Muscle Excitations?

Recent studies suggest that muscle synergies, a low-dimensional representation of a large set of experimentally collected muscle excitations, may provide an avenue for increasing the uniqueness of muscle force solutions when trying to predict knee contact forces. This study explores the feasibility of using muscle synergy information collected by surface EMG from 8 muscles to accurately reconstruct additional muscle excitations collected from up to 16 other muscles using surface and fine-wire EMG. Muscle synergy analysis was performed on subsets of 8 surface excitation profiles using non-negative matrix factorization (NMF) to obtain a low-dimensional set of time-varying signals and a corresponding set of weighting vectors that specify contributions to individual excitations. Using the neural commands obtained from synergy analysis, we performed a least-squares regression analysis to obtain a set of synergy vectors that would reconstruct the remaining surface and fine wire excitation profiles not included in the synergy analysis. This method was termed “synergy extrapolation”. Synergy extrapolation was able to account for greater than 90% and 88% of variance on average in healthy subject and stroke subject data respectively. Overall, synergy excitations extracted from muscle subsets were able to reconstruct remaining muscle excitations with high reproducibility.

MR Spectroscopy and Functional Measures in Boys with DMD 12 – 18 Months Prior to Loss of Ambulation

Duchenne Muscular Dystrophy (DMD) is a rare X-linked genetic disorder. With disease progression, dystrophic muscle is ultimately replaced with fat and other noncontractile tissue. DMD is characterized by progressive weakness, decreased mobility, and diminished physical activity (PA). The purpose of this study was to investigate muscle pathology, functional ability, and PA over the last year of being ambulatory in boys with DMD. A retrospective analysis was performed for 10 non-ambulatory boys at a time point 12-18 months before loss of ambulation. Proton magnetic resonance spectroscopy assessed muscle composition, 6-minute walk test (6MWT) measured functional abilities, and an accelerometer determined PA. Increases in lipid infiltration were observed in the soleus and vastus lateralis muscles over 12-18 months. Before becoming non-ambulatory, subjects walked 120-360m for the 6MWT. Activity monitoring revealed low energy expenditure before losing the ability to walk. Subjects spent the majority of their time at sedentary and light activity levels before loss of ambulation. Spectroscopic measures, the 6MWT, and PA may provide information to better understand changes in boys with DMD prior to losing ambulation. Future research should investigate how these measures can be used to predict loss of ambulation in boys with DMD.
101 Years with the Machine: Parallels in Architecture from 1914 to Now

Now, over a decade past the 21st century, is it safe to say that there exists an updated spirit? With the Information Age replacing the Industrial Age as the progenitor of a new architecture, what changes? This research seeks the parallels between the forces that formed Modernism; the technological advancements of the 20th century such as mass production of steel, concrete and glass, assembly production of automobiles and rapid rise in urban workers, to that of a new epoch of architecture that is using technologies of the 21st century, such as information access, networks, unlimited use of mobile devices and collective intelligence to understand an architecture of this generation.

Heart Rate Variability in Infants Undergoing Therapeutic Hypothermia Treatment: Preliminary Findings

Hypoxic-ischemic encephalopathy (HIE) in neonates has led to major neurodevelopmental disabilities. Therapeutic hypothermia (TH) has demonstrated promising results for treatment in these infants. Currently, only 1 in 8 infants respond to TH or have none to minimal damage seen on magnetic resonance imaging (MRI) following treatment. To determine responders to TH, it is critical for clinicians to have a reliable bedside predictor, of which, heart rate variability has been shown to potentially distinguish responders to TH. The objective was to further evaluate the use of HRV as a bedside predictor for responders to TH in newborn infants diagnosed with HIE using MRI results obtained 72-96 hours following treatment. Nine infants diagnosed with HIE were cooled to 33.5oC for 72 hours using TH. HRV was measured using a spectral analysis of heart periods from which the parasympathetic and sympathetic tone were quantified. HRV measurement occurred 24-48 hours after initiation of TH and only in infants not receiving respiratory support during measurement. Findings indicated a difference in autonomic control with greater sympathetic tone in responders versus non-responders. Findings support further investigation of HRV as a bedside predictor in infants undergoing therapeutic hypothermia for HIE, in particular clarification of how respiratory support and timing at which measurement occurred influenced study outcomes.
House-Elves and Hermione: Slavery and the Other in Harry Potter and the Goblet of Fire

Children's literature in general is discounted because it is regarded as having no cultural, societal, or political implications. My research challenges these notions by investigating the role of the house-elf in J.K. Rowling's Harry Potter and the Goblet of Fire. Through Hermione's crusade for the welfare of house-elves, the status of the house-elf as the Other is revealed. The inclusion of the Other in literature is generally a device to prompt a person or culture to examine itself. This paper investigates Hermione’s journey learning about the larger social and political structures that have defined, excluded, and enslaved members of the magical community which don’t have clear-cut solutions. I argue that the inclusion of this theme, especially once the Harry Potter series had huge international audiences, brings to the attention of both the child and adult reader the real, parallel issues of slavery and human rights in the world outside of the Harry Potter books that the 20th and 21st centuries want to ignore.

Wind Load Design Recommendations for Sawtooth Roof Structures

The wind loads on sawtooth roofs in the United States are typically estimated using ASCE 7-10 Minimum Design Loads for Buildings and Other Structures. Wind pressures are designated using specific zones on the roof (interior, edge and corner), and are adjusted based upon the building dimensions. The definition for the size of the corner and edge zones for low-rise buildings found in ASCE 7-10 was originally determined by Statathopoulos (1979). The edge zone was defined as the distance from the edge required for the pressures to reduce to 70% of the peak pressure. The current study examines the influence of the building height on the magnitude of the worst suction acting on the roof and develops a more appropriate roof designation to envelop pressures up to 70% of the peak value experienced. This study included several roof spans and three building heights. The windward span of the classic sawtooth roof building is also found to act more similarly with the monoslope roof building. This would be different from the currently held approach used in ASCE 7 wind design load standard which assumes a constant size for roof zones (Zones 1, Zone 2, Zone 3). Recommendations will be provided to develop an appropriate method for choosing Zone dimensions.
Power and Wealth: Axe Shaped Iron Ingots in Viking-age Europe

The notion of “medieval hoard” conjures the image of a collection of gold or silver coins, bracelets, and earrings. It is much more difficult to imagine that for certain parts of early medieval Europe, iron tools and implements were sufficiently valuable to be hoarded. Collections of such artifacts from 9th-century Moravia (the eastern part of the present-day Czech Republic) and Viking-Age (9th- to 10th-century) Norway include a number of artifacts that cannot be classified either as tools or as weapons. For lack of a better name, they have been called “axe-shaped ingots.” In Moravia, those iron bars appear in deposits, stray finds and burial assemblages. Hoards and graves may be dated with some degree of certainly to the 9th and early 10th century, and axe-shaped ingots from Norway have been dated to that same time. What was then the purpose of those artifacts? Why were they in simultaneous use in two regions of Europe so far from each other?

The Effect of Poly(Lactide-co-Glycolide) Nanoparticle Size and Polyvinyl Alcohol/CTAB Coating on Transfection Efficiency into Human Mesenchymal Stem Cells

Poly(Lactide-co-Glycolide) (PLGA) nanoparticles (NPs) are often employed as delivery vehicles for drugs or gene therapeutics into several types of cells. In this study, PLGA NPs were emulsified in several formulations of polyvinyl alcohol (PVA) and Cetyltrimethylammonium bromide (CTAB). Each formulation produced a different average diameter and zeta potential for the NPs. A filtering system was used to overcome the challenge of high energy particle aggregation at such a small scale. This study intends to test the efficacy of a range of NP diameters with an overall negative charge on their uptake into human Mesenchymal stem cells (hMSCs). Once an ideal uptake size is identified, testing with DNA conjugation and subsequent hMSC transfection will occur. We hope that this study will aide in the design considerations of future labs conducting hMSC transfection experiments using NPs.
**Interaction of Alu Polymorphisms with Instances of Discrimination in the Context of Hypertension in African-Americans**

African Americans are disproportionately affected with hypertension in comparison to non-Hispanic, white Americans and have a 30% higher instance of mortality due to associated cardiovascular disease. Our study investigated this disparity from a combination of genetic and sociocultural perspectives. Three Alu insertion/deletion polymorphisms, instances of discrimination, and West African genetic ancestry were studied in the context of diastolic and systolic blood pressure levels in a population of African Americans living in Tallahassee, FL (n=163). The Alu polymorphisms in the ACE, TPA, and WNK-1 genes were selected based on previously published findings of association with hypertension in European populations but had never been studied concurrently in an African American population. The ACE D allele was significantly correlated with higher blood pressure, but neither the TPA nor WNK-1 Alu polymorphisms were associated with blood pressure levels. Multiple linear regression models were created with combinations of the Alu genotypes, sociocultural variables, and discrimination scales. The inclusion of the interaction of the ACE genotype with instances of discrimination experienced by individuals close to the participant improved the model and made the WNK1 genotype significant. This result signals an epigenetic interaction between ACE and WNK1. West African genetic ancestry was not significantly associated with blood pressure and reduced the strength of every model tested.

**Exploring Implications of Gender Differences in Perceived Maternal Support and Internalizing Symptoms among Children**

Perceived social support is related to well-being among children. Parents are the primary source of support in childhood and can buffer risk for internalizing problems (i.e. anxiety/depression). Gender differences in rates of internalizing problems are well-known; however, it is not known whether gender differences in perceived parental support play a role in these processes. The present study addresses this gap by examining relations among stressful life events (SLE), perceived support (PS) from mothers, and internalizing problems among girls and boys. Ninety-eight children and parents reported recent SLEs, PS from mothers, and internalizing problems (IP). SLEs were dichotomized into low (0-1 events) or high (2 or more events). Regression analyses revealed that PS was significantly predicted by the interaction between gender and SLE. Specifically, for children with high recent SLEs, girls reported more PS than boys. For children with low SLEs, no gender differences in PS were observed. Further analyses showed that IP was significantly predicted by the interaction of PS and gender. Higher PS was linked with lower internalizing problems for boys only. Results suggest that boys and girls differentially benefit from perceived maternal support. Future studies should investigate the origins of the gender difference in PS.
Presence of Aftereffects Using A Robotic Exoskeleton

Stroke survivors experience balance and coordination deficits that impair their walking ability and function. Robotic devices have recently been developed to improve the efficacy and efficiency of neurorehabilitation for walking dysfunction post-stroke. It remains a question whether the robotic effects are passive, providing biomechanical constraint, or active, inducing neuromechanical adaptation. Aftereffects describe persistence of altered movement patterns following repetitive, controlled movements in novel conditions once the perturbation is removed and the subject performs unconstrained movements. Here we investigated whether a robotic exoskeleton induces aftereffects, reflecting acute adaptations that might be leveraged to restore gait patterns post-stroke. Healthy individuals wore an actuated robotic exoskeleton, the Tibion Bionic Leg (TBL), on one leg for >2hours while walking, standing, sit-to-stand and stair climbing. Participants were studied with 3D motion analysis during unconstrained walking immediately following TBL removal and at 5:00 intervals over 30:00. We analyzed gait kinematics for differences in joint angles relative to baseline including presence of asymmetries after wearing the TBL. Acute changes in kinematics would confirm the presence of an aftereffect suggesting an active, vs. passive, role of the TBL. Our results provide insights to inform design and use of rehabilitation robotics to improve walking function in stroke rehabilitation.

Kidney Microanatomy for Modeling Radiation Doses during Alpha Particle Radionuclide Therapy

This study investigates variations in kidney nephron size in relation to ranges of alpha particles for potential cancer therapy. A combination of tissue sectioning, immunohistological staining, confocal imaging, and measurements have been made of the proximal tubules, distal tubules, and glomeruli across the 3 cadaver kidney specimens. The proximal tubule diameter (from outer wall to outer wall) and wall thickness averages ranged 54-65µm and 7 -15µm. The distal tubule diameter and wall thickness averages ranged 36-50µm and 4-12µm respectively. The average number of bowman's capsules found in each sample varied between 11 and 32. As hypothesized, there were some statistically significant variations in microscopic aspects of the kidney nephron among the selected specimens. The differences between kidney 1 and kidneys 2 and 3 were found to be statistically significant in most cases. The variations between these kidney specimens are nonlinear and appear to be based on patient differences alone. These measurements demonstrate the multiple facets of patient variability in kidney nephron size. Finally, due to the short range of alpha particles typically used in radioimmunotherapy (on the order of 50-80 µm), the range of variability in these microanatomical structures is relevant to future investigations of radiation dosimetry and kidney toxicity.
Social Perceptions of Atheists in the African American Community

Research and polling opinions depict that Americans don’t like atheist; they are a social hazard to society. There is plenty of research that display that a main reason anti-atheist biases occur is due to distrust. We tend to distrust atheist due to their lack of morality since they don’t believe in a higher power. However, is distrust the only operating socio-cultural mediator when it comes to these discriminatory behavior in all communities. The assumption we have is that in the African American communities, anti-atheist prejudices occur due to the fact that atheist inhibits empowerment which limits social mobility potentially or in-group unity. With a sample size of 200 African American and 200 Caucasian volunteers, we will test our assumption that anti-atheist biases operates differently in the African American communities. It is important to shed light on the discrimination that atheist individuals or groups face because they are still a part of society and even though knowledge on anti-atheist biases is present, society has, yet, to treat this marginalized group any better.

Election Day Registration and the effect it has on the Youth Vote

There are many costs and barriers related to voting that make it difficult for Americans to vote. In an effort to ease some of these barriers, seven states have allowed Election Day Registration (EDR). This article will examine how EDR affects voter turnout with the youth vote (18-29) in three states Minnesota, Wisconsin, and New Hampshire. I used the Current Population Study (CPS) to look at turnout results and analyze the effect EDR creates. The results showed that there was an increase in voter turnout in those states initially and then that increase becomes the new norm. The attempt to ease the barriers to voting causes a moderate change in voter turnout. From eliminating the closing date in all 50 states to stopping irregular registration office hours there are many avenues America can take to help increase the level of turnout.
Truing or Skewing the Electorate?  Federalism and Non-State Actors in American Elections

The tradition of American federalism creates decentralized elections. States generally determine where to hold elections, what the eligibility criteria are for voting, who may observe the voting process, and more. Although states are responsible for these procedures, they do not successfully reach every eligible member of the electorate—every citizen who is eligible to vote is not registered and every eligible vote cast is not always counted equally. In order to compensate for these cracks within and across the American states, non-state actors arise with two distinct perspectives towards the electorate—one attempts to affirm the electorate’s ability to vote, while the other attempts to conserve the quality of the electorate. This project explores the relationship between non-state actors and the state as well as the interaction between rival non-state actors. Evaluating the normative implications of federalist elections and the role of non-state actors in the electoral process, the project is informed by a qualitative approach, relying on case studies that describe the work of the Lawyers’ Committee for Civil Rights Under Law’s Election Protection efforts, and True the Vote’s voter fraud detection efforts, which represent the affirmative and conservative perspectives of the electorate. I conclude by assessing whether these competing perspectives end up “truing” or “skewing” the electorate.

Investigating the Methane Potential of Sweetpotato Culls

Sweetpotatoes can be grown for human consumption (table variety) or as a feedstock for bioethanol production (industrial variety). Industrial-type sweetpotatoes are generally drier with higher starch and less sugar contents than table sweetpotatoes. Whether grown for human consumption or biofuel production, agricultural residues such as culls (rotten or damaged sweetpotatoes) are generated during harvest. Cull rates for sweetpotatoes are generally 30% of the overall crop yield, and thus culls represent excess biomass that can be anaerobically digested for methane production. Anaerobic digestion is an effective means of converting organic matter into methane in an oxygen-free environment. The objective of this research was to determine the methane potential of culls from a common table variety (Beauregard) and an industrial-type (CX-1) sweetpotato. Methane index potential (MIP) batch assays for both types of culls were conducted at mesophilic (35°C) temperature, in triplicate. The positive controls for the MIP assays included glucose, cellulose and starch. The results indicated that the Beauregard culls had twice the soluble sugar content of the CX-1 variety and were easily biodegraded. The methane production from the Beauregard culls reached 95% of the theoretical methane yield after 22 days, and followed the trend of the glucose control.
**Function of Ketohexokinase (Khk) in Somitogenesis and Angiogenesis**

Ketohexokinase (Khk) plays an important role in metabolizing fructose. Compared to glucose metabolism, the metabolic mechanism of fructose is not tightly controlled by feedback. Studies on metabolism of fructose have recently garnered attention due to the association of high fructose diets with an increase risk of diabetes and other diseases. These adverse effects in both human and animal models were exhibited during adult stage. However, the impact of fructose diet on fetal development has been overlooked. We utilized the zebrafish as an animal model to study khk function during embryonic development. We proposed whole mount in-situ hybridization with antisense RNA probe to investigate spatial and temporal expression patterns of khk during early embryonic development. We over-expressed khk to study gain of function in developing embryo. Here, we report that khk expression was detected as early as 24 hours post fertilization of zebrafish embryos; we knockdown and over-expressed by injection into 1-2 cell stage of embryo and analyzed the formations of somites (somitogenesis) and new blood vessels (angiogenesis). It resulted in developmental delay, abnormal segmentation with curved body, and severely defective sprouting of new blood vessels. Altogether, khk enzyme in developing embryo is essential for normal embryonic development.

**Fabrication of a Shear Stress Sensor using vertically aligned nanowire arrays**

Shear stress sensors are highly relevant to fluid dynamics, especially in cardiology where the wall shear stresses measured by these devices have been implicated in the causes of certain cardiovascular diseases like atherosclerosis. Piezoelectric barium titanate nanowire arrays offer the potential for the fabrication of sensitive, robust, and direct measurement shear stress sensors by virtue of their high aspect ratio and high coupling coefficient. However, the application of a conformal top electrode to these nanowire arrays poses a challenge. In this work, a conductive polymer, PEDOT:PSS, was used to create a conformal top electrode for a prototype sensor. PMMA was spin coated into the nanowire arrays to form a barrier layer to prevent device shorting and enhance the mechanical stability of the device. This nanowire-polymer device was characterized under dynamic vibration testing for both axial and lateral (shear) modes. The spectral characteristics and sensitivity of the device were measured and it was shown that the device had less than unity coherence but a peak sensitivity of 40.86 mV g⁻¹. Still, the device showed significant departure from frequency dynamic sensor ideals of a large flat band region. Further work must be completed to determine whether the stiffness of the PMMA matrix inhibits full functionality of the device.
Effect of Anti-apoptotic Compound on Tear Production in NOD Mice

Sjögren’s syndrome is an autoimmune disease that causes apoptosis in the lacrimal glands, causing inflammation and decreased tear production. The objective of this study was to test the effectiveness of DrugX (caspase-3 inhibitor) in reducing eye inflammation and preventing dry eye condition using the non-obese diabetic (NOD) mouse model of Sjögren’s syndrome. Saline (negative control, n = 10), Restasis (positive control, n = 12) or DrugX (n = 10) were administered twice per day to the right eye over the course of the 10 week trial. Stimulated tear volumes were collected once a week and at the conclusion of the trial, lacrimal glands were surgically removed for histological examination of inflammatory cell infiltration number and size. Mice treated with DrugX showed significantly higher tear production after 10 weeks compared to the controls. Histological examination of the lacrimal glands did not show significant differences between DrugX and the controls for the number or size of immune cell infiltrate foci. In conclusion, daily application of anti-apoptotic DrugX maintained highest tear volume for NOD mice in comparison to saline and Restasis treatments despite no significant alteration in lacrimal gland inflammation. Therefore, further studies should be performed to determine how DrugX improves tear production.

Individuals with a Reconstructed Anterior Cruciate Ligament Exhibit Reduced Complexity in Neuromuscular Control

Following anterior cruciate ligament reconstruction (ACLR) and rehabilitation, lingering deficits in walking biomechanics are observed. Herein we evaluate the neural contribution to these abnormal gait patterns. Neural control of movement is thought to be simplified by grouping of muscles activations into synergies or modules that can be activated by a single neural command. The purpose of this study was to determine how muscles are functionally linked together and how activation timings and magnitudes may be different in the uninjured and reconstructed limbs. ACLR individuals walked on a treadmill for 3-5 minutes as lower body muscle activity was recorded using electrodes placed on the skin. Data were analyzed using a complex mathematical algorithm and the number of synergies, synergy composition, and activation timing profiles for each synergy were determined for the healthy and injured leg of each individual. It was found on average, an injured leg showed a decreased number of synergies compared to a healthy leg. This suggests a reduced complexity in the activation patterns of the muscles in ACLR individuals during walking. These findings support the use of rehabilitation strategies which target impaired neuromuscular control in walking.
What Are the Implications of Minimum Wage Regulations on Franchising?
Franchising is often overlooked when people speak about “big business.” However, franchise companies are often those that consumers frequent almost every day. U.S. franchisees employ millions of workers, often at low wages. Therefore, when specific laws about workers are discussed, the effects of these regulations on franchising must be examined. Specifically, proposed regulations to increase the minimum wage greatly impacts franchisors and franchisees, not just employees and their families. This article examines the positive and negative effects of increasing the minimum wage requirement on United States franchising.

Chemical Weathering and Composition of Bedrock in the De-glaciated Portion of Western Greenland
Chemical weathering is enhanced in glacial terrains because glacial grinding creates much fine-grained sediment. As continental ice sheets collapse, exposing fresh land surfaces, chemical weathering becomes a long-term sink for atmospheric CO2, a source of nutrients to coastal zones, and affects oceanic fluxes of radiogenic isotopes (e.g., Sr, Pb). Over the past 10,000 years, the Greenland ice sheet has retreated about 100 km from the coast, exposing newly formed watersheds to varying amounts of weathering related to differences in exposure ages and precipitation. Investigating the mineralogy of weathered material and weathering intensity is thus critical to understanding environmental impacts of weathering in glacial terrains. This study assesses the composition and degree of weathering of bedrock, stream bedload, and moraine material in four watersheds in western Greenland using XRF analysis, microscopic examination of mineralogy, and chemical weathering indices. These analyses illustrate that bedload and moraines have similar compositions, reflecting the homogenization of the local bedrock. Bedrock composition is more variable than sediments and less weathered (weathering indices 0-13%) relative to sediment (weathering indices 28-37%) as expected from small grain size. Sediments show little variation in weathering intensity between inland and coastal sites, although water chemistry there reflects differences in weathering minerals.
Truncation and Expression of Aspartic Acid Protease Plasmepsin 10

Malaria is an infectious disease that is increasingly becoming immune to drug treatments due to rapid rates of mutation. The development of new antimalarials could rely on targeting plasmepsins, which are aspartic acid proteases found within the parasite. Plasmepsin 10 (PM 10) will be the focus of this project because the enzyme is found within an infected erythrocyte and could be vital to the plasmodium life cycle. The study is aimed to successfully express PM 10 and obtain a crystal. This will allow the structure of the protein to be analyzed and the creation of specific inhibitors targeting PM 10.

Folded Patch Antenna with Omnidirectional Radiation Pattern and Electromagnetic Interference Protection for Smart Capsules

Capsule based sensor nodes are an attractable architecture for body area networks and the Internet of Things. A Smart Capsule is a pill sized embedded system with microprocessor, wireless transceiver, battery, and plurality of sensors. The system requires a power efficient antenna, for which a folded resonant mode patch antenna is proposed. The antenna is configured to cover the outmost layer of the capsule and features an omnidirectional radiation pattern. The ground plane of the antenna formed in a cylindrical shell shape serves an electromagnetic interference protection function from enclosed electronics in a self-packaged manner, offering high signal and power integrity. The gap between two edges of the patch is utilized for impedance matching leading to high antenna power efficiency. Especially, a trapezoidal patch, where two edges of the patch in an unfolded form have slightly different lengths, is devised and enables the frequency bandwidth of the antenna to be enlarged compared with a conventional rectangular patch counterpart. As a test vehicle, a 2.4GHz folded patch antenna is designed, fabricated, and characterized for use in the Bluetooth Smart band. This folded antenna architecture could satisfy many smart capsule applications for medical and environmental sensor networks, surveillance, millimeter scale robots, etc.
The Effect of Particle Size on Methane Potential of Sugarcane Bagasse

Agricultural residues can be used to produce second-generation biofuels. However, their woody texture presents challenges to biodegradation. Sugarcane bagasse is a lignocellulosic residue that can be converted into bioethanol, but requires extensive pretreatment with high temperature, pressure and chemical additions for effective fermentation. Anaerobic digestion is an alternative conversion technology that produces methane gas, but also has limitations with lignocellulosics. The initial conversion of complex biomass into simple sugars (i.e. hydrolysis) is considered the rate-limiting step because the lignin component prevents microbial access to the degradable fractions of the feedstock. The objective of this research was to determine the impact of particle size on methane production from sugarcane bagasse. Sugarcane bagasse was dried and milled to two particle sizes (2mm and 0.85mm). Methane index potential batch assays were conducted at mesophilic (35ºC) temperature, in triplicate. Positive controls with glucose and cellulose reached 98% and 91%, respectively, of the theoretical methane yield, demonstrating the efficacy of the inoculum. The average methane production from sugarcane bagasse only reached 57% of the theoretical yield, emphasizing restricted hydrolysis from the presence of lignin. However, minimal pretreatment, 2mm to 0.85mm particle-size reduction, increased methane production from sugarcane bagasse by 9% over a 20-day digestion period.

Characterization of Activated Carbon Functionalities to Investigate Mercury Removal

Treatment of water through activated carbons has been widely known and used for over 2000 years. Many organic materials can be used to synthesize activated carbons such as coal, coconut shells, wood, and lignite. Activated carbon is an extremely porous material and produces a large non-polar surface area suitable to adsorb many organics. The goal of this research is to formulate and characterize specific functional groups of physically and chemically activated carbon and investigate modifications to learn its effects and efficiency on mercury removal. The characterization will focus on surface area, pore volume and size distribution, elemental composition, ash content, pH, and yield.
**Perforated Graphene Enabled Organic Vertical Field Effect Transistors**

Following on the heels of the carbon nanotube enabled vertical field effect transistor (CN-VFET, B. Liu et al. Adv. Mater. 2008, 20, 3605–3609) graphene enabled vertical field effect transistors (G-VFETs, M. Lemaitre et al. ACS Nano 2012, 6, 9095-9102) provided an opportunity to distinguish between the mechanisms contributing to the excellent performance of these Schottky barrier controlled devices: barrier height lowering due to the gate field induced modulation of the Fermi level on the carbon side of the junction or tunneling through the barrier due to its gate field induced thinning. Devices fabricated with a continuous layer of graphene probed principally the barrier height lowering mechanism (responsible for 2½ order of magnitude current modulation) while devices fabricated with graphene into which random, micron scale holes had been created probed tunneling as well (resulting in 6 orders of magnitude current modulation). The random hole density in the latter case was limited to 20% of the graphene surface area. Here we describe the performance of devices in which ordered hole arrays permit the exploration of higher hole density G-VFETs.

**Age-related Differences in the Metabolic Cost of Daily Activities**

The population of older adults is rapidly escalating in size in the United States. As members of this demographic increase in age, they become increasingly more susceptible to disabilities and mobile impairments. It is therefore of utmost importance to have accurate tools to assess and prescribe activities of physical functioning that properly meet the needs of older adults. The Compendium of Physical Activities, a resource containing estimates of Metabolic Equivalents (MET) for various daily tasks, is a reliable tool for younger adults, but falls short in measuring the metabolic demands of daily tasks in elderly populations. Therefore, this project aims to test that aging is associated with a difference in the metabolic cost of performing activities of daily living. In carrying out these aims, we assessed pulmonary gas exchange in a sample of adults, with ages ranging from 22 to 88 years, using a portable indirect calorimeter worn while performing various common daily activities, like gardening and cooking. We examined results as energy expenditure, MET values, and as relative metabolic costs. This project is expected to expand the basic understanding of age-related differences in metabolic cost for daily activities to ultimately reduce the burden of physical impairments in older adults.
**The Growth, Inception and Development of The Margaritaville Franchise in the Caribbean: Margaritaville Caribbean (Jamaica)**

The idea of franchising was revolutionized in the late 2000s in the Caribbean by the Margaritaville Company. They captivated the entire market by introducing exciting tourist attractions all across Jamaica with American restaurant concepts to the international airports in Montego Bay and Kingston, Jamaica. The purpose of this research is to analyze success drivers of the Margaritaville Company with the consideration of Jamaica's economy structure, major industries, travel/tourism, and food/restaurant sectors. Through an interview with the Margaritaville Company's senior managers, its strategies for expansion were further analyzed within the context of franchise operations in tourism businesses.

**Photoplethysmography and Heart Rate Variability for the Prediction of Preeclampsia**

Preeclampsia, a hypertensive disorder of pregnancy, is a leading cause of maternal and fetal morbidity and mortality. The cardiovascular physiologic changes pre-date the onset of hypertension and offer an opportunity to predict preeclampsia, enhancing the delivery of healthcare, particularly in underserved areas. Women receiving prenatal care at UF Health’s Shands Medical Plaza were invited to participate. Exclusion criteria included gestational age >24 weeks at presentation, chronic hypertension, pre-gestational diabetes, and renal or cardiac disease. After written, informed consent, continuous ECG and pulse oximetry (photoplethysmography, PPG) were collected for 20-30 minutes with the patient at rest. This was repeated at each prenatal visit until term. Upon delivery, the preeclampsia status was recorded. Timing and morphologic features of the PPG and ECG were extracted and used as a testing set for a Hidden Markov Model trained on data collected at delivery from known preeclamptics and normotensive controls. Data collection and analyses are ongoing. ECG and PPG analysis may enable non-invasive, cost-effective, early prediction of patients at risk for developing preeclampsia, enhancing research and enabling efficient distribution of resources.
Function of the Robo Membrane Receptor in Intervertebral Disk Development

The intervertebral disks connect the vertebra along the axial skeleton. Disks are susceptible to degeneration in aging animals through mechanisms that are not fully understood. Degeneration is strongly implicated as the cause of low back pain. To develop therapies for low back pain, it is necessary to better understand disk biology. By genetically manipulating regulatory pathways in mouse models, we can gain insight into the effects of various genes on disk development and maintenance. We recently identified a role for the Robo cell membrane receptor in regulating disk development. Robo has been shown to interact with its ligand Slit to mediate a wide range of effects in mice. We used RNA in situ and lacZ-Xgal experiments to assess Robo and Slit gene expression patterns in the disks of developing mice, and found that genetic knockout of the Robo 1 and Robo 2 receptors results in enlarged, abnormal disks. To characterize this phenomenon we used a dual fluorescent Cre reporter mouse and showed that this phenotype is not caused by mixing of two distinct embryonic cell populations during disk morphogenesis.

Neuroanatomical Considerations for Anesthesia Sensitivity

UF researchers have suggested pre-surgical neuroanatomical vulnerabilities may interact with surgery variables such as anesthesia to result in cognitive changes. Response to anesthesia is highly variable and damaging to individuals with comorbid health complications. The Bispectral Index Monitor is measurement tool for assessing anesthesia depth that utilizes EEG signals. It is hypothesized that pre-operative frontal lobe thickness and thalamic volume will explain a significant portion of variance in anesthesia responsiveness, as measured via the BIS, during anesthesia induction. This was a prospective and surgery anesthesia-controlled pilot investigation with participants recruited from a larger, ongoing study examining anesthetic management in older adults. The BIS monitor was placed on the left frontal region of the forehead to measure change in response from a set of pre-anesthesia baseline points throughout the induction phase (7 min of the anesthetic). BIS change was calculated using a modified ‘area under the curve with respect to ground’ formula. Our results suggest that frontal lobe thickness is associated with depth of anesthesia, meaning that the thicker your frontal lobe is (i.e. less atrophy), the better your brain responds to anesthesia appropriately. Pre-operative neuroanatomical health and anesthesia responsiveness may not be independent.
Rate-Dependent Hardness, Compressive Response, and Amorphization Behavior of Nano-Grained Boron Carbide

Traditional micro-grained boron carbide (B4C) has exceptional mechanical properties, making it an ideal material for armor applications. However, amorphous behavior under high pressures is a major hindrance to ballistic performance. Nanomaterials often show drastically improved properties due to their reduced grain size. This study is an investigation of the material properties and amorphization behavior of nano-grained boron carbide. The response of the nanomaterial was compared to a baseline micro-grained boron carbide. Vickers indentation was used to determine hardness and to investigate the toughness behavior of the nanomaterial. Compression tests were conducted to determine quasi-static and dynamic compressive strengths. Raman spectroscopy on static indents was utilized to document amorphization behavior. Nano-grained boron carbide exhibited 10.2% higher static Vickers hardness, 17.6% reduction in lateral crack length, 33.3% increase in static compression strength, and 20.0% increase in dynamic compressive strength compared to the baseline micro-grained boron carbide. Nano-B4C also showed significantly lower amorphous intensity. These results have significant positive implications in the implementation of nano-B4C as an armor material.

The Effects of Mycorrhizae on the Competitive Success of Cogongrass

Understanding the mechanisms driving non-native invasions has become increasingly important as more is known about the negative effects of invasions on native ecosystems. In my experiment I evaluated how well non-native plants compete for nutrients with and without mycorrhizae using the invasive Cogongrass (Imperata cylindrical) as a model species. Cogongrass, introduced to Florida from Southeast Asia during the 1920’s, now occurs on over 600,000 ha throughout the Southeastern United States. Species from four native grass genera (Andropogon, Aristida, Eragrostis, and Saroagustris) were chosen to compete with Cogongrass. Twenty replications of three plant communities were arranged: Cogongrass alone, the four native grasses without Cogongrass, and both Cogongrass and the four native grasses together. In half of these replications, the soil was inoculated with a mixture of mycorrhizae common to Florida soils. After four months of growth under experimental conditions, Cogongrass tiller number and tiller height was recorded. To ensure adequate root competition, more time is required before biomass measurements can be made, which will be used to evaluate competitive success. Preliminary data on tiller height suggests that there is no significant difference between the Cogongrass growing in communities with mycorrhizae and communities without mycorrhizae.
**Influence of an Exercise Intervention on Recovery Heart Rates of Young Adults with Intellectual Disabilities**

Adults with intellectual disabilities (IDs) struggle more so than typically developed individuals (TDIs) in both physical activity and cognitive ability relating to daily tasks. Evidence shows that regular physical activity can have a positive impact on quality of life in intellectuals without disabilities. This study focused on expanding the understanding of this phenomenon in students with ID, both male and female by utilizing a known positive correlation between improvement in fitness and decreased recovery heart rate. Young adults with ID were involved in a peer-mentor functional training (FT) program for years (fall/spring semesters) and their recovery heart rate was obtained and compared before and after the physical fitness intervention each semester. The intervention design kept the participants’ heart rates in the aerobic zone (60-70% of the maximum heart rate). Results show that participants involved in the study showed decreases their recovery heart rate compared to the recovery heart rate obtained before the intervention, indicating regular physical fitness could have a positive impact in the health of adults with IDs.

**Utilizing “hot holes” for Photo-Oxidation: Power and Wavelength Dependence**

Plasmonic nanoparticles exhibit unique absorbance properties, allowing researchers to channel low energy visible light in catalyzing various reactions. Most research, however, has focused on the reduction capabilities of these particles, in which excited electrons transfer to semiconductor systems or adsorbed molecules. Interestingly upon light absorption, excited electrons will leave behind a positively charged region, known as a “hole,” that is also capable of participating in chemical reactions. Within this report, the properties of these holes were studied in relation to citrate oxidation on both gold and silver nanoparticles. The dependence of photo-oxidation rate on illumination intensity and photon energy is reported. Future research will employ adsorbates other than citrate to test which reduction potentials are necessary to produce a photocurrent. Such research will allow one to quantify the oxidative potentials of plasmonic “holes” and their dependence on particle shape/size.
Own-Age Bias in Face-Name Associations: Evidence from Memory and Visual Attention in Younger and Older Adults

While crucial for social engagement at all ages, the ability to associate and remember faces and names declines with increasing age. This research examined own-age bias, preference for one's own- versus other-age group, in memory and visual attention. Both younger and older adults demonstrated superior name memory for faces of their own- versus other-age group. Evidence of the role of visual attention in this performance is mixed. Findings are discussed in the context of various social factors that may influence cognitive performance in aging.

Molecular Adsorption of NO on PdO(101)

Heterogeneous catalysis is widely used in industry, primarily for energy conversion and chemical production. Recently, numerous advances have been made towards acquiring an improved molecular understanding of the catalyst surface reactions. Several thermodynamic calculations predict that both Pd(111) and Pd(100) prefer single and multilayer palladium oxide PdO(101) structures which can potentially oxidize nitric oxide (NO), under catalytically-relevant conditions, thus encouraging further studies. Temperature programmed desorption experiments determined that NO saturates PdO(101) at ~0.54 monolayer (ML) at 90 K and five different desorbing species are evident between 100 and 550 K. The majority of the desorbed products contained NO, which indicates that NO does not react on the PdO(101) surface. Reflection adsorption infrared spectroscopy results show that at low coverage, NO adsorbed in flat and atop (atop-Pdcus) configurations on coordinatively unsaturated Pd atoms of PdO(101) at 90 K, but then switched to bridge (bridge-Pdcus) configurations with increasing temperature. Additionally, at higher coverages, atop-Pdcus became preferred. Furthermore, density functional theory calculations determined bridge-Pdcus and atop-Pdcus are preferred for low and high coverages respectively, which is significantly consistent with our experimental observation.
Characterization of Smooth Muscle Cells from Patient-derived iPSCs
Smooth muscle cells are important in many settings as they are responsible for vasodilation and vasoconstriction of the vascular system. Smooth muscle cells (SMCs) surround majority of the endothelial cells and are responsible for the rigidity of vessels. The endothelial cells control vasoconstriction and vasodilation of the vessels by sending signals to the SMCs. An alternative to embryonic stem cells are induced pluripotent stem cells (iPSC), adult cells that are reprogrammed to a stem cell state that closely resembles embryonic stem cell state by expressing specific stem cell genes. Our laboratory has extensive experience using iPSCs and have started a collaboration with pharmacogenomics. Our goal is to utilize patient-derived iPSCs to model hypertension. As previously mentioned, endothelial cells and SMCs are important cell types in hypertension response and therefore we will pursue the differentiation of iPSCs to these cells. Then, we will evaluate typical SMC phenotype and function of iPSCs differentiated to endothelial and SMC lineages. Typical phenotypic behavior involves the contraction of SMCs when treated with a stimulant. My project aims to provide proof of this behavior through analysis of cell features when tracked with a fluorescent dye.

Manipulations of the Extracellular Matrix Trigger Stress Responses in Caenorhabditis elegans
Cytoprotective genes are important to an animal's survival during periods of environmentally-induced stress and during aging. Throughout the animal kingdom, a family of proteins called Cap'n'Collar transcription factors (CNCs) are master regulators of detoxification genes, a subset of cytoprotective genes. The model nematode Caenorhabditis elegans has a single CNC transcription factor called SKN-1. Utilizing the genetic tractability of C. elegans allows the molecular regulatory pathways that control cytoprotective genes to be elucidated. In this study, we identify a novel signaling pathway between the extracellular nematode cuticle and SKN-1. The cuticle of nematodes is a barrier network of collagenous proteins, polysaccharides, and lipids excreted from epidermal cells. Using RNA interference, we screened gene manipulations that alter cuticle integrity and found five that up-regulate the expression of cytoprotective genes normally regulated by SKN-1 and osmotic stress. Interestingly, these five gene manipulations all prevent the development of the same structural feature in the cuticle. Our results are consistent with the presence of a previously unknown mode of signaling in which a specific manipulation of an extracellular barrier specifically signals to two conserved cellular stress responses. Ongoing work will test the functional role of this novel signaling mode during stress and will define the mechanism of signal transduction.
Electrical Impedance Tomography for Functional Brain Imaging

Non-invasive recording of brain function is an important tool for diagnosing many mental illnesses and brain injuries, and for conducting neuroscientific research and developing brain-computer interfaces. This project proposes to build an Electrical Impedance Tomography (EIT) device to image functional activity in the brain, and to study its potential as a diagnostic and research tool. EIT works by inducing small, insensible, ionic currents in the body with an array of stimulating electrodes, and then recording the corresponding voltages produced at the body surface. The impedances of discrete volume elements (voxels) within the body can then be determined from the voltage data recorded at the surface. The impedance of a tissue can provide valuable information about the tissue's physiology, and it has been shown that changes in brain tissue impedance due to cognitive processes make the imaging modality useful for imaging brain function. This project aims to create a device for measuring these impedance changes in brain tissue, and to test it under a variety of protocols to determine efficacy as a diagnostic or research tool.

Assembly and annotation of the chloroplast genome of red mangrove (Rhizophora mangle)

Red mangroves play an important role in the environment because they support coastal ecosystems and protect coastal habitats from the effects of rising sea levels due to climate change, rising water and associated storm damage. Genetic markers can be valuable tools for characterizing genetic diversity, and therefore the genetic health of populations and species. The goal of this study is to assemble and annotate the whole chloroplast genome of red mangrove (Rhizophora mangle). The chloroplast genome is a valuable tool in phylogeographic inference because it has a stable genetic structure with very little recombination and can easily be traced back many generations. We obtained Illumina sequence data (approximately four million raw reads) from four individuals from Florida and used Velvet for de novo assembly of the reads into contigs. We then mapped the contigs and unused raw reads to a reference sequence from GenBank (Populus alba) using Geneious. Finally, we annotated our assembled draft chloroplast genome using CpGAVAS. The results of this study will be valuable for future studies characterizing genetic diversity in red mangroves in coastal areas of Florida and the Caribbean.
Silicon Carbide Joining with a Polymer Precursor

Silicon carbide is investigated as a potential material to replace current Zircaloy nuclear fuel rod encapsulation. Joining of silicon carbide end caps remains an obstacle for implementation of this new technology that would increase the operating temperature of reactors and minimize the production of hydrogen gas. The mechanical properties of joints made with pyrolysis of SMP-10, a polycarbosilane from Starfire Systems Inc. are to be characterized. Specifically, nanoindentation and 4-point bend tests will be conducted. The pellets were produced with densities on the order of 75-80% of theoretical density. A polymer impregnation and pyrolysis procedure was done to increase this density, as would be necessary for industrial implementation. Scanning electron microscopy was also performed to show the micro-structural evolution and eventually the joint coverage after each pyrolysis step.

Silver Electroplating: A Novel Approach for Understanding Neural Control of Respiration

Cervical spinal cord injury (cSCI) can impair respiratory function due to damage of the pathways carrying the brainstem generated signals to the motor nuclei in the spine. Fundamental to rehabilitation and repair is a basic understanding of the spinal respiratory network and changes that occur after chronic cSCI. Thus, the overall goal of this project is to characterize the underlying respiratory circuitry and determine how injury impacts the neural control of muscles involved in breathing. To that end, fine wire multi-electrodes are used to record respiratory neural activity in a murine model. Determining the location of neural recording sites is a historically challenging task therefore we are employing a novel method of juxtacellular labeling in which silver is electroplated on the tip of each electrode and deposited at the recording site. Initial results of the silver deposition technique demonstrate discrete labeling of recording sites in the cervical spinal cord, greatly enhancing the ability to identify the location of recorded neurons. This data will allow us to define the spinal circuitry controlling respiratory muscles and identify neural targets for potential therapeutic approaches for patients who suffer from respiratory impairment due to cSCI.
Comparing the Accuracy and Versatility of Industry Standard Empirical Tire Models

The way in which tires generate grip is not well understood. To overcome this barrier, engineers create mathematical models to predict the forces that are expected from a tire under a given set of conditions. The better these models correlate with the actual tire, the better a vehicle can be designed to take advantage of the tire's unique behaviors. This project compares the accuracy of the ChassisSim Tyre V3 model and variations of the Pacejka Magic Formula by using each to model the lateral force produced by a Hoosier racing tire. Tire data was provided by the Calspan Tire Research Facility. MATLAB was used to process the raw data, fit the constituent functions, assemble the models, and evaluate and visualize the results. While the ChassisSim Tyre V3 model incorporates pressure and surface temperature, its approach to modeling inclination angle as a scaling factor does not capture the asymmetries present in the data. All of the Pacejka Magic Formulas are based on one versatile equation. The more recent versions do a better job of capturing the subtleties of inclination angle, but all of the models studied fail to properly consider the significant hysteresis inherent in tire performance.

Teachers’ Perceptions of Strategies for Including Students with Autism Spectrum Disorders in General Education Classes

The purpose of this qualitative study is to provide insights into expert teachers’ perceptions of the feasibility of practices they currently use to facilitate the successful inclusion of students with Autism Spectrum Disorders (ASD) in general education classrooms within an excelling, inclusive elementary school.
A Q-Learning and Multi-Armed-Bandit Approach to Solving POMDPs

Partially Observable Markov Decision Processes (POMDPs) are control algorithms that provide an agent with a way to determine the optimal action to take given a certain state of being. Here, optimal simply means taking the action that maximizes the expected cumulative reward. POMDPs specifically address the problem of having to deal with uncertainty in the agent’s estimation of its own state and the state of the world around itself. This research attempts to generate an optimal, or near-optimal, policy offline by combining the UCB1 algorithm, which provides a framework for balancing exploration versus exploitation by using a Multi-Armed-Bandit problem approach, with Temporal-Difference Q-Learning. Since POMDPs tend not to perform well in high-dimensional spaces, heuristics are thereby needed to obtain a good approximation of the Q-function and, by extension, in order to obtain a usable policy. In the real world, an optimal policy may not be obtainable since the amount of time given to calculate such a policy will be limited; therefore, research is being conducted in order to show that a good-enough policy is able to be generated in a feasible amount of time.

Biomarkers of Lactogenesis Stage II in Mothers of Very Low Birth Weight Infants

Breast milk is shown to reduce short and long-term morbidities associated with prematurity. Delayed lactogenesis stage II (LGSII) occurs in up to 82% of women delivering prematurely and decreases the amount of breast milk available for infant consumption. Maternal perception of a sudden feeling of fullness in the breasts is commonly used but has not been physiologically validated. The purpose of this prospective observational study was to compare a biomarker of LGS2 with maternal self-report and expressed milk volume of greater than or equal to 20 mL in 2 consecutive pumping sessions. Beginning 24 hours after delivery, mothers who delivered infants weighing < 1500 grams and < 32 weeks gestation were questioned if a sudden feeling of fullness in their breasts had occurred. When the mother expressed at least 20 mL of breast milk on 2 consecutive sessions, a sample of milk was analyzed for sodium levels. Sodium levels ranged from 1.5-11mM. 92% correlated with milk volume of 20 mL on 2 consecutive pumping sessions. Attainment of 20 mL in 2 consecutive pumping sessions appears to be a valid indicator of LGSII.
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**RESEARCH FIELD: Biological Sciences**

**Generation of a Lysine Auxotroph in Haloferax volcanii**
The amino acid lysine is essential for life in humans and must be supplemented in the diet. However, lysine can be synthesized from aspartate in some species of plants, bacteria, and archaea. The halophilic archaeon Haloferax volcanii can synthesize all amino acids necessary for growth. In effort to create a lysine auxotroph, the lysA gene was deleted by homologous recombination using a pop-in/pop-out strategy that relies upon selection for uracil biosynthesis and counter selection for 5-fluoroorotic acid resistance. The lysA gene encodes diaminopimelate decarboxylase which catalyzes the last enzymatic step in the lysine biosynthesis pathway. Here we show the lysA deletion strain is unable to grow without the supplementation of lysine in the media when compared to the parent strain, Hfx. volcanii H26. This lysine auxotroph will be useful for quantitative proteomics studies such as Stable Isotope Labeling of Amino Acids in Cell Culture (SILAC).

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**Diel Partitioning of the Effects of Vermetid Gastropods on Coral Growth**
Coral growth and survival are reduced by vermetids; however the mechanism is unknown. Vermetids could affect corals during peak feeding hours (i.e., night exposure results in competition for food) or when lights available for photosynthesis (i.e., day exposure reduces the light available to coral photosymbionts). To eliminate possible mechanism by which vermetids affect corals, we manipulated the type of vermetid exposure. We placed coral fragments on coral bommies, where all bommies were paired: one with ambient densities of vermetids and one with all vermetids removed. Using an orthogonal design, we compared two main effects: day (+/-) and night (+/-) exposure to vermetids. Unlike past studies, there was no significant effects of vermetid exposure (day, night, and day x night: p > 0.05). We conducted a secondary two-way ANOVA, crossing stage (juvenile/adult) with three vermetid exposures: No, Partial (day only combined with night only), and Full (both day and night). Tissue biomass was greater with full vermetid exposure, suggesting corals might consume vermetid nets. Overall, juvenile corals budded less than adult corals, potentially a consequence of morphology. Finally, the large disparity in effects of vermetids from this study versus past studies, suggest that further research is needed.
Synergistic Interactions in Triple Transgenic Fly Model of Alzheimer's Disease

Alzheimer's disease (AD) is a terminal neurodegenerative disease that causes memory loss and cognitive regression. It is the most common cause of dementia among the elderly, affecting an estimated 5.3 million people in the US and 26 million worldwide. Individuals with AD present with two typical neuropathologies: an abundance of extracellular amyloid deposits (plaques), whose principal component is the Amyloid-β (Aβ) peptide, and neurofibrillary tangles of hyperphosphorylated tau protein. While Aβ is a main constituent in the development of AD, testing of amyloid-reducing drugs has led to disappointing results. This, as well as other studies on the tau protein, suggests that the AD neuropathology develops through a dual pathway that links Aβ with tau protein abnormalities. Interestingly, this pathway appears to involve Apolipoprotein E4 (ApoE4) as a common upstream driver. The ApoE4 allele is the strongest genetic risk factor for AD. It increases the frequency and decreases the age of onset of AD, and has been associated with an increase in both Aβ plaques and Tau tangles in studies of deceased patients. Therefore, the goal of my project is aimed at combining Aβ, Tau and ApoE4 in Drosophila to create a more accurate fly model of AD. By characterizing the interaction between these transgenes I hope to provide a more comprehensive fly model for the testing of drug therapies and for unraveling the mechanistic basis underlying this devastating disease.

Exploring the Architecture Curriculum at Obafemi Awolowo University, Ile-Ife, Osun, Nigeria

From May to August of 2014, I researched in southwest Nigeria, specifically to gain knowledge about the architecture school in Ile-Ife, Obafemi Awolowo University. I worked alongside Professor Donna Cohen to gather student and instructor information, as well as the curriculum and its cause and effect in the Nigerian society. While in Nigeria, I also had the opportunity to work hands-on with two architecture firms, which aided me to further understand the full cycle of work for architects in Nigeria. I learned of language’s role in connection to architecture, and the ways in which this could be further manifested in schools. In addition, I assisted in curating an exhibition of fourteen architecture schools in Africa. This exhibit, which was on March 13th-14th of 2015, was part of the Carter Conference supported by the Center for African Studies and organized by Prof Cohen.
Predictive Processing in Semantically Constraining Sentences

In this experiment, semantic prediction was explored via event-related potentials and examination of the N400 effect (a pronounced negative wave that has been found to reflect anticipatory processing in language) in sentences of varying semantic constraint. 21 native English speakers silently read sentences as brainwaves were recorded from electrodes atop their scalps. Sentences were either designated high-cloze (highly constraining, such as “The barber cut my ___ hair”) or low-cloze (lowly constraining, such as “I don’t like my ___ hair”) and were presented to participants one word at a time. To further investigate if there is evidence of semantic prediction, a delay paradigm was employed, whereby the presentation of a word was sometimes delayed by 300ms. In both the delay and no-delay conditions, there was a larger N400 for low-cloze sentences than for high-cloze sentences. This was interpreted as there being a lack of any specific prediction in the low-cloze condition. Additionally, the N400 appeared to be unaffected for low-cloze sentences between delay and no-delay conditions, but in high-cloze sentences the N400 was smaller in the delay than in the no-delay condition. This smaller N400 in the high-cloze delay condition suggests that the presentation delay may strengthen a reader’s prediction.

Spoils to Soils Project at the Student Compost Cooperative

Organic wastes such as food waste, spoiled fruits and vegetables, garden wastes, and yard trimmings can become a nutrient-rich soil amendment, known as compost, which can be used in agriculture, horticulture and urban gardening. Composting is the natural process by which a consortium of aerobic organisms degrades organic matter into a fine humus material. Several factors contribute to successful composting including small particle size, appropriate moisture and temperature conditions, oxygen provided from consistent mixing, and a nutrient balance between carbon and nitrogen. The Student Compost Cooperative (SCC) is a multidisciplinary campus outreach program established by Dr. Ann Wilkie (Soil and Water Science Department, UF-IFAS) that encourages resource conservation and nutrient recycling through hands-on experience with composting and sustainable farming. The SCC operates a composting facility at the BioEnergy and Sustainable Technology Laboratory, where students can drop off their food scraps and receive finished compost in exchange. The benefits of composting are far-reaching. Not only does compost enrich the soils with organic matter and improve water retention, it also significantly reduces organic waste sent to landfills and the use of commercial fertilizers, thereby reducing our reliance on fossil fuels and paving the path toward a sustainable future.
Automated Registration of Three-Dimensional Implant Models to Fluoroscopic Images through Lipschitzian Optimization

This paper describes an automated method for registering three-dimensional models of metallic joint implants to single-plane radiographic images. We develop a pyramidal approach that identifies the correct pose by matching decreasing dilations of an edge-detected image with the silhouette of an implant model. The location of the similarity function’s minimum is found using a novel optimization routine that combines the DIRECT (Dividing Rectangles) algorithm with properties of the Lipschitz constant specific to the dilation level. Depending on the image quality and implant type, this technique has a capture range of approximately 35 to 45 millimeters for each translation component and 35 to 45 degrees for each Euler angle. After an initial guess for the first image in the sequence, subsequent frames are automatically registered starting from the optimum pose from the previous image. Our methods performed well on fluoroscopic images of shoulder and knee joint implants during dynamic movements. With the exception of a humeral stem, implant registration either converged at every image or slightly misregistered (at an infrequent rate of 5%). Minor registration errors were generally inconsequential to the success of future frames.

Making Higher Education Attainable for Low-Income, First-Generation-In-College Students: An Examination of the MFOS Program at UF

The purpose of this study was to assess the impact of the various components of the Machen Florida Opportunity Scholars (MFOS) Program on low-income, first-generation college students and identify effective practices. Literature shows that low-income, first generation students experience significant barriers not only during their first year but throughout the college experience that affects enrollment, engagement, success, and retention. De-identified data from the University of Florida’s 2013 Student Experience in the Research University (SERU) survey was used for evaluation. The data compared the two groups with regard to academic success, study skills, financial stress and financial literacy: those students in the MFOS program, and students of a similar demographic (reported low-income and first-generation-in-college) who are not in the program. Students in the MFOS program reported having less financial stress and higher levels of financial literacy. Alternatively, there was no significant different between MFOS students and their similar peers for academic behaviors, academic aspirations, study behaviors. There were minimal differences in students’ reported obstacles to academic success, with MFOS students having fewer obstacles. The results suggest that although MFOS can still improve, it is relatively successful in equipping students with the tools that they need for success.
Non-normative Events in Emerging Adults: Autobiographical Memories of a Brush with Death

First-hand encounters with mortality are often associated with late life and are not considered normative in emerging adulthood. However, these experiences do occur even in early adulthood and can be quite memorable. The current study examines emerging adults’ (N=50) autobiographical memory narratives of a brush with death. Narratives were content-coded for event type, level of death threat, and changes in the sense of real time (i.e., out-of-time experiences). Participants then self-report qualities of the memory. Personal characteristics of the participants were examined in relation to content-coded and self-reported aspects of the memories. Emerging adults most frequently described experiencing a brush with death as an accident. Their subjective sense that they were facing death was higher than the threat portrayed in the event. Memories contained out-of-time experiences and were experienced as more vivid than personally significant. Emerging adults’ with lower future time perspective were more likely to express having of out-of-time experiences. Gender was related to subjective death threat: women generally reported higher subjective threat in recalling a brush with death. Emerging adults appear to have more significant experience with death than previously expected. There are commonalities in how these memories are expressed but also personal factors that influence their recollection.

Pharmacological Blockade or Genetic Knockout of the Prostaglandin E2 EP1 Receptor Reduces Blood-brain Barrier Disruption and Permeability in Ischemic Stroke

Ischemic stroke is characterized by the occlusion of an artery supplying the brain. Reductions in blood flow result in brain injury that progresses over time as ionic imbalances, inflammation, and blood-brain barrier disruption contribute to delayed cell death. Our present study has demonstrated that administration of an anti-inflammatory drug reduces blood-brain barrier permeability in a rat model of ischemic stroke by reducing matrix metalloproteinase-mediated injury.
A Proposed Model to Capture Temporary Price Impact on Bid/Ask Spread

It is generally understood that large buy or sell orders on a public exchange such as the NASDAQ or NYSE tend to be followed by an appreciable increase or decrease in the stock price. However, no single model is yet recognized as being an acceptable approximation of this process. In this research, I conduct an empirical validation of a two-pronged approach, which consists of first identifying a reasonable model for the normal evolution of the bid-ask process, and second verifying that the recently developed price-impact evaluation method of Cont et al. (2014) still carries to this model. To this end, I compare the linear and the discrete mean-reversion bid/ask spread models by out-of-sample testing. They are then augmented with the linear Order Flow Imbalance (OFI) model of Cont et al. (2014). Based on stock data taken at one-second intervals on the New York Stock Exchange, preliminary results indicate that the bid-ask process can be modelled as a mean-reverting Ornstein-Uhlenbeck process and that the OFI model originally developed to capture a linear relation between price change and order flow imbalance still holds when considering bid-ask spread and order flow imbalance.

Genetic Characterization of Esocid Herpesvirus 1

Blue spot disease, believed to be caused by Esocid herpesvirus 1 (EsHV1), has been observed in northern pike (Esox Lucius) in the northern United States, Canada, and Ireland. In the spring of 2014, a northern pike was caught in Wisconsin displaying multiple bluish-white circular (5-12 mm diameter) slightly raised skin lesions on the dorsum and fins. Histological inspection of the skin lesions revealed significant epidermal hyperplasia with individual hypertrophied keratinocytes displaying an eosinophilic cytoplasm and basophilic nucleus. Transmission electron microscopy revealed naked icosahedral virus particles (100 nm diameter) in the nuclei and enveloped cytoplasmic particles arranged in clusters within the cytoplasm of affected keratinocytes. Polymerase Chain Reaction assays and a primer walking strategy was used to sequence approximately 7,000 bps of the viral genome. Annotation of this genomic segment revealed a similar gene orientation to related fish herpesviruses (family Alloherpesviridae). Phylogenetic analyses of the partial viral DNA polymerase and terminase genes confirmed that EsHV1 is a novel alloherpesvirus branching closely with the salmonid herpesviruses. These data support EsHV1 as the newest species in the family Alloherpesviridae and the first confirmed alloherpesvirus discovered from an esocid host.
Age and Origin of the Bridger Gneisses: Implications for Provenance of the La-Hood Formation

The Bridger Range occupies a critical tectonic location in the Precambrian crystalline basement of SW Montana because it lies near the eastern limit of the Belt Basin and the western limit of the Great Falls tectonic zone. Six basement samples were taken from the Bridger Range near Bozeman, MT. The range is comprised predominantly of metaigneous lithologies; mostly granitic gneisses with some amphibolites. Although it is widely considered to be the deepest basin on the planet, the Belt Basin lacks the significant research that would allow for its history to be thoroughly unraveled. This project aims to understand the basement rocks that underlie the layers of sedimentary rocks in the basin. Dating of these rocks will bring a greater understanding as to the creation of the basin and the source of the sediments (i.e., local crystalline basement or more distal sources). These data will also help us to relate the Bridger basement to other crystalline basement in the Wyoming province (e.g., relation to the Beartooth Mountains [2.8 Ga] or the Tobacco Root Mountains [3.2 Ga]).

A Copper Catalyzed Synthesis of 3-phenylsulfonyl-2-trifluoromethyl-1H-indoles

Substituted indoles are important biological molecules, some of which are even essential for humans to live. While some indoles occur naturally (e.g. L-Tryptophan), synthetically substituted indoles, such as 3-aroyl and 3-sulfonylindoles, are attracting attention for anticancer and antiviral drugs. In contrast, fluorine chemistry is becoming ever more pervasive in modern drug synthesis. For example, the trifluoromethyl substituent has many known uses in modifying biological activity. The natural thought would be to add both groups to the indole, which is exactly the intention behind this new synthetic methodology. The synthesis starts from readily available methyl-phenylsulfones, which must then be reacted with trifluoroacetyimidoyl chlorides using LDA/THF at -40°C. This produces a mixture of intermediate isomers. Finally, these intermediates are cyclized to the indole using a copper catalyst to give the target molecule in good yields.
Psychosocial Risks Facing Congolese Mothers during Pregnancy

For the past five decades the Democratic Republic of Congo (DRC) has been the site of perpetual military and civilian conflict which has plagued the country with economic upheaval, physical violence and health disparities. These stressors are particularly insidious for the nation’s female population. This study examined the psychosocial and physical health risks faced by pregnant mothers and their newborns in the DRC. An existing dataset was utilized that included 101 mothers (M=26 years, 14-42 years) and their infants (males=48%). Our data included medical information collected at delivery and ethnographic questionnaires that assessed stressors related to war trauma and pregnancy. We found that 99% of mothers reported receiving prenatal care, yet 55% had malaria while pregnant and 7% had hypertension. Additionally, 12% were physically abused, 13% emotionally abused and 5% of pregnancies the result of rape. Lack of food during pregnancy was reported by 20%. When asked about major stressors, 30% mentioned poverty while 14% cited war stressors. Ultimately, these results suggest that the after-effects of war continue to impact the lives of mothers in the DRC, while the burdens of poverty and inadequate healthcare make it essential to explore the type of stressors affecting both mothers and their newborns.

Synthesis of Manganese Zinc Ferrite Magnetic Nanoparticles for Biomedical Applications

Synthesis and suspension of magnetic nanoparticles to create a fluid that responds to a magnetic field, a “ferrofluid,” has opened the door to various biomedical applications such as targeted drug delivery, MRI contrast agents, and nanoscale energy delivery. The goal of this project is to synthesize Manganese Zinc Ferrite (MZF) nanoparticles with narrow size distributions and surface coatings that make them suitable for biomedical applications. Of note, we are interested in exploring the dependence of the mechanism of magnetic relaxation on size of the particles, and how this affects performance in biomedical applications. Responding to a magnetic field, a particle relaxes by the Brownian Mechanism (physical rotation) or the Néel Mechanism (dipole rotation). When a nanoparticle grows above a critical diameter, it will switch from Néel to Brownian relaxation. Due to its particular crystalline structure, the MZF particle is expected to have a low anisotropy constant, which increases the critical diameter for this transition. Elemental composition analysis by ICP-MS of our samples confirms that we have successfully incorporated Manganese and Zinc into the nanoparticles. Results from TEM show highly monodisperse particles with physical diameters of ~20 nm. Dynamic magnetic susceptibility experiments indicate the particles respond through the Néel relaxation mechanism.
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A Theoretical Investigation of Ferromagnetism in Doped Transition Metal Dichalcogenide WSe₂
Two-dimensional transition metal dichalcogenide represent new class of novel materials which have high carrier mobilities and large energy gaps. Due to these novel properties, these materials can be used as a platform to study the interaction between ferromagnetism and charge conduction for potential applications in spintronic devices. In order to investigate the ferromagnetic properties, theoretical simulations based on density functional theory methods were conducted to understand the interaction between magnetic dopants in the host material. The study focuses on introducing 3d transition metals in WSe₂ to produce ferromagnetism. Specifically, only dopants like Mn and Fe are able to generate long range ferromagnetism. The nature of the ferromagnetic interactions is also shown to be different between Mn and Fe. For Mn, the ferromagnetism is mediated by the parallel spin-spin coupling between the magnetic impurities and the delocalized p-states of Se in the valence band. For Fe, the interaction between Fe and Se’s p states is shown to be antiferromagnetic. In addition, the results also reveal that the ferromagnetic interaction is strongly dependent on the spatial positions, distances and concentrations of dopants. These theoretical results can provide useful guidance for engineering ferromagnetism in 2D transition metal dichalcogenide for advanced nano-electronic devices.

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RESEARCH FIELD: Physical Sciences

Performance Differences between Patellar, Hamstring, and Quadriceps Tendon ACL Autografts
There are many graft choices for anterior cruciate ligament reconstruction (ACLR), however there is no consensus as to which graft choice is best for those wishing to return to sports. Further, few studies have compared lower extremity biomechanics during dynamic tasks, such as walking and jumping, following ACLR with different grafts. Specifically, we evaluated if differences in performance exist among three autografts: the quadriceps, patellar, and hamstring tendons. Seven females with ACLR (three patellar tendon, two hamstring tendon, and two quadriceps tendon autografts) performed a step down and single leg vertical jump with both their injured and uninjured legs. Lower extremity biomechanics were evaluated using an eight camera motion capture system. Participants with a quadriceps tendon autograft demonstrated more variability in the frontal hip angle in comparison to the patellar and hamstring tendon autografts. There was also a tendency towards more hip angle variability in the quadriceps tendon compared to the patellar tendon autograft during the vertical jump task. A decrease in stability at the hip joint has been proposed as a contributing risk factor for reinjuring the ACL. The findings of this study suggest that individuals with quadriceps tendon autografts may be at a higher risk of re-injury.
**Structural vs. Psychiatric Predictors of Sleep Disturbance in Veterans With Mild Traumatic Brain Injury**

In veterans, post-traumatic stress disorder (PTSD) and mild traumatic brain injury (mTBI) are separately correlated with persistent sleep disturbances that are detrimental to overall health and quality of life. Although symptoms of sleep disturbance are similar in PTSD and mTBI, neurobiological mechanisms producing disordered sleep have not yet been established and may differ. We hypothesized that structural damage to the Locus Coeruleus (LC), a small sleep related structure in the brainstem, may be directly related to sleep disturbances after mTBI. We also hypothesized that sleep disturbances after PTSD are separate in nature. We tested this hypothesis by looking at the relationships between LC volume, score on the PTSD Checklist – Military version (PCL-M), and qualitative sleep disturbances on the Pittsburgh Sleep Quality Index (PSQI) in a population of 18 veterans. PCL-M was significantly positively correlated with all PSQI items we examined. LC volume was significantly negatively correlated with poorer sleep efficiency and more instances of uncomfortable breathing. Our results suggest that damage to the LC may be related to sleep disturbances after mTBI. Nightmares were only related to PTSD (PCL-M). Therefore, our results suggest that sleep disturbances after PTSD may be caused by a different mechanism than in mTBI.

**University for All: The Rise and Repression of the Chilean University Reform Movement of 1967-73**

The Chilean University Reform Movement of the late 1960s to early 1970s offers a compelling glimpse into the hopes and tensions that characterized the country during the turbulent, heavily contested period preceding the 1973 military coup. A growing percentage of the Chilean population was gaining access to both the ballot box and the lecture halls. Groups that had been previously been excluded from participating in these institutions used their newfound power to challenge the status quo, but disagreement over how to reform the existing university system led to paralyzing battles for control. The same questions debated nationally were also present at the universities. Should reforms be revolutionary or moderate in nature? How should political power be distributed? What kind of society was desirable and what role should the university have in constructing it? These questions were passionately discussed but never reached a logical conclusion.
The Potential of OCT for Early Detection and Treatment of Meniscal Degenerative Pathology Relevant to Pre-osteoarthritis

Osteoarthritis (OA) is the most common form of musculoskeletal disease leading to morbidity and disability. OA is incredibly hard to detect in its early stages due to the small size of the early-stage meniscal tears. Because of this, severe damage to menisci can only be currently detected once the damage has already been done. Optical Coherence Tomography is (OCT) is a medical imaging technique that has the resolution and penetration depth to visualize early-stage meniscal tears that would give medical practices knowledge to allow for a more proactive diagnosis for his/her client. Early-stage meniscal tears were simulated by slicing thin horizontal cuts into canine menisci. These samples were tested on both the OCT and MRI, and were compared to verify the imaging accuracy of the OCT system. Some tears can only be seen on the OCT, giving a potential advantage over MRI in detecting early-stage tears.

Synthesis and Characterization of Trinuclear tin(II) Complexes of a Macrocyclic Ligand

The ability of multiple transition metal centers to react cooperatively to active substrates (e.g., O2, N2, CO2) has precedence in metalloprotein active sites. This reactivity relies on the ability of individual transition metal ions to undergo cycles of oxidative addition and reductive elimination. Similarly, it was recently demonstrated that low valent main group atoms are able to perform oxidative elimination reactions; however, performing reductive elimination remains a challenge. In contrast to transition metals, main group centers rely on populating energetically accessible triplet states, which have diradicaloid character with frontier orbitals of similar symmetry to that of transition metal d-orbitals. Drawing a parallel between the cooperative reactivity in clusters that enhances the reactivity of transition metal ions, this project aims to examine multinuclear main group complexes, in which steric and electronic properties are controlled by ligand design, to exhibit novel cooperative reactivity as compared to mononuclear compounds. The synthesis and characterization of trinuclear SnII clusters supported by a trinucleating tris(β-diketiminate) cyclophane ligand are presented. Theoretical calculations as well as preliminary reactivity will be discussed.
Effect of Chronic Heart Failure on Mitochondrial Bioenergetics and Apoptotic Susceptibility in Skeletal Muscle

Chronic heart failure (CHF) is primarily characterized by myocardial dysfunction but has secondary systemic effects on skeletal muscle which include symptoms such as muscle fatigue, contractile dysfunction, and muscle wasting but the underlying mechanisms are not well understood. Thus, we investigated whether CHF alters mitochondrial function, content, and apoptotic susceptibility in skeletal muscle. Young Lewis rats (8 weeks) were subjected to either myocardial infarction (MI) to induce CHF, or sham (Sh) operation, and hindlimb muscles were removed 16 weeks post-surgery. Overall mitochondrial content (mtDNA content, COX activity, cytochrome c expression) and expression of mitochondrial regulatory factors (PGC-1α, Mfn-2, Fis1, and Hsp70) were significantly reduced with CHF. Functionally, both subsarcolemal (SS) and intermyofibril (IMF) mitochondrial respiration rates were impaired and this coincided with structural decrements in electron transport chain proteins. Oxidative stress (protein oxidation), apoptotic susceptibility (Bax-Bcl-2 ratio), and ROS-induced mitochondrial release of cytochrome c (SS and IMF) and AIF (IMF) were significantly increased in CHF. Taken together, our results indicate that CHF impairs mitochondrial function/content, increases susceptibility to apoptosis, and appears to enhance ROS-induced damage in skeletal muscle.

Processing of Lead Zirconate Titanate Near the Morphotropic Phase Boundary

Lead zirconate titanate (Pb(Zr0.52Ti0.48)O3) is a piezoelectric material with a very high dielectric constant that can be electro-spun with a magnetostrictive material to form a nanofiber multiferroic material. Multiferroic materials, though important for engineering application including energy storage are rare to find in nature. PZT was investigated using XRD for phase analysis of the morphotropic phase boundary (MPB). Calcination took place over a range of temperatures in order to see the effects of temperature on PZT peak intensity and peak splitting. The existence of the MPB depends on the coexistence of both tetragonal and monoclinic phase in certain specific areas, and the result of having PZT material with a MPB allows for a higher response to an applied electric field.
Gender Moderates the Association between Sleep and Parent-Report Internalizing/Externalizing Behaviors in Overweight and Obese Youth

Introduction: Poor sleep in youth is predictive of current and future mood disorders. Rates of pediatric internalizing/externalizing behaviors are shown to vary by gender. Because overweight and obese (OV/OB) youth are at risk for poor sleep and mood disturbance, this study investigated the role of gender in the relationship between sleep and internalizing/externalizing behaviors in OV/OB youth. Methods: OV/OB youth (n=123) wore an actigraph for 7 days, which provided objective estimates of Total Sleep Time (TST; minutes spent asleep) and Total Wake Time (TWT; minutes spent awake while trying to sleep). Behaviors were measured via the internalizing/externalizing subscales of the Child Behavior Checklist. Results: Although TST and TWT did not significantly predict internalizing scores (p’s>.05) or externalizing scores (p’s>.05), there was a significant gender*TWT interaction for externalizing (F(3, 123)=5.95,p=.001) and a significant gender*TST interaction for internalizing (F(3,123)=4.76,p=.004). Conclusions: Whereas OV/OB girls exhibited more externalizing behaviors as they spent more time awake when trying to sleep, boys exhibited less. Interestingly, girls also exhibited more internalizing behaviors as they spent longer sleeping, whereas boys exhibited less.

Chemical Effects of Vermetid Snails on Coral Microflora

Coral reefs benefit many different marine organisms and coastal populations by providing habitats, shelter, and sustenance. Corals, however, are threatened by a variety of stressors that reduce growth and survivorship, including vermetid snails. Vermetids (Ceraeongium maximum in particular) are common on the shallow reefs of Mo’orea, French Polynesia and cast a mucus net used for feeding. This net leads to reductions in growth and survival of corals, however, the mechanism underlying the deleterious effects of the mucus net remains unknown. We hypothesized that vermetids negatively affect coral by shifting the coral Surface Mucus Layer (SML) microbial community (the corals first line of defense) via selective inhibition by chemicals in the snails’ mucus nets. We used antimicrobial assays to determine whether chemical extracts from mucus nets inhibit the microbial growth of bacteria isolated from massive Porites corals. We isolated crude chemical extracts from mucus net material and also nine unique cellular morphologies primarily comprised of firmicutes, bacteriodetes, and proteobacteria. Our data showed that chemicals in the mucus net did not inhibit growth of the isolated microbes, which suggests chemicals from Ceraeongium maximum do not have a regulatory effect on massive Porites microflora.
**Cultivation of Spirulina for Maximum Biomass Yield**

Algae are high-yielding plants and a potential alternative to conventional fossil fuels that can alleviate the greenhouse effect while simultaneously treating wastewater and producing biomass for biodiesel and food. The objective of this study was to identify optimal cultivation methods for maximum biomass yield of Spirulina, a filamentous cyanobacterium. Spirulina was cultivated in Modified Zarrouk’s Medium with sodium bicarbonate as the carbon source and sodium nitrate as the nitrogen source. Subcultures were prepared with 10% inoculum in 1L flasks (500 mL active volume). Cultures were illuminated at 250 µmol photons/m2/s on a 12:12 photoperiod. Algal growth was monitored by spectrophotometry using absorbance at 680nm. The effect of culture vessel geometry on biomass growth was evaluated. Results indicated that biomass growth rate was higher using a Luer flask (12.2 mg/L/h) compared to an Erlenmeyer flask (8.4 mg/L/h). The high biomass yields for the Luer flask were likely due to better light penetration into the growing culture because of the greater surface-to-volume ratio. The effect of mixing strategy was also evaluated. Using a Luer flask, mechanical shaking and aeration mixing gave similar biomass growth rates of 12.2 and 12.7 mg/L/h, respectively. Mechanical shaking, however, has the distinct advantage of reduced ammonia stripping.

**A Novel Strategy In Synthesis of Cyclic Dipeptides**

Diketopiperazines are a unique class of compounds with diverse structural characteristics that have captured the attention of scientists since their discovery. In particular, it has been shown that 2,5-diketopiperazines (2,5-DKPs), which are cyclic dipeptides, have significant biological activities. They have a wide range of applications including: antibiotic, insecticidal, antimitotic, chemosensitizing, anti-HIV, and so forth. All these properties make 2,5-DKPs substantial building blocks for the discovery of new leads and therapeutic agents. Despite the considerable exploration to date, there is still a need for further development of alternative, flexible, and cost-effective synthetic strategies. Our longstanding involvement in benzotriazole (BT)-mediated oligopeptide chemistry prompted us to design a new, versatile, and flexible strategy able to provide 2,5-DKPs and bis-2,5-DKPs starting from inexpensive l,l-dipeptidoyl benzotriazoles. We have developed a novel, widely applicable, and flexible triethylamine-promoted strategy for the synthesis of 2,5-DKPs and bis-2,5-DKPs from open chain peptidoyl benzotriazole sequences. The methodology was successfully demonstrated on the synthesizes of novel 2,5-DKPs and symmetrical bis-2,5-DKPs, in moderate to good yields. Proline and hydroxyproline have been utilized to introduce reverse turns to achieve short end-to-end distance in peptide chains in order to facilitate the intra-molecular lactamizations.
Social Conscience and Film Form in English Postwar Cinema

The difficult circumstances of British life in the immediate aftermath of World War II influenced film subject matter and production. These difficulties are especially apparent in the work done by Ealing Studios. These films, often accused today of being mild-mannered and sentimental, upon closer inspection reveal a keen class-consciousness and an engagement with the everyday problems of their intended audiences. The collaborative nature of these films' production also sheds new light on the debates surrounding the role of the director and producer in filmmaking, suggesting that there may be a more nuanced “third way” to approach the issue of cinematic authorship, where the aesthetic and narrative aspects of a film appear as a collective undertaking by dedicated craftsmen. In the case of these English films, this spirit of cooperation may very well have risen from the special social and economic circumstances of the post-war period.

Intercellular Trafficking of Streptococcus mutans from Endothelial to Smooth Muscle Cells

Streptococcus mutans, a member of the Mutans group of oral streptococci, is an etiological agent of dental caries and has been linked to cardiovascular diseases. Approximately 10% of S. mutans clinical isolates have a cell surface adhesion, Cnm. S. mutans OMZ175 has been reported to enter and persist in primary human cardiovascular cells in culture in a Cnm dependent manner. To investigate the intercellular spread of S. mutans from human coronary artery endothelial cells (HCAEC) to coronary artery smooth muscle cells (CASMC), CellTracker™ dye concentrations were optimized to the cell types and tested for interference of infection. HCAEC were then infected with the S. mutans OMZ175 strain and overlaid onto CASMC in the presence and absence of antibiotics. Results indicate that intracellular S. mutans that exited HCAEC were still infectious and able to enter CASMC even in the presence of antibiotics as there was evidence of CASMC infection without direct contact with HCAEC (about 87.5%). Ultimately, S. mutans exiting HCAEC remain infectious and have the potential to infect other cell types.
Identifying the Supports Needed by Teachers of Students with Emotional and Behavioral Disabilities

Students with emotional and behavioral disabilities (EBD) have the lowest academic outcomes of all students with disabilities, yet extant research indicates that their teachers use evidence based behavioral and instructional practices with alarmingly low frequency. To improve these students’ outcomes, it is essential to better understand the factors that shape their teachers’ efforts to use evidence based practices. Therefore, this study examines the attitudes of three teachers in self-contained EBD settings to identify areas in which they feel well-supported, as well as areas of need. Participants were interviewed and the data were analyzed qualitatively using constructivist grounded theory methods. Data analysis is ongoing. Findings will have implications for designing intervention research to address the needs identified by the participants and improve the working conditions for EBD teachers in self-contained settings.

Reactive Oxygen Species Are Essential in Cross Presentation of Antigen to Autoreactive CD8+ T cells

Type 1A Diabetes (T1D) is a serious disorder caused by T-cell mediated destruction of insulin-producing pancreatic islets. Reactive Oxygen Species have been proposed as a pathogenic mechanism involved in the development of T1D, however, the exact source of ROS and the levels necessary to affect the onset of T1D have not been fully revealed. The primary goal of this study was to elucidate the mechanistic implications for ROS during activation and diabetogenic effector functions of CD8+ Cytotoxic T cell Lymphocytes (CTL). Purified native CD8+ CTL from NOD.Ncf1m1J mice were compromised in production of effector molecules (i.e. Granzyme) and cytokines (i.e. IFNγ) after in vitro stimulation with αCD3/αCD28. We have further identified that DC are the cell type responsible for the extrinsic defects in CTL activation in NOD.Ncf1m1J mice. DC from NOD.Ncf1m1J mice exhibited accelerated antigen degradation resulting in defective cross-presentation and CTL activation. This study identified that the impact of ROS on CD8+ CTL by pathways that are both intrinsic as well as extrinsic to CTL. These observations have identified the cell types where ROS are essential in CD8+ CTL effector responses, however gaps exist in our understanding of how these processes occur as well as their impact on T1D.
The Effects of Positive and Negative Coping Skills on Depression Levels among Adolescents with IBD

Inflammatory bowel disease (IBD) is a chronic autoimmune disease that impacts the digestive system. Adolescents with IBD endorse higher levels of depression compared to their healthy peers. Positive/problem-focused coping strategies are associated with lower levels of distress, whereas negative/avoidant coping styles are associated with poorer emotional functioning. Limited research has addressed the relationships between coping strategies and depression among this population. Subjects included 37 adolescents with IBD and their parent attending a pediatric gastroenterologist clinic. Adolescents were screened for depression using the Reynolds Adolescent Depressive Scale. The Coping Strategies Inventory assessed adolescent coping across four positive and four negative coping-style subscales. Linear regressions were conducted to examine associations between positive coping styles, negative coping styles and depression. 18.9% had scores in the clinical depression range; 8% were in the moderate to severe range. Greater use of negative coping styles was related to higher depression; Social Withdrawal was uniquely related to higher depression levels. Engagement in positive coping styles did not predict depression levels; however, use of Cognitive Restructuring was significantly related to lower levels of depression. Use of negative coping skills was related to higher depression. Clinicians should focus treatment on helping adolescents with IBD to develop positive coping skills.

Eye Tracking and Visual Search Strategies on Emotional Stimuli

Investigations examining visual search strategies during emotional events require standardized visual stimuli. We sought to establish a standardized set of emotional stimuli containing similar content, complexity, luminance, and contrast characteristics. We also aimed to identify the non-emotional regions of selected images for follow-up studies seeking to manipulate the locus of visual gaze as a means of emotion regulation. Participants’ fixations and fixation durations were recorded while viewing 60 emotional stimuli drawn from the International Affective Picture System and internet searches. Low and high complexity images were categorized as pleasant, unpleasant, and neutral. For Experiment 2, a grey circle was added to non-emotional regions identified in Experiment 1. Participants’ arousal and valence ratings confirmed affective image categorization. Search patterns indicated that high complexity images elicited more fixations with shorter durations than low complexity images. Addition of the circle in non-emotional regions did not modify affective ratings of the images or gaze behavior recordings when searching the images. Findings indicate that non-emotional regions of the visual scene can be modified in a manner that does not alter natural gaze behavior. The images used in this investigation can be implemented as a standardized set of emotionally variable stimuli free of confounding psychophysical properties.
The Effects of Ascorbic and Retinoic Acids on the amount of Collagen and Elastin Produced during Tissue Development

Achieving mechanical fit is essential to develop tissue engineered cardiovascular constructs. Collagen imparts strength and stiffness in cardiovascular tissue while elastin assures recoil and elasticity. It is hypothesized that ascorbic and retinoic acids may be utilized to tailor growth of elastin and collagen. Five groups of porcine smooth muscle cells (SMCs) were cultured under different conditions: all retinoic (RA) 0.30 ug/ml, all ascorbic (AA) 0.05ug/ml, both ascorbic and retinoic (AA-RA), alternating ascorbic and retinoic (AA/RA), control group, and negative control 3ul EtOH/ml. Results showed mixed elastin and collagen growth parameters. Cell cultured with AA, appeared to inhibit collagen growth completely. AA/RA conditions showed both collagen growth, and inhibition. RA and negative control had no tissue formation. At four weeks, AA showed highest elastin growth with high standard deviation and, in all samples, elastin content increased between four weeks, and eight weeks. In conclusion, growing collagen in in-vitro derived tissue, while growing elastin, remains challenging. Preliminary data supports that ascorbic acid, and retinoic acid reciprocate each other’s production pathway, thus longer culture period, and bigger sample size is necessary to draw conclusive evidence.

Characterization of a Novel Alloherpesvirus from Glass Catfish (Kryptopterus bicirrhis)

Over the last few years the ornamental aquaculture of glass catfish in Thailand has been hampered by high mortality epizootics of an unknown etiology. Dying catfish display discolored musculature and abnormal swimming behavior. Tissue homogenates from dying fish were cultured on epithelium papulosum cyprini (EPC) cells and a replicating agent was observed. Transmission electron microscopy of affected EPC cells revealed naked icosahedral virus particles (100 nm diameter) in the nuclei and enveloped particles within the cytoplasm (130 nm diameter). Polymerase Chain Reaction assays and a primer walking strategy was used to sequence approximately 7,000 bps of the viral genome. Annotation of this genomic segment revealed a similar gene composition and orientation to alloherpesviruses previously characterized from ictalurid catfishes. Phylogenetic analyses of the partial viral DNA polymerase and terminase genes confirmed that the novel glass catfish alloherpesvirus is most closely related to Ictalurid herpesvirus 2 previously isolated from European black bullhead (Ameiurus melas). These data support the glass catfish alloherpesvirus as the newest species in the family Alloherpesviridae and the first confirmed alloherpesvirus discovered from a silurid catfish. Future challenge studies are planned to confirm whether the isolated virus is lethal to glass catfish under controlled experimental conditions in fulfillment of Koch’s postulates.
EP elections – Engagement with EU(ropean) issues or “business as usual”? 

Media, parties, and the public are not usually paying attention to the European Parliament elections. Interest and turnout are usually low, lower than national elections, and if debated, it’s mostly national issues that dominate the campaigns. The most recent European Parliament elections, however, took place in an environment that was substantially different than previous ones. The global financial crisis delivered a major shock to the European economy and brought EU leaders and EU institutions to the forefront in searching for European-wide solutions. The European Parliament promised voters that these elections would be different and introduced the “Spitzenkandidaten” debates as a constitutional innovation meant to provide a democratic mandate to the Commission President. Foreign policy issues were also critical on the European continent with the Ukraine crisis. This research examines how these three topics: the economic crisis and the EU response to it, the war in the East and the EU response to it, and the structural innovations introduced at the EU level (the Spitzenkandidaten exercise and Brexit) were portrayed by the media in Germany, France, and the UK.

Magic Labelings
The magic condition of a labeling of a given set has varied significantly over the centuries. However, the condition consistently requires that the labels are distributed such that, when the set to be labeled is cut into specified components, the sum of the labels in each component is the same. Due to the open nature of such a condition, magic labelings have been applied to arrays (magic squares or rectangles), as well as to an extensive catalog of particular graph types (trees, complete, k-partite, wheels, cycles, digraphs, etc.). We discuss some of the ways that the magic condition and equivalent conditions have been worked with in various fields, especially the instances in which magic falls out of more general theories.
Acquisition of Native-Like Structural Preferences: A Corpus Study of English as A Foreign Language

Native speakers of English show marked preferences with regard to the verbs they combine with specific argument structure constructions. For example, there are two variants of the ditransitive construction: the double object construction (The undercover cop sold the criminal some cocaine) and the prepositional phrase construction (The undercover cop sold some cocaine to the criminal); native speakers strongly prefer to use verbs like 'give' in the former and verbs like 'sell' in the latter. This study investigates the extent to which similar preferences can be observed in learners of English whose first language does not make distinctions in this way. Ultimately, this addresses the larger question of how well second language learners are able to acquire aspects of the second language that have no counterpart in their first language. We examined data from a corpus of English essays written by Korean students and used a Distinctive Collexeme Analysis to identify any verb-construction biases. The results indicate that Korean learners' verb-construction preferences largely align with native speakers', suggesting that these learners acquired the implicit preferences of verb-construction combinations in a native-like manner, despite their first language using a morphological rather than syntactic information structure.

Compound 21, an Angiotensin Type II Receptor Agonist Exerts Cardiopulmonary Protection Against Bleomycin-Induced Pulmonary Fibrosis

Pulmonary Fibrosis (PF) is a devastating disease of unknown etiology that affects the lung architecture. Dysregulation of the renin-angiotensin system has been implicated in the progression of PF, and recent developments suggest a protective role for the angiotensin type 2 receptor (AT2R) in cardiopulmonary disease. These findings indicate a promising role for the AT2R for PF therapy. This study further elucidates the therapeutic potential of the AT2R by employing an AT2R agonist, Compound 21 (C21), in the bleomycin (BLM) model of PF. A single dose of BLM was injected intratracheally (2.5mg/kg) to induce PF in rats. Immediately after, a portion of rats received C21 (0.03mg/kg, ip) daily for 2 weeks, after which hemodynamic measurements were taken and tissues were collected for histological analysis. BLM significantly increased right ventricular systolic pressure (RVSP) and maladaptive cardiac remodeling. C21 countered these effects, attenuating the BLM-induced right ventricular hypertrophy and increase in RVSP. Further, histopathological studies of hematoxylin and eosin stained lung sections demonstrated decreased interstitial collagen deposition in the C21 treated group (Control: 0.07+0.058; BLM: 5.02+0.18; BLM+C21: 3.59+0.26). In sum, this study indicates the significant anti-fibrotic effects of the AT2R agonist, C21, and suggests its therapeutic potential for patients with PF.
Aaron Copland’s Piano Fantasy and the McCarthy Hearings

In 1951, the president of the Juilliard School of Music, William Schuman, asked Copland to compose a piece for the School’s 50th anniversary. Accepting the commission, Copland decided on a cantata with text by Walt Whitman. This was a natural decision for him, for as one of the most prominent American composers in his time, a choral work would have fit his populist style. Various events, however, forced him to put this piece on hold, one of which involved Senator Joseph McCarthy summoning Copland before a subcommittee investigating “Un-American” activities in May 1953. This hearing had a tremendous impact on Copland’s life and the cantata’s fate. When pressed about the commission’s deadline, Copland decided that the cantata should be replaced with the serial Piano Fantasy he had begun three years before. Such a dramatic change was a result, I argue, of the conflicting aesthetics between populist and abstract compositional approaches. Using autograph materials preserved at the Library of Congress and a close analysis of the score, I claim that the McCarthy hearings were pivotal in Copland’s decision to write the Piano Fantasy as well as his adoption of 12-tone serialism.

IL-10 Modifies Disease Progression and Pathology in a Mouse Model of Alpha Synucleinopathy

We will test the potential disease modifying effect of the potent, broad spectrum, anti-inflammatory cytokine IL-10 on a-synuclein (aS) pathology and neurodegeneration. IL-10 will be constitutively and broadly delivered to the brain and spinal cord of M83 A53T mutant aS mice via cistern magna injection of rAAV2/9-IL-10 at P0. Time to moribund and neuropathological phenotypes will be assessed in cohorts of  i) otherwise unmanipulated M83 mice and ii) a novel seeded model in which pathology is dramatically accelerated and synchronized by intramuscular (IM) injection of aS fibrils in 2 month old M83 mice. The proposed studies leverage experimentally validated paradigms that we have developed to rapidly and cost-effectively deliver genes that modify innate immune activation states to the CNS of mouse models of neurodegenerative disease (2-7). These studies will directly test the hypothesis that IL-10 mediated suppression of innate immune activation that accompanies aS inclusion pathology is a potentially disease modifying strategy in Parkinson’s Disease (PD). In addition to the focused testing of IL-10, these studies have extrinsic merit as they will establish cost-effective paradigms for target validation relevant to disease modification using rAAV vectors to deliver biologic agents to the CNS in seeded and unmanipulated A53T M83 mice.
Balancing Selection Maintains Chromosomal Inversion in Ceratodon purpureus

A central problem in evolutionary genetics is to understand the role of balancing selection in maintaining variation in natural populations. A classic example of a balanced polymorphism is a chromosomal inversion. For example, if genes are present on a chromosome in the order ABCDEFG, an inversion might change the order to ABEDCFG. Many inversions show evidence of spatially variable selection, whereby one inversion type is favored in one region, and the alternate type is favored elsewhere. Here, I sought to define the boundaries of a putative inversion at the adk locus in the moss Ceratodon purpureus. C. purpureus experiences reduced recombination around the adk locus and greater genealogical depth between the two adk alleles than expected under neutrality, both patterns characteristic of inversions. To accomplish this, I used the C. purpureus genome and the statistical software R to analyze the scaffold containing the adk locus; I then used Illumina resequencing data to identify markers spanning the putative inversion. Next, I began to grow progeny from field-collected heterozygous and homozygous plants in order to test marker order. These data will allow me to discover where in the genome the inversion breakpoints are, and thus where balancing selection acts in these populations.

Electrospun Vascular Scaffolds with Crosslinked Diol-Citrate Elastomers

Electrospinning has emerged as a promising method to create highly porous scaffolds for vascular tissue engineering. Several challenges exist in the engineering of a biomaterial scaffold that mimics the fibrous extracellular matrix (ECM) of the vasculature, including the selection of a suitable material able to be fabricated in a similar fibrous form. Poly(diol-citrates) (PDCs) are biodegradable elastomers that have been studied for vascular tissue engineering due to their reported anti-thrombogenic nature, biocompatibility, and tunable mechanical properties. There has however been difficulty processing PDCs into the fibrous form resembling ECM by electrospinning, due to its gel-like nature before thermal crosslinking. We report the fabrication of crosslinked PDCs in a novel electrospun composite. In this study PDCs were electrospun with poly(acrylic acid) (PAA), which has been studied extensively for biomaterial applications due to its biodegradability. Electrospun scaffolds were fabricated and characterized by SEM analysis, cell attachment and proliferation studies using smooth muscle cells, mechanical testing, and the degradation profile. The results of these studies show that PDC-PAA is a dynamic fibrous scaffolds matrix that is biocompatible with tunable mechanical and degradation properties, making this a promising approach to the creation of a medial layer for vascular tissue engineering applications.
Interactive Mechanical Simulation of Human Bones

Mechanics are often difficult to visualize, especially for objects which do not very visibly deform. This project is a prototype for an interactive mechanical simulation of human bones. By using a gamified design and greatly exaggerating the deformations, users can better visualize the deformation effects of various stresses on the bone. Additionally, reasonably accurate estimations of the stresses experienced at each point in the bone can be returned separately from the exaggerated deformation; the relative stress at each point can then be used to render a specific color, e.g. red for an area under extreme stress and green for an area under little stress.

Paleodemographic Analysis of Mayport Mound (8DU96)

Northeast Florida, particularly the Lower St. John’s region, has been a subject of interest to archaeologists for well over a century. Of the numerous excavations undertaken in the region, a majority of them have been sand burial mounds. Marked similarities between these sites, in addition to associated artifacts, have resulted in the confident assignment to >20 mounds dating to the Woodland period in the region. These constructed mounds were 1-2 meters high. Substantial work has yielded information regarding cultural affiliation through ceramic analyses, however, minimal attention has been focused on site demographics including basic estimates of age and sex. This study focuses on one site, Mayport Mound (8DU96), where excavations began in 1964. We focus specifically on paleodemographics, and age and sex assessment methods of individual burials recovered. New methods, in particular the 'zonation method', are applied to this fragmentary assemblage to glean more accurate information than using traditional 'standards' used in assessing age and sex of skeletal remains. These data will contribute to broader studies of paleodemographics in the southeastern United States. Further, identified individuals will be situated in bioarchaeological context with other sources of data to assess individual life history of the ancient Floridians interred at Mayport Mound.
The Differential Effects of Macromolecular Crowding on Tau Aggregation and Interactions of Tau with Microtubules

In its natively unfolded form, tau acts to stabilize tubulin polymerization into microtubules (MT), a key feature of the cytoskeleton. However, tau dissociates from MT and forms insoluble fibrils when abnormally phosphorylated, destabilizing the cytoskeleton. Phosphorylated tau forms aggregates called paired helical filaments, which are the principal constituents of neurofibrillary tangles, the pathological hallmarks of Alzheimer’s disease (AD). This research investigates the influence of macromolecular crowding on the self-association of tau and interactions of tau with MT. “Crowding” refers to the high volume occupancy of solutions by inert macromolecules. Experiments under crowded conditions mimic the physiological conditions inside cells, thus providing a more realistic representation of protein interactions compared to in vitro experimentation. Due to high volume exclusion in crowded solutions, the system seeks chemical equilibrium by favoring changes that reduce occupied volume, such as protein folding and macromolecular association. It was hypothesized that crowding should accelerate aggregation over MT binding, since tau aggregation involves both protein folding and association, while evidence shows that tau-MT binding has only the latter. The results of this research will elucidate the aggregation behavior of tau in the presence of crowding agents, which can shed light upon the mechanism of tau pathology in AD.

Extended Spectrum of β-lactamases-producing Microorganisms May Cause Antibiotic Treatment Failure in Cows with Metritis

Metritis is a postpartum uterine disease in dairy cows characterized by uterine discharge and chronic inflammation of the endometrium. Cefotaxim, a 3rd generation cephalosporin, is widely used to treat uterine disease in dairy cows. However, the treatment failure rate is about 30% with unknown reason. We determined the prevalence of extended spectrum β-lactamases (ESBL)-producing microorganisms in postpartum dairy cows with clinical metritis. The uterine samples were collected from 23 dairy cattle with metritis at the Dairy Research Unit (DRU). The swab samples were enriched in tryptic soy broth (TSB) overnight in the presence of cefotaxim. We found that fourteen animals (60.9%) were infected with cefotaxime resistant (CefR) microorganisms. The CefR isolates were further purified on MacConkey agar containing cefotaxime. Majority of the CefR microorganisms were identified as pathogenic E. coli by further biochemical analyses, with a few other genera identified by 16S rRNA gene sequencing. In addition, we found that the percentage of bla TEM, bla CTX-M, and bla CMY genes in CefR isolates were 7.14%, 21.42%, and 78.57%, respectively. Our study suggests that ESBL-producing microorganisms may cause the antibiotic treatment failure in cows with metritis. Therefore, it is an urgent need to develop alternative treatment methods for animal health.
Evaluating the Raz-Rru System for Use in Identifying Biogeochemical Hot Spots in Springs

Shifts from macrophytic to algal cover in Florida’s springs are thought to result from increased nitrate loading and decreased flow; however the linkages between hydrology and nutrient processing are not well understood. While the hyporheic zone has been identified as a biogeochemical “hot spot” with significant denitrification potential, its contribution to nitrate removal is debated. “Smart tracer” methods such as the resazurin-resorufin (Raz-Rru) system have been introduced to quantify hyporheic exchange and microbial metabolism; however preliminary tests did not yield transformation of Raz due to insufficient residence times and inactive, homogeneous soils. This study will employ batch tests of samples from expected “hot spots” to determine the effectiveness of Raz-Rru as an indicator of microbial metabolism throughout spring soil profiles. Raz transformation rates will be measured over a gradient of oxidation-reduction (redox) potentials and compared to respiration estimates. Greater reduction of Raz is expected with high redox potentials, and variations in this transformation will likely be the product of changing microbial respiration pathways. Although reach scale Raz-Rru studies in first magnitude springs are cost prohibitive, this work will contribute to the understanding of hydrologic effects on biogeochemical cycling and provide an impetus for the development of new “smart tracer” systems.

The Politics of National Accounts: Debt and Deficit in the European Union

This article examines the politics of national accounts in the European Union (EU), focusing on two of the most salient elements – debt and deficit. Previous literature in the field has uncovered many European states have a propensity towards “creative accounting,” even after the introduction of the Euro. Within this literature, there are differing accounts as to what gives rise to this phenomenon. Where some suggest domestic political and economic cycles are the primary motivation, others argue adherence to the supranational framework of the Economic and Monetary Union (EMU) gives states an incentive to use “creative accounting.” My research considers the interaction between domestic and international components and extends the analysis beyond the global financial crisis of 2008. It shows that the crisis has altered the hierarchical dynamic within the EMU, and concludes with perspectives on how this impacts national accounts.
The Association of Perceived Provider Cultural Sensitivity with Physical Activity among Rural African American Patients

Physical activity is important for achieving and maintaining a healthy BMI. The amount of cultural sensitivity patients perceive from their health care providers can impact their likelihood of following provider recommendations (e.g., engaging in physical activity). The present study analyzes the relationship between patient-perceived provider cultural sensitivity and patient engagement in physical activity among rural African Americans. Ninety African American patients who utilize either of two rural clinics in Florida (i.e., ACORN Clinic and Archer Clinic) self-reported their frequency of engaging in physical activity and completed the Tucker-Culturally Sensitive Health Care Provider Inventory-Patient Form. Most participants reported high levels of perceived cultural sensitivity in their providers and low levels of physical activity. Physical activity was not significantly correlated with patient-perceived provider cultural sensitivity. However, age and physical activity were negatively correlated. Lack of variability in provider cultural sensitivity ratings in this sample may have contributed to finding no significant relationship between patient-perceived provider cultural sensitivity and physical activity. Future research is needed that controls for satisfaction with health care and includes a larger sample of patients. However, the findings suggest that programs to increase engagement in physical activity among rural African American patients should target older patients.

Size-at-Maturity in a Simultaneous Hermaphrodite Fish

Serranus tortugarum (chalk bass) is a simultaneous hermaphrodite that participates in paired mating wherein one partner releases eggs and the other partner fertilizes them (Fisher, 1980). Additionally, chalk bass streak, or a fish joins a neighboring pair and releasing sperm over the spawn of the pair (Fisher, 1984). The unique mating strategies exhibited by chalk bass prompted this study that aims: to identify the size at which the reproductive tissues of chalk bass are found to be mature, and to assess which reproductive tissues mature first. We began by removing gonads from 70 fish and scoring them based on appearance of being mature/separable. This allowed the selection of 30 samples from 25-30 mm standard length (SL) range. Gonads above 30 mm SL were found to have both male and female tissue obviously mature and gonads of fish below 25 mm SL were immature (Hart, 2013). We then used histology to prepare gonad sections and assess the maturity of them under a microscope. Our research showed that male tissues are mature from 26 to ≥ 28 mm SL, and female tissues are mature from 26.5 to ≥ 29 mm SL. These results support the maturation of testicular tissue before ovarian tissue.
Patterns in Death: A Reevaluation of Middle Bronze Age Burials at Tel Megiddo

In the 19th and early 20th centuries, archaeologists excavated sites in the ancient Levant and reconstructed past societies based on stratigraphy, material goods and architecture. When human burials were encountered, the findings were documented with now-dated photography methods and limitedly descriptive burial reports. This dilemma has made any modern osteological analysis near impossible. Through the remnants of burial documentation at Tel Megiddo, micro-patterns emerged within the parameters of age, social status and biological sex. In this paper, I reevaluate any prospective osteological and cultural information from previously published data, with hopes to find and potentially explain these Middle Bronze Age burial patterns at Tel Megiddo.

How Edges Impact Predation Risk of Threatened Juvenile Gopher Tortoises

While much research has been conducted on adult Gopher Tortoises (Gopherus polyphemus), some demographic models suggest the species’ long-term survival is sensitive to changes in juvenile and hatchling mortality rates, and the factors that affect these rates remain largely unknown. Additionally, little is known about how anthropogenic edges, such as roads, might influence this risk in fragmented habitat. Such areas provide canopy gaps (especially in fire-suppressed habitat) that support plants that Gopher Tortoises feed on but may also provide unobstructed routes for predator movement. I investigated edge effects on predation risk for juvenile tortoises by placing tortoise-scented plasticine model tortoises in artificial burrows at interior and edge points in historically fire-suppressed habitat at Archbold Biological Station in Highlands County, Florida. I recorded predator occurrence and attack rates at each point using motion-sensor cameras. Approximately twice as many predators visited edges compared to interiors (with 0.92 and 0.42 mean visits per six-day block point, respectively), though this difference was non-significant. Similar patterns were found for predator attacks on model tortoises. Presently it is unclear what effect predator activity rate has on the tortoise population. Further study is warranted to wholly understand how to best conserve this vulnerable species and its habitat.
Islamic Feminist Spirituality: An Underutilized Instrument of Progress

Looking specifically at the feminist movement in Islam, we can see spirituality as a key tool for progress that has been severely underutilized. Islamic feminism remains at a standstill, lagging miles behind its Abrahamic counterparts. A promising way to push past the never-ending obstructions to feminist progress is to work through a new and largely unexplored avenue. Working from the grass roots, with the varied practices of spiritual Islam, we can seek improved conditions for Muslim women. This paper explores fundamentalism/Islamism as the antithesis of feminism, spirituality as the antithesis of fundamentalism, and consequently, postulates spiritual Islam as an avenue of growth for Islamic feminism. This postulation is explored first by examining secondary texts relating spirituality to feminist progress in the other Abrahamic traditions (Christianity, Judaism). We next narrow our focus into spiritual Islam, expressed through the mystical traditions of Sufism. By examining primary texts and feminist history within Sufism particularly, we can see a correlation between spirituality and feminist progress.

Keywords: Muslims, Islam, Islamic Feminism, Fundamentalism, Feminist Spirituality, Sufism, Mysticism, Mystical Islam, Rabi'a, Modern Feminism, Reformist Feminism

Self-assembled Nanoparticle Anti-glare Coatings for Glass Substrates

Anti-reflection coatings (ARC's) are widely used in photovoltaic and many other optoelectronic applications. A large variety of techniques currently exist in fabricating ARC's, but unfortunately many of them suffer from being very expensive or time consuming. Here we introduce a novel self-assembled method to fabricate ARC's on glass substrates. Both sides of the substrates are easily coated with a closely packed monolayer of silica nanoparticles using electrostatic forces. The coatings produced were extremely uniform and had a minimum reflection less than 1% for a broad range of visible and near-infrared wavelengths. This method is simple and scalable that lowers reflection less than 1% which is highly promising for applications ranging from highly efficient solar cells and photo detectors to flat panel displays.
Effect of Bath Salt (MDPV) on Functional Connectivity in an Animal Model of Frontotemporal Dementia

Carriers of a mutation to the progranulin (PGRN) gene may be susceptible to the stressful effects of drug of abuse, especially potent drugs like bath salts. Progranulin is a 593 amino acid protein distributed in brain that mediates pro-inflammatory signaling and neurotrophic actions. PRGN has been linked to frontotemporal lobar dementia and as well as depression and schizophrenia. Negative mood, cognitive impairment and hallucinations may occur in individuals with functional deficits in the progranulin (PGRN) gene. Chronic MDPV abuse can cause a similar syndrome with hallucinations, excited delirium, depression, anxiety, and in many cases violent aggression and suicidal thoughts that may persist for months. Interestingly, mice lacking the PGRN gene show behavioral signs that resemble bath salts effects. We have recently shown that the bath salt drug, 3,4-methylenedioxy-pyrovalerone (MDPV) causes a potent reduction in brain functional connectivity measured by functional magnetic resonance imaging. We assess functional connectivity in PGRN +/- mice following chronic exposure to MDPV. We predicted that this potentially vulnerable phenotype will be especially sensitive to the central actions of MDPV. The present experiments will provide the needed data that will help develop strategies to treat impaired brain function in people with a history of bath salt abuse.

The Effect of Tenascin-C on Glioblastoma Multiforme Cell Migration.

Tenascin-C is an extracellular matrix protein involved in different biological processes such as embryonic development, wound healing and rheumatoid arthritis. It also appears in aggressive Glioblastoma Multiforme (GBM) and has been linked to a reduced survival rate in GBM cancer patients. Since mechanical stress induces the production of tenascin which co-exists with fibronectin on the ECM and the invasiveness of GBM is also correlated with the rigidity of the extracellular matrix, this study aims to determine the role of tenacin-C in GBM cell migration when combined with fibronectin. This study utilizes nucleus displacement, single cell analysis and immunostaining to quantify GBM cell migration. The results of this experiment will clarify the role tenasin and the rigidity of the ECM play in the aggressive GBM cell migration.
Impact of Focusing Grid Electrodes and Pulsed Power on Modified IEC Fusion Device

Modifications to a standard, cylindrical D-D Inertial Electrostatic Confinement fusion device are proposed and analyzed. In hopes of reducing operating power consumption and component degradation, pulsed operation is proposed. As the interval of fuel's exposure to high voltage potential is decreased, it is necessary to compensate for the reduction in ionic production. This is accomplished via injection of electrons into the reaction chamber. An axial magnetic field is to be used to 1) restrict the electron tracks to the outer area of the cylinder and 2) briefly confine the ionized fuel – thus ensuring maximum final collisional energy of the hydrogen atoms. The idea of ion-pathway focusing grid electrodes is also explored. A charged particle lens that focuses incoming ions onto the center of the chamber can be created by placing an additional, concentric electrode at a between point of the IEC cathode and anode, and at a voltage lower in magnitude and opposite in sign to that of the cathode. This decreases the stochastic behavior of the ions, and minimizes the collisional area – therefore increasing collisional probabilities. A Schwarz-Christoffel electrostatic field representation simulation was ran to verify these claims.

The Effect of Support Services on Women in Training Programs

Job Corps is the largest government sponsored training program for economically disadvantaged youth aged 16-24 years old in the US. The program offers individualized and self-paced academic and vocational instruction along with supportive services including counseling, child care, and health services. Studies allude to the beneficial effect on participants' labor market outcomes (higher earnings—an additional $25.2 per week, employment probability—a 3.3 percentage point difference), and health, among others. Recently, a series of studies unbundles the average program effect accounting for the part mediated through the attainment of a degree through Job Corps relating labor market performance to accumulation of human capital. In this paper we venture to estimate the effect of the program channeled through its supportive services as captured by participation in counseling, health education, parenting skill, and social skill training, among others. We are especially interested in evaluating the impact of the supportive services for female participants, a demographic that has not been discussed extensively in the training program evaluation literature.
Quantifying Arterial Pruning from Birth to Adulthood in Children Born Prematurely

Each year in the United States 1 out of 8 babies that are born are prematurely; less than 37 weeks gestational age. Those that make it into childhood face additional medical issues such as respiratory distress syndrome, bronchopulmonary dysplasia (BPD), lung disease and pulmonary arterial hypertension (PAH). Chronic PAH can be fatal due to the damage it causes to the vascular endothelium which in turn leads to progressive occlusion and pruning away of the arterioles. My hypothesis is that those who are born prematurely and develop chronic PAH will have a progression in the amount of occlusion and pruning away of the arterioles as they grow and develop further into adulthood. I received chest CT scans of patients seen at the UF Health Shands Pediatric Pulmonary Care center. I focused on children who are in the age range between 3-18 years old; analyzing each chest CT scan using software tools specifically developed in Dr. O'Dell's research lab. Charting information related to the number of vessels at each size in a diagram form allowed us to correlate the age of the patient with the amount of pruning of the arterioles.

Dysregulated Cytokine Production by Leukocytes, Mediated by SOCS1 Deficiency, is Correlated to Skin Pathology: Implications for Therapeutic Targeting

Dysregulated leukocyte activation and cytokine signaling are known to contribute to autoimmunity. Notably, although Suppressor of Cytokine Signaling-1 (SOCS1) is important in the regulation of both leukocyte activation and cytokine signaling, how deficiencies in SOCS1 relate to autoimmunity is not well understood. Therefore we analyzed leukocytes from mice bearing heterozygous expression of SOCS1 (SOCS1+/-) for dysregulated immune function. LPS stimulated SOCS1+/- leukocytes exhibited enhanced production of IL6, and IL12. Notably we observed that SOCS1+/IFNγ-/- mice, but not IFNγ-/-, SOCS1+/-, or wild-type mice exhibited significant skin pathology on the back and ears. The observed skin pathology in SOCS1+-IFNγ-/- mice was correlated to leukocyte accumulation within draining lymph nodes and spleen. In vitro, SOCS1+/IFNγ-/- leukocytes activated with αCD3/αCD28 were hyperproliferative and produced higher levels of IL17 when compared SOCS1+/+ littermates. Finally, a peptide capable of partially mimicking SOCS1 (SOCS1-KIR) was sufficient to reduce excessive proliferation, and aberrant IL12 and IL6 production of SOCS1+/- leukocytes in vitro. Together these results implicate an important role of SOCS1 in the regulation of immune responses. Moreover these results suggest that targeting SOCS1 deficiency, by a mimetic of SOCS1, may have implications in the regulation of skin pathologies mediated by immune dysregulation.
Mechanisms of PTEN Inactivation in NF1 Malignant Peripheral Nerve Sheath Tumors

Neurofibromatosis 1 (NF1) is an autosomal dominant tumor condition with patients heterozygous for inactivating NF1 gene mutations. NF1 benign tumors (neurofibromas, Schwann cell tumors) are formed as a result of an inactivating somatic mutation of the remaining normal NF1 allele. Neurofibromas on the skin are not of medical significance, but those that grow in larger, deeper nerves (called plexiform) can cause functional impairment and have a 15-30% risk of transforming into a malignant peripheral nerve sheath tumor (MPNST). We hypothesized that inactivation of PTEN would be present in human NF1 MPNSTs. I looked for somatic PTEN deletions in DNA from 14 patient MPNSTs using loss of heterozygosity (LOH) analysis with polymorphisms. All 7 MPNSTs informative for PTEN polymorphisms, showed LOH supportive of the hypothesis. Because I did not find any more-subtle mutations after sequencing PTEN cDNA from the other tumors, I chose to do an epigenetic methylation study of PTEN in samples that do not contain LOH, hypothesizing that methylation could silence gene transcription, as a functionally-equivalent alternative to somatic DNA change. So far the normal Schwann cell culture is completely unmethylated at PTEN as expected. One MPNST primary tumor DNA showed complete methylation, and the cell line derived from it showed mixed methylation, supporting our hypothesis that methylation can be an alternative way to inactivate PTEN in MPNST progression.

Coupled Thermal and Structural Finite-Element Analysis of a Disc Brake Rotor

This paper outlines techniques to design and analyze a disk brake rotor. The methods presented focus on the generation of boundary conditions for finite-element analysis. A strong focus is on the creation of an accurate thermal model. Data collected from testing of a known disk brake rotor design under similar design conditions will be used to calculate the thermal boundary conditions. Validation of the thermal modeling technique will be included. The creation of a structural model using the thermal model results as a boundary condition will be mentioned, however the analysis of the structural model results is beyond the scope of this paper. The design presented throughout this paper was tested in operation, and shown to perform satisfactorily under the intended design conditions. Under operating conditions exceeding the design conditions, the rotor failed due to overheating. The cause of this was investigated, and the thermal model updated with the increased boundary conditions to determine if the temperatures predicted would lead to failure.
Dance, Art, and Academia: The Impact of Dance on the Lives of Students in a High School Setting

This paper discusses a research study investigating the personal impact of a core curriculum dance class on the high school student. By conducting a bi-weekly dance class and administering a survey to refine a questionnaire tool, the research produced qualitative and quantitative data. The case study involved conducting an intermediate dance class composed of sophomores at Humanities and Arts Academy in L.A., CA. Class time was used to teach technique classes, set a choreographic work, provide input for the dance survey, and to discuss and reflect upon the personal impact of taking a dance class in students’ lives. Documentation included interviews, group discussions, personal observations, and student’s feedback from the survey process. The case study showed how the class affected the student’s perceptions of day-to-day life, physical and emotional needs, and desire to attend school. The survey administered was refined in consultation with the students to render a quantitative questionnaire tool. The questionnaire portion of the study expanded to ten high schools involving over two hundred students. While the original case study group reported positive impacts, including physical, emotional, social, and academics; the expanded group results further validated that taking a core curriculum dance class positively influenced their lives.

Effects of Spinal Nerve Rootlets on Intrathecal Drug Delivery

Intrathecal drug therapy is a widely applicable method of drug delivery by which pharmaceuticals are administered to targeted regions of the spinal cord. Current intrathecal transport models neglect dispersion effects of spinal nerve rootlet geometry, erroneously assuming the sole presence of diffusion. A corrected model, governed by the coupling of dispersion and diffusion, was designed to characterize the concentration, flow, and spread of intrathecal drugs. Diffusion coefficients were determined experimentally and compared to reported coefficients, to quantify variance between the two models. An in vitro model of the spinal cord was fabricated to simulate flow patterns within the cerebrospinal fluid (CSF). Indigo dye, which replicated intrathecal baclofen, was injected into the model CSF. Images were recorded at various time points and analyzed to develop a dye concentration profile. An equation for concentration was fit to each data set, and diffusion coefficient values were generated. The experimental diffusion coefficients were found to be several orders of magnitude greater than predicted coefficients. This variance indicates that dispersion effects are significant in the mass transport of intrathecal drugs. An unexpected drug distribution due to a diffusion coefficient miscalculation may be lethal, thus it is crucial to accurately model the transport of intrathecal drugs.
Examining Coverage Surrounding the Ha’Avarah Transfer Agreement in Jewish Palestinian News Outlets

My research examines the press coverage of Davar and the Palestine Post in regard to three main topics: the announcement of the Jewish American boycott movement against Nazi Germany, German Jews and their situation in Germany during the 1930s, and the announcement of the Ha’Avarah Transfer Agreement. An analysis of this nature shed light on the perceptions these publications held in regard to these topics and the influence they held over their different targeted readerships. Research of this nature is useful when attempting to gain an insight into the social rhetoric common within Jewish Palestine right before the mass arrival of German immigrants escaping Nazi Germany through the Ha’Avarah Transfer Agreement.

Do Fish Fear Snorkelers? Non-lethal Human Effects on Fish Foraging Behavior

Coastal areas provide many resources and services to humans. As such, extensive research has been conducted on consumptive human impacts (overfishing, pollution, etc.) on these coastal environments. However, little is known about the non-consumptive effects of fishing and tourism, or in other words, how fish alter their behavior in the presence of lethal or non-lethal humans. We tested the effect of human presence along with effect of reef structure density by measuring herbivory rates in the reef north of Cook’s Bay, Mo’orea. We randomly assigned one high density and one low density structured location to be subjected to human visitation. We quantified the effects of human visitation and percent structural cover through the average length of Acanthophora spicifera that was consumed at each location. We discovered that herbivory is mostly determined by the density of surrounding structure, while human presence had little effect. Flight Initiation Distance, or FID, data determined that the amount of surrounding structure is highly correlated to the skittishness of the fish species, Acanthurus nigrofuscus and Zebrasoma scopas. The correlation indicates that the higher the percent structure of coral in a given area, the closer a human can get to a fish and the smaller the FID.
**Glutathione Transferase Z1 on the Efficacy of Dichloroacetate as an Anti-tumor Drug**

Dichloroacetate (DCA) is a small molecule that has been used for many years in the treatment of children with mitochondrial disorders. By reactivating the Pyruvate Dehydrogenase Complex though its inhibition of Pyruvate Dehydrogenase Kinase, DCA has the ability to alter cell metabolism. Thus, DCA is under investigation as a cancer therapy due to its ability to reverse the Warburg effect and induce apoptosis in tumor cells. Here we present data showing that glutathione transferase zeta 1 (GSTZ1), the enzyme responsible for DCA metabolism, is often misregulated in cancer. This misregulation can lead to variations in DCA metabolism in tumors from different patients. We present both two- and three-dimensional cell cultures that show that increasing GSTZ1 expression results in resistance to DCA. Furthermore, while GSTZ1's role in DCA metabolism is well studied, the process by which the enzyme is degraded is not. Here we present data that provide clues into how GSTZ1 is degraded in the presence of DCA in vitro. The clinical implications of these results are important, as the outcomes of DCA as a therapy for cancer are likely dependent on how DCA is metabolized in the tumor.

**Application of a Combinatorial Natural Product Therapy for the Treatment of High-grade Gliomas**

Resistance to toxic compounds used at maximum tolerated dose is the most commonly experienced outcome in cancer therapy. We have developed a therapeutic strategy relying on multiple independent and non-toxic stressors that enable efficient horizontal and vertical targeting of the tumor. The first aspect involves the simultaneous application of three natural products (curcumin, epigallocatechin-3-gallate, and sulforaphane) that have previously demonstrated anticancer properties and have a documented safety profile. Each individual natural product (NP) is able to inhibit in vitro the expansion of glioma cancer stem cells with the combination of all three compounds producing a synergistic effect. The NP combination also demonstrated greater ability to decrease tumor progression and increase survival in a clinically relevant orthotopic xenograft model of glioma. The second component is a metabolic targeting through dietary alteration limiting the intake of carbohydrates, thereby reducing glucose metabolism, which represents the main source of energy production for cancer cells. Animals intracranially xenografted with glioma cells show greater survival when treated with the combination of the metabolic treatment coupled with the NPs. Notably, CA.001 works synergistically with the conventional chemotherapy temozolomide (TMZ) and is an effective therapeutic against TMZ-resistant glioma cells. CA.001 is able to sensitize TMZ-resistant cells to TMZ.
**Effects of Peripheral Oxytocin Injections on Alcohol Consumption in Rats**

The neuropeptide oxytocin interacts with mesolimbic dopamine neurons to mediate reward associated with behaviors like consuming drugs of abuse. Based on its efficacy to decrease intake of many abused substances, oxytocin is implicated as a possible treatment for excessive alcohol consumption. We tested this hypothesis by measuring ethanol intake in male rats injected with oxytocin or saline using two different ethanol self-administration paradigms. First, a dose-response curve was constructed for oxytocin inhibition of fluid intake using a modified drinking-in-the-dark model with three bottles containing saccharine and two different concentrations of ethanol. Next, they received oxytocin injections preceding operant sessions in which they were trained to lever-press for either plain or ethanol gelatin. An extension of this study compared gelatin containing polycose to plain gelatin to determine whether calorie content motivated the rats to consume. Consumption values for ethanol in all studies were analyzed for significance compared to pre- and post-injection days and the saline injection baseline. For both of our studies, consumption data shows a significant decrease in ethanol gel consumption on the day of oxytocin administration. These data affirm oxytocin’s usefulness for decreasing drinking behavior in rats, and suggest that oxytocin is a potential treatment for alcoholism and addiction.

**The Effect of Raspberry Ketone on Various Drug Metabolizing Enzymes**

Raspberry ketone is a naturally occurring chemical compound that can be found in raspberries, cranberries, blackberries, and kiwi fruits. The use of raspberry ketone as a dietary supplement is increasing because of purported beneficial effects on skin, hair loss, and weight loss. The cytochrome P450 (CYP) family of drug metabolizing enzymes is responsible for eliminating about 75 percent of prescribed drugs. Specifically, the subfamilies CYP3A and CYP2D are responsible for about half of all CYP activity and these enzymes metabolize a variety of chemically unrelated drugs from many classes. Thus, these CYP enzymes are two of the most important ones to investigate. The UDP-glucuronosyltransferase (UGT) family of enzymes is a major contributor to drug metabolism mediated by conjugation reactions, accounting for about half of them for prescribed drugs. The aim of this study is to identify whether or not, and to what extent, raspberry ketone is an inhibitor of the enzymes CYP2C8, CYP3A4, UGT1A8/10, and UGT1A9. Because of the recent increase in popularity of raspberry ketone, and the corresponding increased risk of it being taken with prescription drugs, it is important to understand how it affects these very common metabolism pathways.
English Language Learners and Reading Comprehension: Using Culturally Relevant Texts
There has been little research in how to best support English Language Learners’ (ELLs) development of reading comprehension. Based on recent research in the areas of reading comprehension, student engagement, effect of book choice, and students’ funds of knowledge, it can be proposed that ELLs can be supported through the use of culturally-relevant texts, as it helps to facilitates reading comprehension and sub sequentially, achievement. This small, qualitative study was conducted with three 4th-grade ELLs. The students read a total of four books, two with a main character who was Caucasian and two with a main character matching their ethnicity, which was Mexican-American for all three students. After completing the reading each week, students were prompted to retell the main events of the book orally. The researcher used a reading comprehension checklist to determine the level of comprehension for both texts. Results of the study indicate a slight increase in comprehension for at least one student and a varied response to the culturally relevant books in the other two. Related literature indicates that regardless of these results, it could be an effective practice for instructors to utilize culturally relevant texts with their students.

Fabrication of Nanofibrous Carbon Electrode Based Supercapacitors
Supercapacitors are energy storage devices that have rapid charge and discharge capability, high charge storage density, and long life cycles. Therefore, applications requiring high energy flux in short time find supercapacitors very useful such as power regulation in automobile breaking systems, wind power plants, etc. There are two important components of a supercapacitor besides electrolyte: electrically conductive electrodes (anode and cathode) and an electrically non-conductive separator between the two electrodes. In this research, electrospun polymer derived carbon nanofibers have been used as electrode materials and electrospun polymer nanofibers as separator materials. The goal is to create a one layer supercapacitor with a high capacitance density per area. Experiments include fabrication of electrospun nanofibers using photopatternable epoxy SU-8, photolithographical patterning of SU-8 nanofiber membranes, carbonization of SU-8 nanofibers, assembly of electrodes and filling up electrolyte in the active supercapacitor area, electrical characterization, and circuit modeling of a supercapacitor using capacitance and series resistance. Feasibility of multi-layer supercapacitors is also discussed.
Benzotriazole-mediated Synthesis of 7-membered cyclic dipeptides
Cyclic dipeptides, or 2,5-diketopiperazines (2,5-DKPs), are found in many natural products often as the main structural motifs in more complex molecular compounds. DKPs are extracted from a variety of natural products and are attractive for drug development because of their ability to bind to a wide range of receptors, and many other special characteristics, gives them a wide range of biological responses. Numerous studies have been dedicated to the synthesis and biological properties of DKPs, but relatively few on the 7-membered analogs, Homo-DKPs. The most common synthesis of Homo-DKPs occurs using peptide coupling reagents through head-to-tail ring-closing lactamization. Unfortunately, reaction set-ups are challenging due to their peptide backbone requiring a more extended synthetic procedure, which most commonly results in low yields and partial epimerizations. Additionally, synthesis of small and medium ring-sized cyclic peptides failed even when using powerful coupling reagents (i.e. EDC–HOBt, BOP, TBTU and PfPyU) at high dilutions. Our research has been dedicated to improving diketopiperazine synthesis through the development of novel, innovative, efficient cyclization procedures for construction of peptide macrocycles. In this project, we have selectively converted open chain dipeptidoyl benzotriazole analogs containing a \( \beta \)-turn-inducing constraint into the corresponding seven membered Homo-DKPs in an intramolecular cyclization pathway.

Comparison of Sous Vide Preparation methods of Larger Boneless Beef & Pork Cuts
In this study we obtained pairs of beef clod hearts and pork shoulder butts from both sides of nine pork and nine beef carcasses. After aging, muscles were thawed and weighed. One muscle from one side of each carcass was browned in a non-stick skillet, then individually vacuum sealed, and placed in a constant temperature water bath at 135°F with a circulating water agitator for 10 h. No samples utilized in this study exceeded 4 inches of thickness, ensuring they reached the same internal temperature as the water bath (Baldwin, 2012). Upon removal from the water bath muscles were weighed again. Muscles not browned prior to sous vide cooking (SVC) were browned as previously described, and reweighed prior to trained sensory panel evaluation. The pork butts browned prior to SVC showed a lower cook loss compared to browning after SVC \((p=0.02)\). Clod hearts browned prior to SVC had 19.4% cook loss, similar to clod hearts browned after the SVC \((p=0.12)\). Slices from beef and pork roasts browned before SVC tended to have lower Warner-Bratzler Shear Force (WBSF) values than slices from roasts browned after SVC \((p=0.14 \text{ and } p=0.06, \text{ respectively})\). However, these differences were not detected by trained sensory panelists.
**Investigation of Murine Norovirus MNV-VP2 Protein as Possible Enterotoxin**

Human Noroviruses are one of the leading causes of gastrointestinal illness across the globe. Although this family of viruses presents a significant human burden, very little is understood about how they cause disease on a mechanistic level. However, Norovirus pathogenesis seems to be very similar to that of Rotavirus, another family of intestinal viruses, which cause disease by producing a protein called an enterotoxin. A particular Norovirus protein called VP2 shares structural similarities with the Rotavirus enterotoxin. The aim of this study is to isolate and elucidate the function of Norovirus VP2 to investigate its potential as a viral enterotoxin.

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**After the Orgy: Houellebecq and the Memory of ’68**

May 1968 witnessed a nationwide general-strike across France, uniting students and workers in utopian, liberationist protest. Although often remembered as a time of free love, 1968 was a divided terrain on which issues including consent, homosexuality, and feminism were negotiated. In 1967, the Neuwirth law legalized abortion and contraception and the Mouvement pour la Libération des Femmes (MLF) was founded in 197. A perceived crisis of the nuclear family followed. Simultaneously, an "American" fitness-avid, individualist, and technified consumerism emerged. Critics of ’68 from across the political spectrum have associated these changes. Analyzing the use of leftist notions in rejections of ’68, I turn to Michel Houellebecq, concentrating on Extension du domaine de la lutte (1994) and Les particules élémentaires (1998). I situate his criticisms of sexual liberation within a wider post-’68 frame, including sociologist Jean Baudrillard’s polemical “theory-fiction” in La transparence du mal (1990). I explore Houellebecq and Baudrillard’s crossing of genre boundaries, representations of 1968, and nostalgia for other models of love and sexuality to link the supposedly reactionary novelist and post-Marxist sociologist to a wider anti-liberationist current.
Addressing Issues In Gainesville Student Housing Market

The Gainesville student housing market is dominated by a few large firms that own multiple apartment complexes. These firms experienced landlord-tenant disputes such as maintenance, lease-breaking, the need to implement move out fees, threats of eviction, threats of lawsuits, etc. These disputes, combined with a population of young, first-time renters lead to: ineffective landlord-tenant problem prevention procedures, students who are unaware of their tenant rights and obligations, and students naïve of the rights of the landlord. The objectives of this project were twofold (1) determine quantitatively the number of each type of dispute in the Gainesville student housing market, and (2) research the ways in which apartment complexes contested these issues. This data was used to determine commonalities between the operational problems that each firm faced. The independent variable was the program effectiveness. The independent variable was the program’s response to the issue. The data span was the 2011-2012 and 2012-2013 academic years. My hypothesis was supported by the data as the disputes in each of the complexes under a firm should be similar and stem from the way that the firm handled landlord-tenant disputes.

Phenotypic Analysis of Gene Loci Identified as Risk Factors for Type 1 Diabetes

Type 1 diabetes (T1D) is an autoimmune disorder linked to the degradation of pancreatic β cells. These cells are responsible for producing insulin, a hormone that regulates blood sugar. Genome wide association studies have linked multiple loci as risk factors for the development of T1D. This study analyzed single nucleotide polymorphisms (SNPs) representative of loci that are immune specific (IL-2 receptor α CD25) as well as metabolism and pancreas related (insulin/insulin-like growth factor 2 (INS/IGF-2) and Cathepsin H (CTSH)). There was limited evidence available on phenotypic consequences of genotypes within risk loci. The hypothesis is SNPs within CD25 and INS/IGF-2 loci will stratify serum levels of soluble CD25 (sCD25) and IGF-2, respectively. Another hypothesis is SNPs within the CTSH locus will stratify serum levels of sCD25 and CTSH. Genotyping assays were used to determine SNPs and enzyme-linked immunosorbent assays (ELISA) were used to measure serum levels. This study revealed a trend for lower IGF-2 levels at onset of disease in those with the AA INS/IGF-2 SNP. Higher circulating levels of sCD25 were associated with the TT SNP for the CD25 allele irrespective of disease status. Understanding pathways is critical to understand progression and ultimately intervention for T1D.
**Geographic Information Systems: Rurality, Social Isolation, and Mental Health of Latino Adolescents**

Rural Latino adolescents are at risk for mental health problems, which may be related to the rural environment. The purpose of this study was to describe the evidence on rurality, social isolation and mental health in Latino adolescents and use geographic information systems to examine the relationship between these concepts. Geographic information systems is a software that can represent and analyze geographical data like land use and population characteristics. A review of literature was performed and evidence show that rurality may not affect the prevalence of mental health problems but may be related to the social disparities in rural areas. Data of 30 rural Latino adolescents was analyzed. GIS analysis revealed most of the sample living in very rural areas. Unexpectedly, many of the adolescents’ scores on social isolation and mental health were low; they did no perceive being isolated and not having mental health issues. The small sample may have biased the results.

**Magneto-Absorption Spectroscopy in a GaAs/AlGaAs Multiple Quantum Well Film**

Optically pumped nuclear magnetic resonance (OPNMR) inherently depends on the optical absorption of the excitation photons, but the relationship is neither direct nor well understood. To address this issue, we will directly compare the photon energy dependence of the magneto-absorption and OPNMR from the same GaAs/AlGaAs multiple quantum well (MQW) film with theoretical calculations of the absorption coefficients. These comparisons will aid in understanding the quantitative relationship between absorption and OPNMR. The GaAs/AlGaAs MQW film used in this experiment was grown on a GaAs substrate with a 28 nm well width. To produce an optically transparent film, we epoxy bonded the MQW film to a glass slide and removed the growth substrate with a sulfuric acid and peroxide solution followed by a selective citric acid solution. Magneto-absorption experiments were performed at 4.2 K and fields from 0 T to 17.5 T. Upon cooling the structure, the differential thermal contraction between the glass slide and the MQW film induces a biaxial tensile strain in the film, complicating theoretical calculations. Therefore, this work will also discuss a method to produce strain free films by selectively removing the GaAs substrate from the center of the structure using photolithography, leaving the MQW film unaffected.
Resolving a Rapid Radiation in Guzmania (Bromeliaceae) Using Low-copy Nuclear Genes

The New World Tropics (Neotropics) are an extremely heterogeneous area, characterized by rapid changes in habitat and climate. As a result, many organismal groups in this area have experienced rapid evolutionary diversification events. Bromeliaceae are a prime model group to develop and utilize genetic nuclear DNA markers to understand their phylogenetic history and current diversity. Previous research on bromeliad phylogenetics have failed to resolve fine-scale genus and species-level relationships due to a low level of molecular sequence divergence as a result of the extremely young age of the family. These studies have primarily relied on slowly evolving, less-informative chloroplast DNA markers. The bromeliad genus Guzmania contains approximately 211 species that are thought to have experienced a rapid radiation 4-5 million years ago across the Neotropics. They are an ecologically important group with many species growing as epiphytes on other plants and along rocks. An understanding of the evolutionary relationships among species of Guzmania can serve as a model to improve our understanding of Bromeliaceae evolution as a whole. The major objectives were 1) develop and optimize a set of low-copy nuclear markers for the bromeliad genus, Guzmania and 2) construct a species-level phylogeny using nuclear sequence data.

Carbon Monoxide at Low Concentrations Is Neuroprotective in Hypoxic Ischemia in Neonatal Mice

We have previously shown that exogenous administration of carbon monoxide (CO) at low concentrations is neuroprotective following ischemia in adult mice. With this novel finding, we seek to evaluate if CO is safe and, whether it can be a neuroprotective gas in neonates. We hypothesize that CO will be well tolerated in postnatal day 7 mice, and will decrease brain injury in the mouse model of neonatal hypoxic ischemia encephalopathy (HIE). We strive to investigate CO as a novel therapy following hypoxic-ischemia in neonatal mice. Preliminary results demonstrated that administration of CO to neonatal mice is safe. Exposure of mice to 250ppm CO resulted in no detectable neurological deficits and a blood COHb concentration of < 25%. We found that CO is well tolerated at 250ppm. Initial analysis of brain histopathology suggests that infarct volume may be decreased. With the safety of CO evaluated, we are currently analyzing tissue samples for: brain edema, apoptosis and gliosis, in order that such findings may be applied to the clinic to help protect the brain from these infarcts.
Finding Configuration Parameters That Impact Performance

The advent of cloud computing has created a surge in increased storage, flexibility, and cost reduction for all classes of IT users, especially businesses. For complex computing problems, cloud systems have provided solutions which would otherwise have been too large for a single computer to handle. An example is the Apache Hadoop framework, which provides an interface for solving large and complex computing problems using the MapReduce paradigm and a cloud cluster. Currently, programmers reach an efficiency bottleneck when determining how many resources are needed for a MapReduce job. Hadoop has around 200 configuration parameters and how these settings really affect the performance is not clearly known. People are using adhoc techniques to set these parameters. Underestimating the resources needed to run a job causes a framework like Hadoop to lag or crash. Overestimating the resources needed creates a higher cost. Finding an optimal program configuration by hand is unrealistic and time consuming. In this study, we are exploring automatic discovery of configuration parameters that might impact certain behavior. We use a static program analysis technique called Thin Slicing to extract relevant configuration parameters and we evaluate our experiment by using a case study from the Apache Hadoop bug database.

Lactobacillus acidophilus Surface layer protein-A (SlpA) binds to SIGNR3 to provide immune regulation

Human gut microbiota composed of trillions of microorganisms co-existing in a tightly regulated ecosystem, where a balance is maintained between pro-inflammatory and anti-inflammatory signals. In last few years, several beneficial bacteria were discovered from the gut microbiota, to harness their beneficial effects. In the recent past, we have discovered that the beneficial properties of a surface layer protein-A (SlpA) decorating the commensal bacteria, Lactobacillus acidophilus. To evaluate the signaling cascade engaged by the SlpA, to mount anti-inflammatory immune responses, we tested the binding of certain known immune-regulatory receptors of murine origin (SIGNR1 and SIGNR3). To evaluate SlpA binding with these receptors, the extracellular domains of SIGNR1 and SIGNR3 were genetically fused to human Fc-IgG1 (SIGNR1-hFc, SIGNR3-hFc). The chimeric proteins were expressed in Chinese hamster ovary (CHO)-S cells and purified using affinity chromatography. The data demonstrate that purified SlpA binds to the recombinant SIGNR3-hFc molecule, whereas it does not show any binding to SIGNR1-hFc, DCAR-hFc (control protein), hFc, and the secondary rat anti-human Fc antibody, suggesting SlpA-binding specificity to SIGNR3.
Coupled Transcription/Translation versus Decoupled Process in Cell Free Protein Synthesis

Protein expression includes DNA transcription and protein translation, which is the central dogma of molecular biology. Transcription passes genetic information from DNA to messenger RNA (mRNA). Translation of mRNA produces proteins such as enzymes that control and regulate biological processes in cells. Cell-Free Protein Synthesis (CFPS) is an in vitro method of gene expression that is an alternative to recombinant protein synthesis. In vitro protein synthesis involves the removal of cell membranes via cell lysis to obtain protein synthesizing machinery from the lysate. CFPS procedures are generally manipulated in dilute, coupled-reaction mixtures that neglect macromolecular crowding effects which exist in eukaryotic cells in vivo. Ignorance of such biophysical phenomena may affect the efficiency of CFPS and limit academic knowledge of gene expression. The dimensional analysis and similitude of eukaryotic cells in this project has initiated the development of a microfluidic device that may: [a] effectively model eukaryotic protein synthesis, [b] demonstrate how macromolecular crowding improves transcriptional efficiency, [c] exemplify how a dilute translational environment allows for spontaneous protein folding in CFPS, and [d] conduct proteomic studies via decoupled protein synthesis experiments.

Availability Bias can Improve Women’s Propensity to Negotiate

Women’s reluctance to negotiate aggressively on their own behalf has long been thought to account for the striking disparities between the salaries earned by men versus women. In numerous studies, women have undervalued themselves, responded to stereotypes on women’s lack of aggressiveness, or placed greater value on interpersonal relationships even in negotiating salaries. However, this study found that, contrary to most studies on women’s and men’s propensity to negotiate, women negotiated as aggressively as did their male colleagues. Not only did more women than men negotiate aggressively for a reward, but women relied on heuristics usually seen as misleading in decision-making to make demands in their favor. This study focuses on women’s and men’s reliance on availability, anchoring, and framing—staples of understanding negotiating behavior independent of sex—in requesting rewards, linked notably to perceptions of the value of their highest-earned salaries and to their job performance compared to their workplace colleagues’.
**Google Inc., Case Study**

Research was conducted to evaluate whether Google Inc.’s end of the quarter net income showed a positive correlation with its end of the quarter stock prices between the years 2004 and 2010. This case study incorporates other variables such as operating income, total revenue, advertisement revenue, research & development spending, and number of employees to help determine other positive correlations as well. Most research was examined through Internet sources. The data collected suggests that there may not be a strong positive correlation between end of the quarter net income and end of the quarter stock prices. In some instances, when the net income rose the stock prices, in fact, fell resulting in a weaker correlation. Further research indicated a higher positive correlation, although not considered “strongly positive,” between a combination of these variables with quarterly stock prices. In conclusion, the rise and fall of the end of quarter stock prices can be attributed to externalities that are beyond the scope of this case study.

**Phylogeography & Genetic Conservation of Red and Black Mangroves of the Bahamas**

Red (Rhizophora mangle) and black (Avicennia germinans) mangroves are coastal plant species, that provide shelter and food for many organisms, filter toxins from water and protect coastlines. We assessed genetic differentiation between the east and west coasts of Grand Bahama and measured genetic diversity in each location for both species. The Little Bahama Bank is located between our sampling locations in Grand Bahama; previous studies have indicated that other species on the Little Bahama Bank often show low genetic differentiation among locations. We hypothesized that there would be low levels of genetic differentiation between the east and west coasts of the Bank in the two mangrove species. However, the high FST values of Rhizophora (0.262) and Avicennia (0.267) we observed imply a high degree of differentiation between locations on the Bank. Additionally, our results revealed that there was less heterozygosity than expected within each location; this may be an indication that these populations may be vulnerable and in need of conservation efforts. We also assessed how genetic differentiation between the Grand Bahama populations compared to differentiation between Florida and Grand Bahama. Previous studies indicated the Florida current could allow gene flow between the east coast of Florida and Grand Bahama.
The Effects of Product Type, Price & Donation Level on People’s Willingness to Accept a Donation-Product Bundle

This research studies the effects of price and donation level, and product type (pleasurable vs. functional) on people’s likelihood of purchasing a donation-product bundle. An online experiment of 700 undergraduate business students found that people were more willing to make a standalone donation than purchase a donation-product bundle at no additional cost when the donation level is low (less than $10.00). Moreover, at the $3.00 price level, people were more willing to purchase the bundle associated with a functional product than with a hedonic/pleasurable product. Such findings shed light on the circumstances under which businesses and nonprofit organizations develop mutually beneficial partnership campaigns to increase both the sales of their products and the financial support of a charity.

Dynamic Patterns in Free Surface Convection

My undergraduate research involves the phenomena of convection patterns that arise from an imposed temperature gradient in an enclosed system. The experimental setup consists of a fluid layer that is heated from below and cooled from above. A copper plate is used as the hot wall, and a sapphire glass plate is used as the cold wall. Both walls utilize water baths that are temperature controlled in order to maintain their temperatures. The test fluids are held by a non-conductive acrylic insert positioned between the plates. Currently the system is cylindrical and either a single or double fluid layer can be tested. Well-studied theory backed up by rigorous mathematical calculations predicts that there will be a critical temperature difference where convective flow begins in the liquid layer. Each fluid has its own unique Rayleigh and Marangoni number, a dimensionless value that is affected by intensive properties. The observed convective flow is a result of liquid instability, which derives from the competition of forces within the system.
The Effect of Exogenous Phytohormones on Algal Growth

Microalgae are potential feedstocks for biofuels because of their fast growth rate and ability to produce lipids. One challenge for commercial-scale algal biofuels is the manipulation of algae to create high lipid content without adversely affecting biomass growth. The objective of this research is to investigate the effect of exogenous plant hormones on algal biomass growth and lipid content. Plant hormones are signal molecules that regulate plant growth and development. Chlorella ellipsoidea, a locally isolated strain with demonstrated ability to produce lipids, was selected as the test organism. Chlorella ellipsoidea was grown in BG-11 standard growth medium. Plant hormones of the auxin, cytokinin, and abscisic acid plant hormone classes were added, individually and in combinations, to determine their influence on cell biomass and lipid content. All experimental trials were conducted in triplicate. Preliminary trials have shown that all hormone treatments outperformed the control, and algae grew faster in all hormone combinations than in individual hormone treatments. The combination of trans-zeatin riboside (1 ppm), 1-naphthaleneacetic acid (5 ppm), and abscisic acid (5 ppm) exhibited the fastest growth rate. Among individual hormone treatments, the fastest growth rate was achieved by abscisic acid at a concentration of 50 ppm.

Evaluating the Nutritional Value of Sweetpotato Vines for Animal Feed

Sweetpotato, Ipomoea batatas L. (Lam.), is a highly nutritive crop grown in many developing countries. Sweetpotato is advantageous because of its rusticity, low maintenance and high adaptability to extreme conditions such as droughts and flooding. Sweetpotato roots can be used for human food and vines for livestock feed. Indeed, the fresh vine yield often exceeds the root yield on a per hectare basis. However, the valuable potential of the vines as animal feed is often overlooked. The objective of this research was to evaluate the nutritional value of ensiled sweetpotato vines. Ensiling preserves vine quality by storing the vines under anaerobic conditions and stimulating acid fermentation. Fresh and ensiled vine characteristics, including dry matter, fermentative capacity, crude protein (CP), neutral/acid detergent fiber (NDF/ADF) and lignin, were assessed for different sweetpotato cultivars. The effect of the wilting period on the fermentation process was also evaluated. When compared to the same cultivars of fresh vines, the ensiling process preserved the average CP and NDF concentrations. Ensiled sweetpotato vines can be a highly nutritious, low-cost alternative to grain-based feeds to support livestock in less productive periods of the year when pastures are not available.
Innocent Victims: Food Insecurity and Child Mortality in Brazil

The concept of food insecurity was first endorsed as a target of public policy by the World Food Conference in 1974 and later reaffirmed by the World Food Summit in 1996. The concept has prompted research on ways to increase food production at the national level and reduce hunger among individuals. This study turns attention from the causes to the consequences of food insecurity on a population’s quality of life as measured by the probability of death in the early years of life. The analysis applies logistic regression methods to data provided by Brazil’s 2009 National Household Survey to show that, independent of the major determinants of child mortality (household income, maternal education, maternal age, geographic location, gender of the head of household, and race), children born into households that suffer food insecurity experience a higher risk of death. Evidence that food insecurity has an independent effect on child survival contributes to the study of the causes of child mortality in developing countries and underscores the conclusion that access to sufficient food to meet dietary needs in Brazil is independent of social and economic standing.

Progression of Weight Loss and Death Associated with the Different Type of Gastrointestinal (GI) Cancers

Unintentional weight loss and anorexia are common symptoms in GI cancer. However, the severity of weight loss has not been widely investigated exclusively amongst the different type of GI cancers. It is crucial to comprehend the relevance of demographics and severity of weight loss to improve the quality of life for GI cancer patients. The purposes of this study are to: 1) describe the type of cancer based on patient demographics, 2) describe the amount of weight loss amongst the different types of GI cancers, and 3) examine the frequency of death amongst each type of GI cancer. Descriptive design was utilized for analysis of a de-identified dataset, which includes 966 subjects. The results provided essential information related to the progression of weight loss and incidence of deaths associated with the different type of GI cancers among patients who were hospitalized in North Central Florida. The information offers insight to indicate which patients would require earlier interventions to reduce weight loss, which will further improve overall survival.
Modelling Genetic and Environmental Interactions in the Common Bean

The common bean is considered one of the world’s most important food legumes and is a nearly perfect food source. Thus, improving yield and production of this crop would benefit global food security. (CIAT, 2001). It is imperative to connect the genotype of the common bean to phenotypic expression in order to aid in the “design of a complete breeding program” specific to climate and culture (Graham, & Ranalli, 1997). The purpose of this project is to use statistical tools and genetic analysis software to analyze field data from the common bean to link the genotype with phenotype in varying environments. (iPlant Collaborative, http://www.iplantcollaborative.org/). Specifically, my project will make use of data collected from several lines of Recombinant Inbred Lines (RIL) of two bean plants with distinct differences in growth habit. The experiment was conducted at five sites, with varying climate conditions. This data, along with additional sources, will be analyzed using quantitative trait loci (QTL) analysis to determine whether or not there is a genetic to environmental interaction to the expression of a trait. Furthermore, models will be developed in order to represent the developmental stages of the plant and will integrate genetic and environmental parameters.

Optimization of the Capsid of Recombinant Adeno-Associated Virus 6 Vectors for Gene Therapy

Recombinant adeno-associated virus (AAV) vectors are currently in use in a number of clinical trials as delivery vehicles to target a variety of tissues. The requirement for sufficient amounts of the vector poses a production challenge, as well as the risk of initiating the host immune response. The ubiquitin-proteasome pathway plays a critical role in the intracellular trafficking of AAV vectors. In the present studies we report that substitution of several critical tyrosine (Y), serine (S), threonine (T) and lysine (K) residues on the AAV6 capsid significantly increase the transduction efficiency over the wild-type (WT) AAV6 vectors by preventing capsid phosphorylation and subsequent proteasomal degradation. The most critical mutations were combined on AAV6 capsid, and several vectors, such as S663+551V, Y705+731F+T492V and Y705+731F+K531E, were particularly efficient. These vectors increased the transduction efficiency ~8-10-fold over the AAV-WT vector, in murine hepatocytes and myoblasts (C2C12), in vitro. Similar results were obtained in murine hepatocytes and muscle in vivo following tail vein or muscle injection, and whole-body bioluminescence imaging of C57BL/6 mice. In summary, our studies have led to the generation of a novel capsid-optimized AAV6 vector for the potential use in liver-directed and muscle-directed human gene therapy.
The Relationship Between Territory Quality and Male Competition Intensity in the Cactus Bug, *Narnia femorata*

From the intense physical confrontations of male elephant seals to the ritualistic stand offs of male stalk-eyed flies, competition for access to females is common in males across a wide variety of taxa. Models of male-male competition suggest that males should assess each competitor and the potential reward, competing more intensely when the reward is higher. To empirically assess the broadly occurring behavior these models predict, we investigated changes in male-male competition across multiple contexts in a single model species, the leaf-footed cactus bug *Narnia femorata*. Males in this species compete for cactus territories using their enlarged hind femurs. The nutritional quality of cactus territory resources vary seasonally through the availability and quality of fruit. We experimentally assigned males cactus territories without fruit, with unripe fruit, or with ripe fruit and observed male-male competition and mating success. Counter to our predictions, we did not find a significant effect of resource quality on the intensity of male-male competition. However, we did see trends of both increasing number of male interactions with increasing resource quality, as well as greater mating success for dominant males in territories with fruit. These trends suggest that resource quality affects male-male competition intensity in this species.
**The Role of Multi-Agent-Simulation for Conservation Management in South African Savanna Ecosystems**

Simulation models are important tools to support environmental decision processes. A promising form of describing complex systems is the use of agent-based models. While ‘traditional’ equation-based models, like differential equations, view the system from a top-down or ‘outside’ approach, agents describe each individual entity bottom-up thereby constructing the big picture through smaller details instead of the opposite. Our research with multi-agent-simulations focuses on the interaction between critical conservation species and their environment. As a keystone species, African elephants (Loxodonta africana) greatly influence the biodiversity of their ecosystems. When moving towards water, they trample vegetation and given enough time, create clear areas of fragmentation known as piospheres. To reduce such impacts, researchers can benefit from the development of ecological models that reveal the factors behind piosphere formation. Specific examples of different intra-herd dynamics, such as hierarchy and path fidelity, are explored with respect to elephant individual and herd movement and their interaction with Albany Thicket vegetation. The model can be taken by ecologists and used to predict elephant impacts on vegetation dynamics. By predicting effects elephants have on the landscape based on watering hole positions, ecologists and park managers can select locations and sizes of artificial water holes for elephants.

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**Dietary n-3 PUFA Decrease Plasma TNF-a Concentration in Newly Weaned Pigs**

Supplemental omega-3 polyunsaturated fatty acids (PUFA) decrease inflammatory cytokine production in human and animal models. Currently, there is very little information of the effect of dietary n-3 PUFA on intestinal inflammation in pigs raised without an added bacterial or environmental challenges. The objective of this study was to examine the effect of feeding a diet enriched with vegetable oil (Control) or n-3 PUFA (Treatment) on plasma inflammatory cytokine concentrations in newly-weaned piglets. Forty newly-weaned pigs were balanced for initial body weight and sex, and assigned randomly to receive a vegetable oil (n=20) or an omega-3 PUFA (n=20) supplemented diet. Plasma TNF-alpha concentration was higher in the piglets fed vegetable oil compared to those fed circulating concentration of omega-3 PUFA. The diet or the number of days post-weaning had negligible effects on plasma IL-1 beta and IL-6 concentrations. Dietary n-3 PUFA may constitute a cost-effective means of preventing post-weaning inflammation and diarrhea in pigs.
**Appropriating Agrippina: Visual Representations of Agrippina the Elder**

Agrippina the Elder’s (14 BCE- 33 CE) image was manipulated both during her life and after her death by family members who used her who to further their own interests. As the granddaughter of Augustus, Agrippina allowed her descendents claim legitimacy in the new Roman principate. She was dynamic and popular woman in life, and excepting the brief reign of her father-in-law Tiberius, she was further praised and immortalized in her death. Publius Cornelius Tacitus, Gaius Suetonius Tranquillus, and Lucius Cassius Dio all included Agrippina in their histories of Rome, and she was further commemorated in material sources like coins, busts, and monuments. Augustus was the first emperor to publicly use Agrippina’s image, but the next three emperors—Tiberius, Caligula, and Claudius also issued public likenesses of Agrippina as part of their own iconography. Agrippina’s legacy endured past ancient Rome into eighteenth century England, integrating Agrippina into contemporary politics. Agrippina’s longevity in politics and propaganda marks her as an important figure in Julio-Claudian history and, more generally, marks her as a significant woman outside period constraints.

**Effect of Single Versus Dual Wavelength Laser Exposure on Mitochondrial-Associated Signaling in C2C12 Muscle Cells**

Laser therapy (phototherapy) is a complementary treatment used as part of a multi-modality rehabilitation program to promote tissue healing and improved muscle function following injury. Mechanistically, near-infrared (NIR) laser light (710-1100 nm) is proposed to be preferentially absorbed by mitochondrial cytochromes in skeletal muscle to initiate signaling pathways to promote muscle recovery. Clinically, dual (808/980nm), or single (808nm) near-infrared wavelength lasers are utilized, but it is unclear which is more efficacious in modulating mitochondrial-mediated signaling/mechanisms in muscle. Thus, we exposed C2C12 skeletal muscle cells to single (808nm) and dual (808/980) NIR-light and assessed key mitochondrial biogenesis markers. Our preliminary results indicate dual wavelength laser significantly increases upstream regulatory proteins P-AMPK, P-p38, PGC1-α, and Sirt1 while single wavelength caused no alterations. Despite not elevating upstream mitochondrial signaling proteins, single wavelength laser increased downstream proteins, cytochrome c and NRF-1, while the dual wavelength did not. Additionally, dual wavelength laser increased protein carbonyls, a measure of oxidative stress, while the single wavelength did not. Our results imply that single and dual wavelength exposure of C2C12 cells evoke mitochondrial-associated changes, with single wavelength exposure having selective downstream effects and dual wavelength exposure enhancing upstream markers.
**Repeat-associated Non-ATG Translation And Blood**

Microsatellite expansion disorders are a group of neurodegenerative and neuromuscular diseases caused by long regions of repetitive DNA. The basis of these diseases have previously been linked to protein gain of function or RNA gain of function, which occur when the repeat is located in a coding region or in the noncoding region, respectively. In 2011, the Ranum lab discovered that these expansions can undergo a new form of translation, which can produce up to 6 proteins without an ATG initiation codon. This process was named: Repeat-Associated Non-ATG translation, or RAN translation. The Ranum lab has shown that microsatellite repeats including CAG and GGGGCC expansion mutations undergo RAN translation in autopsy brains and patient cells of myotonic dystrophy and ALS. My project is focused on discovering if RAN proteins are also present in patient blood and blood from mouse models of myotonic dystrophy and ALS and if so if they can serve as a biomarker of these diseases. Biomarkers that can be used to track disease progression and that can signal possible improvements with disease treatments are desperately needed for myotonic dystrophy and other neurologic and neuromuscular diseases.

**The Utilization of Adeno-associated Virus (AAV) Vectors for Use in the Immunotherapy of Prostate Cancer**

Cancer, a leading cause of death in the human population today, is generally being treated with chemotherapeutic methods, which have adverse, toxic side effects. Immunotherapy represents an attractive alternative since it is based on activation of host immune system. In current studies, we initiated specific tumor cell lyses by initiating a protective anti-cancer T-cell immune response. Prostatic acid phosphatase (PAP), a gene up regulated in both human and mouse prostate cancer, was used as a specific target. Capsid-modified AAV-S663V+T492V serotype 6 was used as a vector, as we previously determined it to effectively stimulate an antigen-specific immune response in mice. First, animals were immunized with AAV6-S663V+T492-PAP or AAV6-WT-PAP vectors. Two weeks later, mice were challenged with prostate cancer cell line RM1-FLuc by subcutaneous injection. The effect of treatment on tumor growth was evaluated by whole body life imaging on a Xenogeny Lumina System at different intervals after engraftment of the cancer cells. Results indicate suppression of tumor growth by AAV6-S663V+T492-PAP for approximately four weeks in comparison to one and two weeks for negative control AAV6-GFP and AAV6-WT treated mice, respectively. In conclusion, successful inhibition of tumor growth in this artificial animal model would set stage for potential clinical application.
**Autonomous Mapping With a Monocular Camera**

When using a map, an individual (human or robot) relies on observing their surroundings to inform their position. Likewise, when drawing a map, an individual relies on knowledge of their position to draw their surroundings accurately. However, in general a robot cannot start with both accurate position knowledge and an accurate map. If a robot is sent to Mars, it will have neither an accurate map nor positional knowledge. It must be able develop both of these using only its own sensors. This is known as the "Simultaneous Localization and Mapping" (SLAM) problem. This research intends to create appropriate SLAM algorithms utilizing only a single camera and assumed information about image depth in order to create a map of an approximately planar environment. The robot will then use that map to create a mission plan.

**Polypeptide-based Biomaterials with Modular Composition Assembled via Electrostatic Complementarity**

Biomaterials are receiving increased attention for various medical treatment areas including tissue scaffolding for regenerative medicine and drug delivery. Peptides that non-covalently assemble into nanofibers provide a versatile biomaterial platform, because their amino acid sequence can be specifically designed to govern their shape and behavior. Using a peptide assembly domain allows a biologically active ligand to be attached to a peptide assembly unit, leading to biomaterials with biological activity related to the ligand. However, to achieve modular assembly one must often first disassemble a peptide homopolymer into its monomeric units through harsh conditions that are likely to alter the activity of the appended ligands. A change in the amino acid sequence of the assembly domain to establish electrostatic repulsion via like-charged residues will inhibit formation of the homopolymer until its charge is neutralized. Thus far, synthesis of these molecules has been difficult and has required innovations to the existing protocol. In addition, recombinant production of this peptide sequence is currently being investigated to overcome synthesis complications. The properties of these molecules will be further characterized upon obtaining the desired products.
Engineered Materials for Sustained and Localized Delivery of Therapeutics into the CNS

Sustained drug delivery to the central nervous system (CNS) is often difficult due to the blood-brain barrier and the sensitivity of CNS tissue to direct injection. An injectable drug delivery platform that would allow for targeted, long-term release of therapeutics to affected tissue could circumvent the blood brain barrier, allowing for unrestricted drug delivery. We aim to develop such a delivery system using microparticles (created using Poly(lactic-co-glycolic acid) (PLGA)) entrapped in a thermally gelling injectable hydrogel (created from a physical blend of hyaluronic acid (HA) and methylcellulose (MC)). This delivery system aims to offer short-term (0-16 hours) and longer-term (0-7 days) delivery of therapeutics. We have found this system to have favorable biocompatibility and mechanical properties that make it ideal for intrathecal delivery. Moreover, this system produces a versatile release profile. As such, it is likely that this platform can be used for localized drug delivery following injuries to the spinal cord. Our ongoing work includes an in vivo growth factor release study and an in vivo functional study using a spinal cord injury model in which BDNF is essential in mediating learning.

Bound States in the Radiation Continuum for Periodic Structures

All optical data-processing could diminish the limitations of computational power, a pervasive problem in computational research. The biggest obstacle is developing an optical analog of a transistor. My research advisor, mathematical physicist Professor Sergei Shabanov, has made significant progress toward this end investigating bound states of electromagnetic waves in the radiation continuum. It was shown that the interaction between trapped electromagnetic modes can lead to scattering resonances of negligible width, which are the bound states in the radiation continuum first discovered in quantum systems by von Neumann and Wigner. It was then demonstrated in a double array of subwavelength dielectric cylinders that by varying the spatial parameters toward the critical value, the near field can be amplified in certain regions. The present study is the generalized system of an arbitrary number of arrays, two parallel 2D lattices of spherical scatterers, and analogous systems for elastodynamic and/or acoustic waves. The main fields of study involved are scattering theory, functional analysis, electromagnetism, acoustics and elastodynamics. Other potential applications include large amplification of electromagnetic fields within photonic structures and, hence, enhancement of nonlinear phenomena, impurity detection, biosensing, as well as perfect filters and waveguides for a particular frequency.
PRESENTER(S): Patel, Shivani  
AUTHOR(S): Shivani Patel, Ivana Milian BS, Mona Sayedul Huq MS, Iara Backes, Nancy Hardt MD, and James Grigg MD.  
FACULTY MENTOR: Nancy Hardt  
RESEARCH FIELD: Health-Related (Pharmacy, Dentistry, Medicine, Nursing, The Effectiveness of Safety Net Clinics in Reducing Hypertension for the Underinsured/Uninsured Population  
Hypertension or high blood pressure (HBP) can quietly damage the body for years before developing symptoms. Safety net clinics aim to help lessen cases of hypertension. The Mobile Outreach Clinic (MOC) and Equal Access Clinic (EAC) at the University of Florida provide free medical services to underserved areas in Alachua County to prevent and eliminate health and social disparities. This study investigates the effectiveness of safety net clinics in decreasing blood pressures in patients with hypertension. This retrospective study obtained demographics and previously collected blood pressure data, which is measured every time a patient visits clinic. If a patient measures as hypertensive, physicians do a full diagnostic workup. Shifts in blood pressure categories ascertained positive or negative changes in patients' blood pressure. This study showed higher “positive” bp shifts over “negative” shifts. MOC and EAC strive to improve the health outcomes of their patients, especially those with hypertension. Future goals are to generate protocols and adopt practices to improve hypertension management.

PRESENTER(S): Peña-Vasquez, Andrea  
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FACULTY MENTOR: Kenneth D. Wald  
RESEARCH FIELD: Business, Marketing, Political Science, etc.  
Old Wine in New Wineskins? The Role of Christian Conservatives on the Tea Party Social Agenda  
The Tea Party movement, a fascinating political phenomenon, is known for its free market economic agenda promoted by corporate backers and propagated by media outlets such as Fox News. Looking at its grassroots activism, however, some observers have noted its strong religiosity rooted in evangelical Protestantism. The purpose of this study is to distinguish the factors that contribute to a pro-Tea Party orientation and identification, and determine potential links between religiosity and affect. Drawing on existing survey data, we (1) create a multivariate predictive model to differentiate sympathizers from members of the movement, and (2) analyze the interaction between religiosity and participation while controlling for other sociodemographic factors such as gender, race, and education, etc. Examining similarities and differences between those who sympathize with the values of the movement and those who consider themselves to be part of it can help us understand the role of Christian conservatism in determining the Tea Party’s social agenda. Additionally, it can shed light on whether the Tea Party can be seen as a radically new phenomenon, or as a continuation/reinvention of the Christian Right movement.
Passively Compliant Membrane Wing in an Air Flow

This study focuses on understanding the fluid structure interaction of a passively compliant membrane wing model with aspect ratio 2 and a 25% scalloped free trailing edge. Micro air vehicles have been known to use passively compliant membrane wings to aid flight stability when flying in low Reynold’s number conditions. Exploring the phenomena that drive the vibrational properties of these wings will lead to better understanding and design of these micro air vehicles. The displacement of the wings were measured using a time resolved digital image correlation. By comparing the dominant frequencies in the flow at various angles of attack and those extracted from spectra of the wings motions we are able to see the wing’s ability to drive the flow at the membranes natural frequency.

Regulator Genes Involved in Salmonella Fitness within Tomatoes

Salmonella is a potentially fatal enteric pathogen that is a major public health concern in the United States. Little is known about the ecology of Salmonella enterica serovar Typhimurium ATCC 14028 outside of animal host environments and or the molecular mechanisms by which it copes. This study focuses on analyzing the following Salmonella regulator genes within tomatoes: pspA, pocR, pdhR, celD, glnG, csgD, phoP, and marT. The selected mutants were all identified by a high-density transposon mutant library inoculated within tomatoes for relative fitness compared to LB medium. Plausible genomic regions correlated with statistically significant levels of low fitness of were focused upon using log2 and a rho of -4 to filter out extraneous data points. None of the genes in question currently have definitive information on their phenotypes within the Salmonella framework outside of a few select conditions. This research would definitively assign phenotypes to these global regulator genes within tomatoes while giving a framework for understanding both the described global regulator genes and the genes that they regulate. Preliminary results show that phoP has some significance in survival within tomatoes when compared against a neutral mutation control. However, continued work must be done to elucidate the role of the other five genes.
**Effects of Leaf Mass on Plant Competitive Ability**

Our project addresses the ecological and plant-physiological question of how leaf functional traits, such as leaf mass per area (LMA), relate to plant life-history strategies. There is limited understanding of how LMA differs between plant species that are fast-growing and short-lived (deemed "early-successional"), and those that are slow-growing and long-lived (deemed "late-successional"). We recognize that LMA reflects the leaf mass per area of multiple types of tissue, and we focus on two specific types: photosynthetic tissue (LMAp), which contributes solely to photosynthesis, and structural tissue (LMAs), which contributes to longevity. We analyze an ordinary differential equation that models the change in biomass of a plant species over time, which is ultimately growth of the leaves minus death of those leaves. Growth is represented by photosynthesis minus respiration, and light is our limiting resource. We hypothesized that (i) the LMA of the most competitive late-successional species would be dominated by structural rather than photosynthetic tissue, i.e., LMAs > LMAp, and (ii) the LMA of the most competitive early-successional species would be dominated by photosynthetic rather than structural tissue, i.e., LMAp > LMAs. Through analysis of the equilibria of our system and the use of parameter values found in literature, we were able to prove each of these hypotheses.

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**Determination of Allele Frequencies for Common Inherited Diseases in the UF Quarter Horse Herd.**

Genetic diagnostics is a powerful tool to improve the health of livestock animals like the horse. Here at the University of Florida (UF) Animal Sciences Department we maintain a breeding program focused on production of registered American Quarter Horses. Foals produced by this program are sold at two years of age following completion of a training program, and those known to be free of genetic conditions are more valuable. For this project the UF herd will be tested for several known alleles for genetic diseases including hereditary equine regional dermal asthenia (HERDA), polysaccharide storage myopathy (PSSM1), and hyperkalemic periodic paralysis (HYPP), all commonly found in the American Quarter Horse. Each can result in career or life-threatening clinical signs in the skin or muscles. Genotypes for each of these loci are determined by Polymerase Chain Reaction (PCR), gel electrophoresis, and Restriction Fragment Length Polymorphism (RFLP), in comparison to known carriers of these mutations as a positive control. Here we will present data describing the current allele and genotypic frequencies for these three conditions in the UF herd. These genotypes will be utilized by the UF breeding program to aid in breeding decisions, improving the health and marketability of future foal crops.
Effect of Brain Reserve on Expression of Mood/Motivational Symptoms in Parkinson's Disease

Brain reserve is thought to be the ability of the brain to function normally while incurring damage up to a certain threshold. The current study aimed to determine the relationship between brain reserve and mood symptoms (anxiety, depression, and apathy) in patients with Parkinson's disease. 23 Parkinson's patients underwent a neurocognitive evaluation and brain imaging. Brain reserve was represented by total-intracranial-volume (TICV). Regressions were computed to examine the relationship between mood (apathy, depression and anxiety), brain reserve and duration of Parkinsonian symptoms. Analyses showed a significant interaction of intracranial volume and years with Parkinson's symptoms with anxiety. No relationship was found with depression or apathy. The results suggest that as intracranial volume increases, the proportional increase in anxiety associated with each successive year of living with Parkinson's disease diminishes. Larger brain reserve may have a protective effect against mood symptoms associated with Parkinson's disease. One possible explanation may be that individuals with larger TICV are more efficient at using strategies for coping with anxiety. Future studies with larger sample sizes and healthy controls may benefit by further investigating the role of brain reserve, as well as cognitive reserve (i.e. education), on mood symptoms.

From Earth to Market: Interlinking Voices of the Locavore Movement in North Central Florida

Testing the assumption that food connects people and creates community, this study gathered five oral histories capturing distinct stakeholder views on local farming, food distribution and related social networks. This ethnographic study explored the motivations, obstacles and rewards that drive the local food movement in North Central Florida. Locavore practitioners, who were interviewed, promoted local foods, supplied local foods, and practiced a local foods lifestyle not only in Gainesville but had done so in California, the Northeast and in Europe. While these proponents recognized limitations in this movement, they remained optimistic about the transformative power of food. These findings support the inextricable connection between a thriving local foods movement and community. Food sustainability, community gardens and food sovereignty defined this movement in the region under study, similar to what is happening worldwide. Yet the local foods transformation in North Central Florida reveals a particularly effective intervention for bridging community divisions—facilitated by IFAS outreach, organizations like Blue Ovens, and a segment of the population that is not only motivated by their own individual well being but by the power of the greater good—supporting the thesis that food is the great unifier connecting people to place and to each other.
**PRESENTER(S): Rama, Catherine**  
**AUTHOR(S):** Victor Harris, Catherine Rama  
**FACULTY MENTOR:** Victor Harris  
**RESEARCH FIELD:** Psychology/Social Sciences

**Familism in Context: Exploring How Eight Categories of Needs are Met in Hispanic American Families**  
The purpose of this qualitative study was to assess how eight categories of needs are met in Hispanic American families. The eight categories that examined include: (1) the need to feel safe; (2) the need to belong; (3) the need to develop a positive self-concept; (4) the need to experience close real-love relationships; (5) the need to receive respect from others and ourselves; (6) the need to feel worthwhile by developing a healthy self-esteem; (7) the need to feel competent; and, (8) the need to experience growth. Participants in this study completed an online open ended questionnaire that focused on how individual needs were met or were not met in families within the Hispanic culture growing up. A conceptual model of how familism contributes to and influences how these needs are met in Hispanic American families is proposed. Implications for how meeting these eight categories of needs can help Hispanic Americans develop strong families are discussed.

**PRESENTER(S): Ramsuchit, Bhupaul**  
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**FACULTY MENTOR:** Clayton/Michael Mathews/Moorhouse  
**RESEARCH FIELD:** Health-Related (Pharmacy, Dentistry, Medicine, Nursing, Molecular Mechanism of Idd22 Based Protection against Type 1 Diabetes**  
Type 1 Diabetes (T1D) is a multifactorial disease resulting in autoimmune-mediated destruction of insulin producing pancreatic β cells. The T1D prone-NOD mouse is the predominant animal model used due to genetic similarity with humans. To identify protective features, NOD mice were crossed with T1D resistant ALR mice. A region of ALR genome on Chromosome 8, termed Insulin Dependent Diabetes locus 22 (Idd22), was found to be highly protective against T1D on the NOD background (NOD.Idd22). Data suggest that this is due to reduced autoimmune infiltration of pancreatic β cells attributable to differences in endothelial cell responses. Using the recently obtained ALR and NOD genome sequences, de novo genotyping primer design and Sanger sequencing were used to identify new polymorphisms and fine-map Idd22. Vascular endothelial cell transcriptomes from NOD and NOD.Idd22 mice were compared using Affymetrix Gene ST2.0 technology. Genotyping results identified new polymorphisms that better define Idd22. It is expected that protection is due to differentially expressed immune cell trafficking gene transcripts. Comparing transcriptome data with Idd22 will allow for identification of candidate gene(s). Initial results of these differences and potential mechanisms responsible for protection in T1D will be discussed, as well as, future direction.
Characterization of Amino Acid Composition on CAIX and CAXII in Tumor Cells

Cells that express carbonic anhydrase isoforms IX and XII (CAIX and CAXII) transmembrane proteins are primarily associated with tumor proliferation. The optimal pHs for these proteins are 6.5 and 8.0 for CAIX and CAXII, respectively. These are different from the human isoform CAII (pH 7.0) because of mutations in the amino acid sequence in the loop adjacent to the active site (residues 230-240), which may significantly alter the active site pKa and the catalytic activity. This project will focus on understanding what specific amino acids and their location are responsible for these altered properties by using CAII as a template. Results have shown that we are able to modulate said optimal pH. These inferences could help in designing a better drug that has higher affinity for the protein, and inhibits its activity; this drug would bind cancer cells that use CAIX and CAXII, preventing further tumor growth. X-ray crystallography has been used as an instrument for this rationalization, providing a possible blueprint for more specific and tighter-binding anti-cancer therapeutics.

Associations between Omega-6: Omega-3 Ratio with Knee Osteoarthritis Pain and Omega-3 Supplementation

It is known that a low ratio of omega-6 to omega-3 fatty acids (O6:O3) predicts lower pain levels in conditions like rheumatoid arthritis, dysmenorrhea, and neuropathy. Also, omega-3 levels increase with supplementation. The purpose of our study was to determine whether O6:O3 ratio was associated with pain and function in knee osteoarthritis (OA). We hypothesized that: 1) the O6:O3 ratio will be positively associated with knee OA pain and 2) a lower O6:O3 ratio will be associated with omega-3 supplementation. We also investigated demographic factors associated with supplementation. 168 individuals reporting knee pain completed well-validated self-report measures of knee pain. Blood samples were collected and evaluated for omega-6 and omega-3 levels, and the O6:O3 ratio was calculated. Findings indicate small but significant associations between the O6:O3 ratio and clinical pain and functioning, such that higher ratios are related to greater pain and disability. Also, individuals supplementing with omega-3 had lower O6:O3 ratios. Lastly, race/ethnicity, age, insurance status, and annual income were associated with O3 supplementation. These findings warrant further investigation. If associations of O6:O3 ratio and clinical symptoms are replicated, there may be benefit in determining whether omega-3 supplementation improves symptoms among individuals with knee OA.
A Study to Enhance the Sensitivity for the Discovery of the Higgs Boson Coupling to Dimuons

We present our optimized selection criteria for the predicted Higgs coupling to dimuons with associated production of a vector boson. On July 4th 2012, the discovery of the Higgs boson was announced by the ATLAS and CMS collaborations in data from the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN). Researchers must search for the rare decay modes of the Higgs, as predicted in the Standard Model of Particle Physics, to confirm its predicted couplings to mass. We are contributing to that process by developing a dedicated search strategy for the Higgs decay to dimuons, with associated production of a W or Z vector boson detected in the dijet final state. In order to optimize the search for this channel, we improved upon the published CMS search for the Higgs decay to dimuons by adding additional discrimination criteria: invariant mass of the dijet decay of the W or Z vector boson, dimuon transverse momentum, the angle between the dimuon and dijet systems in the transverse plane, and missing transverse momentum. We optimized these criteria on 7, 8, and 13 TeV CMS simulated data to improve the sensitivity for discovery of this decay channel and will report on the result.

Florida's Freedmen's Bureau during Reconstruction, 1865-1872

In the wake of the Civil War, the Bureau of Refugees, Freedmen, and Abandoned Lands – commonly referred to as the Freedmen's Bureau – had the Herculean tasks of assisting the destitute and assimilating the ex-slaves into Southern society, which resisted the transition from slavery to a free labor system. Operating under the direction of the War Department between 1865 and 1872, Florida's Bureau agents endeavored, with varying levels of success, to meet the socio-economic and political goals dictated by Congress' "Radical" Republicans. While the Bureau's efforts are generally considered a failure, Florida's agents found more than a modicum of success in meeting the wishes of ex-slaves, who sought education for their children and access to land of their own. Bureau agents were also instrumental in preserving peace and order. When Florida held elections after the ratification of its 1868 Constitution, the military occupation of the peninsula ended, and several Bureau agents ran for office and garnered political success. Those former agents sitting in political office wielded more power than those still working under a diminished Freedmen's Bureau, which was terminated in 1872. For Republicans, economic concerns quickly took priority over social reforms, and Emancipation's promise was betrayed.
Destruction of Pharmaceuticals by Advanced Oxidation Processes in Ion-Exchange Regeneration Brine

Pharmaceuticals are a major contaminant in wastewater systems because of both increased usage and improper disposal. A major method in removal of these pharmaceuticals in urine is the use of anion-exchange resins. In order to make this process more sustainable it would be advantageous to efficiently regenerate the resin, in a water-salt-methanol solution, and destroy the pharmaceuticals in the brine to produce a reusable regeneration solution, thus creating a closed loop system. Methanol is considered to be harmful to the environment; hence, the goal of this research is to find the minimum concentration of methanol needed to efficiently regenerate the resin and simultaneously decompose the pharmaceuticals in the regeneration brine. To do this, a series of batch experiments were conducted to compare the effect of methanol on the regeneration of the anion-exchange resin and the destruction of the pharmaceutical through advanced oxidation process (AOP) using ultraviolet irradiation (UV) and hydrogen peroxide (H2O2). Percent destruction of the investigated pharmaceutical, ibuprofen, increases with increasing H2O2 dosage and time. The regeneration of Dowex 22 resin increases and percent destruction of ibuprofen decreases with increasing water-methanol ratio in regeneration solution.

Mathematical Analysis of HIV: A Study in the Optimal Distribution of Envelope Spikes

When a virus enters the body, it is able to infect target cells through the binding sites along its surface. It has been observed through cryoelectron microscopy tomography (Zhu et al, Nature, 2006) that these binding sites appear to be highly clustered. This leads to the hypothesis that certain spatial distributions can confer an evolutionary advantage. In this project, we develop a mathematical model for target cell invasion using three distinct spatial distributions – Poisson (null hypothesis), evenly distributed, and Matern (clustered) – to represent the surface binding site configuration. We compute the probability of infection for each, under the assumption that a virus can infect if a specific number of binding sites are within the contact region between virus and a target cell. We find that if target cell invasion requires more than one binding site in the contact region, then a clustered distribution is indeed more likely to successfully invade the cell.
The Relationship Between Barnacles and Green Sea Turtle Health

Sea turtles host a variety of epibionts, including barnacles. Barnacles can have significant consequences on the health of green sea turtles, a threatened species, due to increases in hydrodynamic drag and body weight. This relationship is important because sicker turtles might have higher barnacle settlement rates due to reduced self-grooming behaviors and slower swimming rates. To study the relationship between barnacles and sea turtle health, I obtained images and health information of captured green sea turtles from the St. Lucie Powerplant. I analyzed photographs of both the dorsal and ventral views of these turtles and calculated barnacle abundance, density, average size and clustering level. I compared these values to the health of the turtle using BCI (body condition index). While I found no significant relationships between barnacles and sea turtle health, sicker turtles had slightly smaller barnacles, and turtles in the middle of the health range had the highest density of barnacles. Barnacle distribution was highly variable, and many other factors (such as sea turtle age, migration patterns and barnacle physiology) likely play important roles in sea turtle epibiosis.

The Box: a New Fossil Species of Box Crab from Florida

Members of the crab family Calappidae (box crabs) are known from the Eocene (~50 million years ago) to the present day. They had and still have a worldwide distribution. Six specimens of a species belonging to the Calappidae were recovered in the lower Oligocene Bumpnose Limestone from a quarry located near Branford, Suwannee County, Florida. This limestone was deposited ~30 million years ago. After comparing the morphology to other genera of calappids, we concluded that this taxon belongs to genus Calappilia, which ranges from the Eocene to the Miocene. Like other members of the genus, this species exhibits similar ornamentation on the dorsal carapace, and spines along the posterolateral margin. The closest alternative genus was Cyclozodion, but the two genera can be distinguished by the more extreme ornamentation in Calappilia. In Florida, Calappilia is currently known from the middle to upper Eocene Ocala Limestone by the species C. brooksi. Most other currently documented Calappilia species are known from Europe. Review of diagnoses and figures given in the literature on all currently known species of Calappilia were used for comparison. It was determined that the Bumpnose Limestone specimens belong to an undescribed species.
Assessing Functional Forelimb Recovery using Behavioral and Histological Assessments of SCI Treated with Three-component Hydrogel

There are about 12,000 spinal cord injuries (SCI) sustained in the U.S. annually. Cervical SCI, which generally cause quadriplegia, account for 52.2% of SCI ranging from incomplete to complete tetraplegia. [1]. Research has expanded into examining spinal progenitor cell implantation into these injured areas to promote neuron regeneration with an improved functional outcome [2]. Previously, our lab developed ECM-mimicking hydrogels to provide a scaffold to improve cell viability and direct behavior. In-vivo work involved a cervical SCI followed by treatment with a collagen, hyaluronic acid, and laminin hydrogel, with or without cells. Treatment and behavioral controls were conducted for comparison. Beginning two weeks prior to injury and extending to 7 weeks post injury, six weekly behavioral tests were conducted to help quantify functional recovery. We examined sensory motor, forced motion, free motion, and motivated motor function with these tests. Additionally, histological assessment was performed to examine tissue sparing and scar formation. Five different experimental groups were used for the in-vivo study: laminectomy, media with cells, hydrogel with cells, media alone, and hydrogel alone. Behavioral and tissue sparing assessments showed significant improvement of the hydrogel with cells group compared to the other four experimental groups for functional recovery.

Structure-based Development of Isoform Selective Inhibitors of Human Carbonic Anhydrase Isoform IX: A Perspective Into the Treatment of Aggressive Cancers

Human carbonic anhydrase (CA) is a zinc metalloenzyme that catalyzes the reversible hydration of carbon dioxide and water into bicarbonate and a proton. Humans express 14 different isoforms of CA with several being characterized as drug targets. As such, human CA isoform IX (CA IX) is shown to be highly expressed in metastatic hypoxic tumor cells, with limited expression in normal tissue, making this enzyme an appealing anti-cancer target. Despite the promise of CA IX as an anti-cancer target, it exhibits high homology with other ubiquitously expressed CAs, making drug targeting a challenge. Therefore utilization of structure-based drug design has shown to be advantageous in terms of developing isoform selective CA IX inhibitors. Here we present a series of natural-product based CA IX inhibitors that show high selectivity for this isoform over other CAs. In addition we use X-ray crystallography to provide a structural rationale for selective inhibition of CA IX, and propose a means to design more potent and specific CA IX inhibitors. Results from this study will provide insight into anti-cancer drug development.
Characterization of Archaeal Ubiquitin-like SAMP2 Modification on Lysine 53 and 63 of TATA Binding Protein (TBP2) by Site-directed Mutagenesis

The ubiquitin-proteasome system (UPS) constitutes the primary pathway for protein degradation in eukaryotes. UPS mediated proteolysis plays a pivotal role in a large number of cellular processes, including intracellular homeostasis, signaling, transcription regulation, and protein quality control. However, the regulated and targeted proteolysis of archaea, one of three major evolutionary lineages of life, still remains largely unknown. Interestingly, UPS gene homologs are widespread in archaeal genome sequences. Although evidence suggests the recent disclosed ubiquitin-like small archaeal modifier proteins (SAMPs) are associated with targeting of proteins for degradation by proteasomes, a direct link between the proteasome and sampingylation is still missing. TATA binding protein (TBP2) is the first substrate identified so far that is targeted for degradation by archaeal UPS. This study aims to further characterize archaeal UPS mediated TBP2 degradation by mutating SAMP2 modification sites on TBP2.

The Sonification and Development of Mexican Folk Music Within the ‘Rancho’ Regions of Mexticacán, Jalisco

In the Alto Sur region of Jalisco, Mexico, there are several "rancho" communities that receive comparatively fewer influence from popular culture and infrastructure technology, and much less influence from Western classical musical conventions. Individuals living in these regions have still managed to compose a plethora of folk songs that can be dated back to as early as the 1780s. This research focuses on the music of this region using both participant observation and interview research, as well as in-depth musical analyses of musical samples. This research will further scholarly understanding of the complex development and evolution of Mexican folk music within the context of relatively isolated communities. Ultimately, this music has evolved drastically in recent years, more closely resembling mainstream Mexican music after having shifted away from the musical elements specific to these regions.
Analyzing Exome Data towards Finding a Novel Cardiomyopathy Gene
In recent years, cases of inherited restrictive cardiomyopathy have been characterized as autosomal dominant diseases caused by single pathogenic gene mutations. In our previous studies, the known disease genes were ruled out by mutation and linkage analyses in a 4-generation family with clinically diagnosed restrictive cardiomyopathy (RCM) kin members. Therefore, our lab undertook a genome wide linkage analysis and found linkage to a region on chromosome 10. Recently, we received genome-wide exome data providing a list of gene variants in one of the affected family members. These data were prioritized, and screened for candidate genes within the region on chromosome 10. These candidates were analyzed in this study for evidence of pathogenesis, first by presence in other affected family members. Selected gene variants were genotyped in 4 affected individuals via several different mutation assays (i.e. PCR, PAGE, Sanger sequencing). Based on this analysis, we have ruled out several gene mutations and have suggested variants to be investigated further.
Implications: This study aims to identify the genetic mutation causing RCM in this family. These findings would ultimately lead to a better understanding of the disease in this family, and may be implicated in other idiopathic RCM cases.

Effects of Heat Treatment on the Microstructural Evolution of a NiTiHfAl Shape Memory Alloy
A NiTiHfAl alloy was investigated as a candidate material for the development of shape memory alloys for actuator design in aerospace, automobile, and power generation applications. The Ni50Ti21Hf25Al4 alloy composition, fabricated via induction melting, was selected to increase the strength and martensitic transformation temperature of the alloy. Alloys were solution heat treated at 950°C, 1050°C and 1100°C, all for 100 hours to reduce segregation and to achieve a solid solution, and then were aged at 800°C for 10, 50, and 100 hours to precipitate the Heusler phase for strengthening. The microstructure was characterized using Scanning Electron Microscopy (SEM) with Back-Scattered Electron (BSE) imaging and phases were identified with X-ray Diffraction (XRD). Mechanical properties of the solutionized and aged alloys were studied using Vickers Hardness. Solutionizing at higher temperatures gave a more uniform microstructure, and subsequent aging treatments resulted in a finer distribution of precipitate phases for samples solutionized at higher temperatures.
Development of the Novel Adeno-Associated Virus (AAV) Vectors with Selective Tropism to Human Cancer Cells.

Cancer is a leading cause of human death worldwide. Commonly used methods of treatment such as surgery, radiation and chemotherapy are largely successful but are extremely invasive and toxic. Oncolytic viruses represent an attractive alternative to currently used anticancer treatments. In current studies identified AAV6 being particularly effective in transduction of several human prostate (PC3), breast (T47D) and liver (huh7) cancer cell. We also found that transduction efficiency of these vectors can be significantly, up to 5-fold, improved by site-direct mutagenesis of surface-exposed residues involved in intracellular trafficking. AAV6-Y705-T31F+T492V vector was identified as the most efficient. To overcome vector promiscuity we also developed AAV vectors with increased tropism to human cancer cells by incorporating Arg-Gly-Asp (RGD) peptide which enabled AAV to infect integrin-expressing cells. These AAV6-RGD vectors improve transduction efficiency for approximately 3-fold compare with wild-type AAV6 vectors by enhancing viral entry into the cells. Combination of RGD and surface mutation on a single AAV6 capsid further increases transduction efficiency up to approximately 10-fold. We are currently evaluating specificity and high transduction efficiency of AAV6-RGD-Y705-T31F+T492V vectors in xenograft animal model. Thus, this approach potentially can lead to the development of therapeutic AAV vectors for selective targeting to cancer cells.

The Influence of Agent/Client Homophily on Open-Ended Responses about Use and Outcomes of Extension Information

When information is being conveyed from one to another, it is important for the associated persons to be able to relate to one another so that information may flow efficiently and effectively. In Rogers’ Diffusion of Innovations theory states, “the more homophilous two individuals are, the more likely that their communication will be effective” (1995: 287). We would expect that when agents and clients are homophilous that the clients would be more likely to have their questions answered or problems solved. Our research explores the effects of homophily on the response valence of the open ended question that asks what was their need or problem, how they used the information, and what the results were in the 2012-13 data. The responses were coded as yes if their problem were solved by Extension, no if their problem was not solved by Extension, don’t know if the client was unsure if their problem was resolved, and other if the client expresses different ideas or points of view other than answering whether Extension was able to provide him/her a solution. The results show that when the client and agent have more similar educational attainment, the client’s answer is more likely to indicate that his/her problem was solved or question answered. In addition, homophily based on race showed no significant effect on response valence. The results give partial support to Roger’s understandings of the effects of homophily on communication.
Prenatal Lactation Education of Mothers and Their Support Person

The purpose was to determine the feasibility and potential effect of a prenatally delivered lactation education program for expectant mothers of premature infants and their significant person (SP) on the initiation of milk expression, timing of lactogenesis stage II, milk volume produced, and stress associated with the first pumping experience. Women were randomized into two different groups. Group 1 received the educational intervention; Group 2 received standard care. Inclusion criteria included: Anticipated birth of an infant < 34 weeks gestation, > 18 years of age, English speaking, stated intent to breastfeed. Exclusion criteria: < 32 weeks gestation and < 1500 grams, known illicit drug use, history of breast reduction or augmentation, positive HIV, infant not expected to live over two weeks. Nine mothers completed the study. Although, the sample was too small to analyze statically, mothers in Group 1 produced more milk, had an earlier lactogenesis stage 2 and initiated milk expression earlier following delivery than mothers in Group 2. Prenatal lactation education of mothers of premature infants and their SP is feasible but continuation of the current study with an increase in sample size is necessary to provide further information on the effect of this program on lactation success.

Come Together

My interest in working with glass, a lustrous gemlike material, and combining it with an earth-born material, synthesizes duality into one form. I seek to layer and fuse the materials on top of one another whilst considering color throughout. The goal of my research is to make art that is not only functional but sustainable and references nature. The nurturing aspects of pottery, food, and community are central to my functional pottery. As a ceramicist, I aspire to explore the idea of collective consciousness through the use of functional tableware, which serves as a material that bridges society. My pots involve community action through vessels meant for eating specific food. I have explored three techniques of combining glass with ceramic; these include blowing, slumping and casting the glass. I have created glass nobs and feet for ceramic tea sets which unify the two materials into one design. Glazes were tested and combined with transparent glass elements to reflect gemlike color. Through the vibrant artistry of my creations, I aspire to invoke emotions in those around me and channel my thoughts and ideas to the community. I hope to contribute to the meaningful impact a dining experience can have.
Grandfamily Resilience and Sustainability
The purpose of this research was to evaluate the effectiveness of the GRandS (Grandfamily Resilience and Sustainability) program. Data were collected from program participants through three focus groups. Of the 20 participants who agreed to participate, 17 completed a demographic form consisting of 12 females and 5 males, with an average age of 65. Each focus group was transcribed and analyzed using a qualitative content analysis procedure. At the beginning of each focus group, grandparents were asked to share what types of difficult experiences they were going through at that moment. The experiences were categorized into 4 topic areas: managing child behavior, engaging influential adults, encouraging children to accept responsibility, and negotiating boundaries with biological parents. The grandparents were then asked to identify the skills they developed as a result of participating in the program. The skills included patience, communication, social support, community resources, legal help, and self-care; all factors closely related to the Strengthening Families protective factor model developed by the Center for the Study of Social Policy. The results suggest that the grandparents developed important skills as a result of their participation in GRandS. The implications for programs for GRGs will be discussed.

Designing Specific Primers for Fusarium oxysporum f. sp. Palmarum
Emerging pathogen Fusarium oxysporum f. sp. palmarum (FOP) causes a lethal disease on Queen and Mexican fan palm trees. Traditional identification of FOP involves pathogen isolation, PCR amplification with EF-1α primers, and sequencing analysis. Goal was to design an inexpensive and efficient diagnostic tool using FOP specific EF-1α primers to differentiate from members of the F. oxysporum species complex. Twenty seven partial EF-1α gene sequences of FOP were obtained from the in-house gene bank. A consensus sequence of 597 bases was used by NCBI Primer Blast to generate the PS1 primer pair. To validate the specificity of the PS1 primer set, known isolates of FOP, F. oxysporum f. sp. canariensis (FOC), F. solani, F. proliferatum, and F. incarnatum-equiseti species complex were selected and PCR was performed using two different sources of Taq polymerase, Terra Taq and NEB. The PS1 primer set amplified both FOP and FOC with Terra Taq whereas the NEB Taq amplified only FOP. The amplified PCR products yielded a single ~560 bp band. Positive PCR products were sequenced and confirmed by BLASTN as FOP and FOC. Due to discrepancy between Taq polymerases, effect of polymerases on primer specificity should be further evaluated.
The Impact of FDI on the Mexican Automobile Industry

The Mexican automobile industry has been thriving over the last few years. This research hopes to find a correlation between FDI and the competitiveness of the Mexican automobile industry by looking at macroeconomic factors such as gross domestic product growth, increase in exports, and microeconomic factors, such as wages, income distribution, and number of domestic firms. The impact of FDI on particular cities with large automobile plants was illustrated. Finally, “spillover effects” into other industries or areas of society are also analyzed. This project is significant because it highlights globalization and the increasing economic connections between countries. Additionally, the United States and Mexico have a strong trade relationship, so it is important to evaluate the impact of FDI from western nations like the US.

Design and Verification of the CHREC Space Processor

With the advent of present and future space-related technology, on-board computing has become a major design challenge in terms of speed, power consumption, weight, size, and reliability. The CHREC Space Processor (CSP) takes on this challenge by using an innovative combination of commercial-off-the-shelf (COTS) devices, radiation hardened (RadHard) devices, and fault-tolerant computing. The CSP will be featured on three upcoming missions with NASA Goddard including STP-H5/ISEM, CeREs, and ESCAPE to demonstrate the effectiveness of its fault-tolerant hardware and software techniques. This USP research presented will signify some of the software development and testing with Core Flight Software, Error Correction Code (ECC), and command/telemetry handling. This work was extended to help NASA Kennedy with deployment of the CSP as a data-acquisition system for flight instrumentation and with autonomous fuel loading using Core Flight Software.
Myelination by Human iPS Cell-Derived Schwann Cells in vitro

Several types of neuropathies are caused by problems in the peripheral glia (Schwann cells). Schwann cells are vital to the formation of myelin in the peripheral nervous system. It is difficult to acquire Schwann cells from humans for therapy testing. By creating Schwann cells from reprogrammed skin cells we could mitigate this challenge. With the advances in induced pluripotent stem (iPS) cell technology we can generate Neural Crest Stem Cells (NCSC’s), the embryonic precursors for Schwann cells. We acquired human NCSC’s from our collaborators and established cultures to differentiate them into functional, myelinating Schwann Cells. To achieve myelination by these Schwann cells, we co-cultured them with rat Dorsal Root Ganglion neurons as Schwann cells require interaction with axons to express their myelinating phenotype. At various stages in growth, we tested the cultures for known markers of myelinating Schwann cells, such as protein zero, MAG and the transcription factor, Krox20. We analyzed cell lysates for these markers through RT-PCR and immunocytochemistry. The verifying the human NCSC origin of the Schwann cells was accomplished by analyzing the expression of human proteins, including human nuclear antigen. Utilizing these methodologies, we are able to define the differentiation state of the human reprogrammed Schwann Cells.

Tulia 46: The Intersection of Race and Criminal Justice

The rising incarceration rates in the United States may lead one to the conclusion that America is a crime infested country but this may not be the case. I will examine a case of inequality and failure of the United States’ justice system that occurred in Tulia, Texas in 1999 to analyze factors like racism and federal funding that is based on the amount of arrests made which directly affects the injustice of the United States justice system. The study will include an examination of the narrative legal strategy as a means to social justice by using the narrative strategy to allow a better understanding of mass incarceration in American history.
The History of the Correlation of Reform Judaism and Zionism

There is a rich history of Reform Judaism and Zionism. Commencing in Germany, Reform Jews, to start, did not feel the necessity of an independent Jewish nation. Rather, these Reform Jews thought it would be best for emancipation, the process of assimilation into already established communities by gaining equal rights and opportunities. Though emancipation seemed ideal, a group of Zionist Jews explained why an independent Jewish nation is a must. After a period of disagreement, conferences, separation, both Reform Jews and Zionist came together in support of an independent Jewish nation. My research project is focused on discovering why the major change in opinion occurred with Reform Judaism and what led to such drastic occurrence. The documents that I have analyzed include the Frankfurt Platform of 1845, the Pittsburgh Platform of 1885, and the Columbus Platform of 1937. In addition, I have analyzed the work of experts in the field including Dr. Jonathan Sarna and Michael A. Meyer. Thank you to everyone who has helped make this possible including my Mentor, Dr. Vassili Schedrin.

The Effects of Aged Garlic Extract (AGE) on Cardiovascular Disease Risk Factors

Garlic has been used medicinally for thousands of years with recent data supporting its positive influence on immune and cardiovascular function. The purpose of this study was to test whether aged garlic extract (AGE) improves cardiovascular disease risk factors in adults with abdominal obesity. Thirty-nine obese (BMI 36.5±6.7) adults (45.5 ± 10.5 years old) were recruited to participate in a double blind randomized clinical trial. Participants were asked to consume three (3) capsules of 600 mg AGE or placebo with food twice a day, for a total of 3.6 grams per day, for 42 days. Baseline and post-intervention capillary blood samples were obtained. This study is ongoing and investigators remain blinded. Thus preliminary results are presented as a difference between group A and group B. Preliminary results indicate a significant decrease in LDL-cholesterol (p=0.05) in group A compared with group B. With the current sample size, no other differences were found between the two groups. Once complete, these and additional cardiovascular risk factors will be evaluated between the two intervention groups.
**Evaluating State Level Diffusion with a Dyadic Approach**

Our research, thus far, has worked to create a possible theoretical extension of policy diffusion. Hypothesizing that regional diffusion is enhanced (or hindered) by not only proximity but also the interaction of state-level political affiliation, we have created a dyadic data set to evaluate the influences of these variables. With these, we intend to isolate "external" pressures in a neighbor model of diffusion, which seeks to observe how geographic proximity to other policy adopters effects adoption time. By assigning states a value on the political spectrum, we hope to compare adoption time to mean “neighboring” political affiliation to see if such external pressures exist.

**How does Store Design and Visual Merchandising Influence Consumers' Perceptions of Authenticity of Fashion/Luxury Brands?**

Retail store design plays an important role in establishing a image for the store and the brand as well as influencing consumers perceptions of the products being displayed. The purpose of this study is to understand how store design factors, which create brand impressions, influence perceptions/authenticity of a given brand and the brand’s products. Also, these perceptions can be placed not only on the products, but the entire store and brand. Our study yielded results by examining perceptions of modern and vintage store designs as well as using unfit and fit subsets. We examined these perceptions independently from one another to obtain results that showed changing perceptions based on numerous factors, such as consistency and how relatable their perception is to their beliefs/personality.
Satiation or Disconfirmed Expectations?

Satiation describes a person’s decreased enjoyment of a food after repeated consumption. While this definition implies that there must be actual consumption for satiation to occur, recent research has shown that mental simulation can have the same satiation effect as actual consumption, meaning that solely thinking about a product causes satiation. Larson, Redden, and Elder (2013) found that enjoyment ratings of peanuts were significantly higher for students who were shown 20 images of salty snacks than for students who were shown 60 images of salty snacks. Larson et al. credited satiation for this effect. Our research objective was to analyze if expectations were an explanation for their result. We theorized that viewing more pictures raised participants’ expectations, and offering them three small peanuts subsequently disconfirmed those expectations, leading to lower enjoyment. We attempted to replicate and extend Larson et al.’s experiment, adding a measure of expectation. Two failed attempts to replicate their findings led to a conceptual replication where we used M&Ms instead of peanuts. The findings of my three studies challenge the extent to which mental simulation from viewing pictures leads to satiation.

Effect of Cultivar on Growth and Strobile Production in Hops (Humulus lupulus) in Central Florida

Hops (Humulus lupulus) is a perennial, herbaceous crop cultivated for its strobiles which contain a resinous compound used for flavoring and aroma in food, tea, and beer. Increased demand for hop products has recently resulted in production of hops in non-traditional areas such as in North Carolina and New Mexico (Davis and King, 2012; Lombard, 2013). Preliminary investigations conducted at the Mid-Florida Research and Education Center support viability of hop production in climate zones previously considered too mild. Sixty hop rhizomes consisting of four varieties were transplanted into native deep sand soil (Tavares-Millhopper soil series) within a polyethylene covered, open-sided greenhouse. Plant bine length was recorded weekly for a period of 20 weeks with mean plant heights of 345, 376, 189, and 166 cm at harvest for Chinook, Columbus, Amallia, and Neo1, respectively. Harvested strobile mass was 2.7, 2.4, 0.9, and 1.0 g plant-1 for Columbus, Chinook, Amallia, and Neo1, respectively. Alpha acids, compounds which impart the bitterness and aromatic qualities of hops, were analyzed for each variety. Concentrations among cultivars were 6.8%, 9.7%, 3.8%, 4.3% alpha acids by weight for Columbus, Chinook, Amallia, and Neo1, respectively. Findings support continued research to assist commercial production of hops within Florida.
Analyzing Medication Data in Community-based Clinical Trials of Older Adults: Challenges and Opportunities

In clinical trials, medication use is commonly assessed as an indicator of health status. Typically, the number of medications is calculated, which provides a limited view of medication use. In order to fully analyze this data for descriptive or predictive purposes, systematic data cleaning and coding is required. This is a complex and time-consuming process that is rarely described in the research literature, but is a necessary precursor to understanding the impact of medications on important clinical outcomes. Thus, the purpose of this study is to describe the detailed methodology used to collect and manage medication data from a community-based study. Data from the ACTIVE Trial (Advanced Cognitive Training Interventions for Vital Elders) was used. The sample consisted of 2,774 adults over age 65. A “brown bag survey” of participants’ medications was conducted. Preparing this type of data for analysis included a multi-step process of deciphering drug names, drug coding, and standardizing. The results indicate that 26% of participants take at least one pain medication. NSAIDs were the most commonly reported category of pain medications whereas few participants reported using opioids. The challenges and rich opportunities of preparing this data for analysis will be described in detail.

Non-invasive Dynamic Muscle Tendon Force Measurement

Current methods for quantifying muscle activity, namely electromyography (EMG) and ultrasound do not provide accurate measures of muscle force. EMG is an indirect measure of muscle activity, and thus is extremely difficult to process in order to reliably indicate muscle force levels. Ultrasound can be used to quantify muscle and tendon stress states; however, it is a complex imaging technology for analyzing simple mechanical systems. This research seeks to non-invasively evaluate the tension in muscles in order to diagnose musculoskeletal problems, monitor post-surgical progress, and to validate computer models, allowing new treatments to be developed. In this research, muscle tendons are considered strings under tensile loading, analogous to the guitar strings. Simple equations can be used to describe the relationship between the frequency of vibration and tendon tension using tensile string theory. A tendon phantom (braided UHMWPe cord) is fed through a tissue phantom (ballistic gel) and a tensile load is applied to the ballistic gel. A mechanical impulse is applied to the tissue phantom at several tendon tensile loads and the vibrational response is recorded using sound transducers. This data is then analyzed using spectral analysis in order to determine a vibrational-frequency and tendon-tension relationship.
The Effects of Specific Point Mutations on Infectivity and Virulence of Murine Norovirus

My research project focuses on determining the effect of specific point mutations in the capsid protein of murine norovirus (MNV) on infectivity and virulence of the virus. The specific point mutations were selected because they arose naturally in malnourished mice chronically infected with a MNV. Together with my postdoctoral mentor, I performed site-specific PCR-based mutagenesis to introduce the appropriate mutations into a cloned version of the parental virus and determined virus yields. For those mutations that were not lethal to the virus, I generated virus stocks and performed virus growth curves to analyze replication efficiency. I performed this experiment in two known target cells of MNVs, macrophages and B cells. I have identified two mutations that reduce the viral replication efficiency in both cell types, demonstrating that these residues provide a critical function during the viral life cycle. The lab is also testing this panel of mutant viruses in antibody neutralization assays to identify mutations that alter virus-specific antibody binding; and virulence studies to identify mutations that regulate the ability of the virus to cause disease in a natural infection. Ultimately identifying residues associated with virulence and antigenicity is critical to vaccine development.

Simulating the Diamagnetic Response of Graphene Flakes

Graphene, a single-atom thick layer of carbon atoms arranged in a hexagonal honeycomb grid, is a material of significant interest to material scientists and physicists. Specifically, graphene displays interesting and unusual electrical properties, being an extremely efficient electrical conductor. Diamagnetism is the physical phenomenon in which external magnetic fields induce an opposing internal magnetic field in electrical materials. Experimental results [cite] suggest that flakes of graphene (i.e. small, finite sheets of the graphene lattice) have unusual diamagenetic response at small variations in magnetic field, some suggesting the presence of a paramagnetic response (where the induced magnetic field is complementary, not opposing, the external one). We simulate graphene lattices digitally, calculating the effects of temperature, shape, and field strength on the magnetic response of flakes. We apply standard solid state quantum mechanical computation to find the wavefunctions for electrons in a given flake, and calculate the induced current & magnetic moment in various fields.
Solar Disinfection of Anaerobic Digester Effluent from Human Waste Treatment

Anaerobic digestion (AD) is a biological method of treating organic waste in the absence of oxygen. Benefits of a controlled AD system include production of renewable energy (biogas) and a nutrient-rich digested effluent that can be land applied as a biofertilizer for agriculture. Efforts to use AD to help developing countries improve sanitation and increase crop and renewable energy production are ongoing. However, when AD is applied to treat human waste, harmful parasites can persist in the digestate, posing a potential health hazard. The purpose of this project was to develop and evaluate a disinfection stage to follow the AD process: solar sanitation. The conceptual design consists of piping the digestate to holding tanks and harnessing solar energy for thermal inactivation. Temperature conditions necessary for parasite inactivation were determined using Ascaris as a model organism since it is among the most resilient and prevalent parasitic helminths in many developing countries. Plastic tanks were filled with water as the test medium, painted black for maximum solar gain, and fitted with solar reflectors and temperature data loggers. The tanks were evaluated in various sizes and temperatures above 50ºC were attained for sufficient time to inactivate the model parasite.

Effect of Exercise on Prostate Tumor Growth and Mitochondrial Bioenergetics

Tumors exhibit altered mitochondrial metabolism and suppressed mitochondrial-mediated apoptosis. Exercise improves mitochondrial function and apoptotic susceptibility in tissues but its effect on prostate tumors is unknown. We used an orthotopic prostate cancer model, injecting AT-1 adenocarcinoma cells into the prostate of young (5mo) Copenhagen rats, and assigned them to sedentary (Sed) or exercise (7 weeks; Ex) groups. Our preliminary findings show a 79% increase in tumor weight with exercise with no change in mitochondrial content (via COX activity). Interestingly, exercise tended to elevate PGC-1α (47%), and increase NRF-1 (1.26-fold), two key mitochondrial biogenesis regulators. Additionally, exercise caused an elevation in mitochondrial ROS production (1.2-fold) and tended to reduce apoptotic susceptibility (Bax:Bcl-2). Energetically, exercise increased hexokinase II (45%), a key glycolytic marker, while reducing (44%) mitochondrial respiration, which suggests an exercise-induced enhancement, and shift to, anaerobic energy production. Our data indicates exercise increases prostate tumor size, alters mitochondrial signaling/function, tends to reduce mitochondrial apoptotic susceptibility, and paradoxically enhances anaerobic while suppressing aerobic energy pathways. Taken together, our study regretfully suggests that exercise may promote tumor growth via an enhancement in the "Warburg effect" (increased anaerobic/suppressed aerobic pathways).
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FACULTY MENTOR: Wendy Dahl  
RESEARCH FIELD: Health-Related (Pharmacy, Dentistry, Medicine, Nursing, etc.)

**Evaluation of Handgrip Strength as a Nutritional Risk Screening Tool for Congregate Meal Site Participants**

There is no established protocol for nutritional screening for community-dwelling older adults. The purpose of this pilot research study was to determine if handgrip strength is a predictor of nutritional risk in this population. Congregate Meal Site participants in Marion County, FL were assessed for handgrip strength using a Jamar Plus+ digital dynamometer and nutritional risk with the SCREEN I questionnaire, a validated screening tool for community-dwelling older adults. Participants (n=136; 45 male and 91 female) completed the study. For men and women, an average handgrip score of 33 kg (from both hands) and 22 kg (from either hand) provided the best cut off point for handgrip and nutritional risk with an area under the curve (AUC) value of 0.59. Nutritional risk was found in 68% of participants, suggesting this to be a vulnerable population (by SCREEN I). The results from this study suggest that handgrip strength alone may have limited application for nutritional risk screening in community-dwelling older adults. Further research is needed to assess clear cut offs and the validity of handgrip strength as a nutritional risk screening tool.

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**The Relationship between BMI, Cancer Stage, and Quality of Life among Female Breast Cancer Survivors**

For many women, breast cancer diagnosis and treatment can result in a significant distortion of body image and reduced quality of life (QoL). These negative psychological effects can be further compounded by obesity, a significant risk factor for post-menopausal breast cancer. The aim of this study is to determine the relationship between BMI, cancer stage, and QoL in female breast cancer survivors. Fifty-five overweight/obese women with a history of breast cancer (stages 1 to 3) were recruited from two distinct geographical locations. Participants completed two QoL assessments (QLQ-30 and BR-23), which assess overall QoL through several unique functional scales. While there were no differences in QoL by BMI or cancer stage, on average participants reported higher physical, cognitive, emotional, and social functioning (84.33+14.97 versus 74.32+26.52), but scored slightly lower than average for body image (62.53+26.05 versus 66.12+29.74) as compared to the EORTC QLQ-C30 Reference Values for women with breast cancer. Further work is being done with this group to determine the effect of two distinct weight management programs on these QoL endpoints.
Incorporation of Social Cognitive Theory Into Functional Intervention for Young Adults with Intellectual Disabilities

Social Cognitive Theory (SCT) is a description of the constant learning between individuals, their peers, and the external environment, with the pivotal three pillars being Observational Learning, Motivational Reinforcements, and Behavioral Capability. Chiefly, all three of these cornerstones have a direct link to the central Self-Efficacy element, and vice-versa. The Sidney Lanier Fitness and Research Program (SLFRP) employs the SCT as part of its purpose to achieve an elevated cognitive response from young adults with Intellectual Disabilities (IDs). The hypothesis in this program is that participation in biweekly exercise sessions with an emphasis on functional training will greatly improve each of the three fundamental SCT pillars, as well as its overarching goal of an elevated self-efficacy. Within SLFRP, the first two pillars of Observational Learning and Motivational Reinforcements are enhanced by pairing the young adults in question with groups of student volunteers from the University of Florida, who do every exercise alongside the subjects and encourage them to push themselves. The final pillar, Behavioral Capability, is elevated through their functional training and examined using multiple pre-program, in-program, and post-program evaluations of the students’ performances and polls of the volunteers’ experiences, as well as an observationally sophisticated social capacity.

Ethical Love: A Socio-Political Critique of Western Individualism in Harry Potter

Although children’s literature is generally considered simple and apolitical in nature, my research seeks to challenge this notion by examining how J.K. Rowling’s Harry Potter series offers a socio-political critique of Western notions of rugged individualism. By conducting a comparative character analysis of the series’ eponymous hero, Harry, and his nemesis, Voldemort, I argue that the Harry Potter books warn against the dangers of extreme individualism and power and instead uphold a vision of ethical goodness rooted in a recognition of one’s relation to the other that demands ethical action and condones community over isolation. Such a vision, I further argue, is rooted in ethical love, which I define not as the sentimental phenomenon, but rather as the ability to accept one’s vulnerability, dependency, and responsibility to the other. Considering the Harry Potter series’ global reach, its offering of an ethical world view based on collective action, communication, and understanding has particular significance as people learn how to ethically navigate a globalizing world in the 21st century.
**Susceptibility to Phonological Interference in a Spoonerism Elicitation Task**

Many clinical populations are abnormally susceptible to speech errors, yet others are abnormally unaware of speech errors. Very little research has been done on the factors, at either the word- or cognitive-level, that affect speech error frequency and awareness. Understanding these factors would facilitate efforts to treat these deficits. This study seeks to address this gap. Participants completed a novel version of the SLIP paradigm (Motley & Baars, 1976), as well as a battery of cognitive tests measuring components of Executive Function (EF), Working Memory (WM), and Vigilant Attention. At the word-level, susceptibility was increased in trials that either repeated rhymes or contained no real words. At the cognitive-level, test performance suggests susceptibility was correlated with high resistance to interference and low processing speed, while awareness was correlated with low resistance to interference, high memory updating ability, and low phonological verbatim memory. These results suggest that susceptibility and awareness of spoonerisms may be related to specific cognitive abilities. This adds to the sparse research on speech error frequency, and is a preliminary step in understanding lack of awareness of speech errors.

**Social Media's Impact on Social Movement Success**

This study explores the relationship between social media coverage and mass mobilization. Scholars have suggested several ways in which social media has influenced collective action, including its role in disseminating information. This study is a Twitter content analysis of the political hashtags #SOSVenezuela and #YoySoy132. The hashtags correspond to two ongoing political movements in Latin America, one in Venezuela and the other in Mexico. Both movements have used Twitter to communicate concerns and share information. The content analysis looks at 473 tweets selected through a constructed week sample and uses metadata to understand the source and location of each tweet. The goal of this research was to gain insight into Twitter’s mobilizing capacities and understand the dominant frames employed by both movements.
**PRESENTER(S): Stratman, Scott**  
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**RESEARCH FIELD:** Health-Related (Pharmacy, Dentistry, Medicine, Nursing, Physical Therapy, etc.)

**Xenograft Model for Testing Nutrient Enhancers of Neurogenesis**

A previous xenograft protocol was developed using Adult human neural stem/progenitor cells (AHNPs) and fetal human neural progenitor cells (HNPCs) in order to develop an accurate model for nutrient testing. Our previous xenograft protocol will be used to further investigate whether human induced pluripotent stem (hiPS) cells and human mesenchymal stem cells (hMSCs) can be used as additional, accurate and reliable models for future nutrient testing. Green fluorescence protein (GFP) labeled hiPS cells and hMSCs will be collected and transplanted into the cortex and lateral ventricles of immunodeficient mice. After various survival periods, the brains of immunodeficient mice will be harvested in order to collect representative tissue sections. These tissue sections will receive a battery of neuronal markers and human specific markers to examine the degree of differentiation and survival of the xenografted cells. Survival, migration, fate choice and differentiation of grafted cells will also be investigated. This will be accomplished through a stereological approach to quantify: 1) number of total cells present after grafting, 2) percentages of different cell populations, and 3) migration of target cells. Once this xenograft model is established, different nutrient supplements can be tested in these animals to determine potential beneficial outcomes in the growth, development, survival, and differentiation of hiPS cells and hMSCs.

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**RESEARCH FIELD:** Agricultural and Horticultural Sciences

**Lactotransferrin Gene Polymorphism and Resistance to Internal Parasites in Small Ruminants**

Internal parasitism is one of the main issues in small ruminant production around the world today. The objective of this project is to identify certain individuals in a population that show resistance to internal parasitism and determine if this resistance is in part due to genetic variation in the lactotransferrin (LTF) gene. This would lead to identification of genetic markers for resistance to internal parasites and provide producers with a sustainable way of genetic improvement. Lactotransferrin is a major iron-binding and multifunctional protein and the LTF gene was previously identified as a candidate gene for resistance to internal parasitism. A Single Nucleotide Polymorphism (SNP) within this gene was identified and primers were designed with Primer3 software to amplify a 173 bp region of the gene. DNA was extracted from blood samples from 200 sheep and goats and PCR will be performed on the DNA samples. In order to genotype the animals, the restriction enzyme Acil will be used to cut the PCR product into a 75bp and 98bp followed by gel electrophoresis to separate the DNA fragments. In order to determine if the LTF gene is associated with resistance or susceptibility to internal parasitism a χ² test will be used.
Explaining Unexpected Energies in MINERvA

MINERvA is a neutrino scattering experiment located at Fermilab. The experiment is located in the NuMI (Neutrinos at the Main injector) beamline, where a wide range of neutrino energies are used to study neutrino-nucleon interactions. MINERvA is studying neutrino interactions on a variety of nuclei, including helium, carbon, water, scintillator (CH), iron and lead. When neutrino-nuclei interactions occur a number of particles can be produced. By tracing the paths of the various particles backward and extrapolating one can then determine their point of origin. Furthermore, with information about the particular type of particle created and its corresponding track length in the detector, one can figure out how a particle’s energy was deposited throughout its lifespan. However an issue has arisen when examining energy depositions near the neutrino interaction vertex. Within small approximately spherical regions centered at the vertex, disparities emerge between actual energy data and the results predicted by simulation. A possible explanation for this discrepancy is the production of low energy photons (500keV-10MeV) around the neutrino interaction vertices, which current simulations would not have accounted for.

Phytoreceptor PhPHY1F Possible Role in Petunia Hybrida Floral Volatile Benzoid/Phenylpropanoid Pathway

Past experiments have shown that petunia volatile profiles can be altered by manipulating red and far-red light conditions. Phytochrome photosensor proteins play a key role in plant biochemical pathways and perhaps in volatile emission. However, there is still much to be understood about the different families of phytochromes and their specific interaction with different wavelengths of light in regard to volatile emissions. Sequence database comparison to the petunia homologs in Solanum lycopersicum allowed strong hypotheses of the different phytochromes genes in petunia. PhPHY1F is what we hypothesize to be a putative phytoreceptor (phytochrome) that partakes in these red and far-red light response processes. Through RNAi system manipulation, genetically engineered petunias with a repressed, endogenous PhPHY1F transcript allowed for assessment of the transcript’s photoreceptor role. Petunia floral volatile emissions and the possible implications of the phytoreceptor is characterized through physiological phenotyping, comparative transcriptional profiling, and the collection and analysis of plant floral volatile emission.
Investigation of Crystal Growth Kinetics in Methyl Ammonium Lead Iodide

Perovskite solar cells have quickly come into prominence due to their relatively high efficiency in hybrid organic-inorganic photovoltaic devices (up to 20% in laboratory conditions). Prior research into perovskites has shown more crystalline film morphologies to have greater charge dissociation efficiencies, charge diffusion lengths, and charge transport properties. This investigation probed the growth kinetics of perovskite methyl ammonium lead iodide (CH3NH3PbI3, MAPbI3) from a PbI2 precursor film exposed to methyl ammonium iodide (CH3NH3I, MAI) solution at varied MAI temperatures and concentrations. Films were characterized by UV-vis Spectroscopy and Atomic Force Microscopy to find optimal conditions for crystalline film growth.

Does a Probiotic Supplement Work Synergistically with Dietary Fiber Intake to Lower Serum Cholesterol?

Cardiovascular disease (CVD) is a leading cause of mortality within many developed countries and is commonly seen in individuals who have high cholesterol. Individually, dietary fiber and probiotics (e.g., live bacteria that ferment fiber) appear to have beneficial effects on serum cholesterol. The purpose of this double-blind, placebo-controlled, crossover study was to determine whether dietary fiber intake and a probiotic supplement work synergistically to lower serum cholesterol. 35 participants (53 ± 1 y, 71% females) with a larger waist circumference that places them at risk for cardiovascular disease randomly received a probiotic or a placebo for 6 weeks with a 4-week washout period before starting the opposite intervention. Participants were divided into 2 groups based on their average dietary fiber intake (lower fiber, 6.3 ± 0.3 g/1000 kcal (n=13) versus higher fiber, 10.2 ± 0.4 g/1000 kcal (n=22)) and change in serum cholesterol was compared between and within fiber groups with the probiotic or placebo. No change in serum cholesterol was observed with the probiotic regardless of typical dietary fiber intake. A larger sample size and a higher fiber intake (recommended fiber intake is 14 g/1000 kcal) may be necessary to observe the expected effects on serum cholesterol.
**PRESENTER(S): Tasi, Alexander**  
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**FACULTY MENTOR:** Neill Wallis  
**RESEARCH FIELD:** Psychology/Social Sciences

**Cob Marked Pottery as a Proxy for Florida’s Pre-Columbian Maize**

The morphology of Pre-Columbian maize cobs is archaeologically relevant because ear shape is often a result of phenotypic changes produced by human mediated selection pressures. In parts of northern Florida, pottery was decorated by rolling maize cobs across wet clay. Broken pieces of these pots have in turn been recovered from sites representing a number of different regions and time periods. The goal of this project is to provide a clearer picture of Pre-Columbian maize in Florida through the analysis of such potsherds. Statistical analysis and microscopy were used to compare kernel width and interior starch residues both across sites and also to modern ears of ethnobotanical maize. Similarly sized kernels were found to be the norm across a wide region, with one exception along the Apalachicola River. Additionally, possible maize starch was identified from a separate site in northeastern Florida.

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**RESEARCH FIELD:** Humanities

**Voting Rights in Florida: Has Anything Really Changed?**

While many regard the Voting Rights Act of 1965 as the strong arm of the fifteenth amendment because the statute effectively eliminated poll taxes, literacy test, voter purges, and other tactics used in the south to prevent minorities from voting, there has yet to be an overcoming. Suffrage continues to be challenged by lawmakers, particularly in the state of Florida, through efforts that disproportionately affect African American and language minority voters. In my work, I examine how minorities in Florida have shaped voting laws and how gerrymandering, non-automatic restoration for felon suffrage, and early voting restrictions have affected minority turnout. I also examine racial polarity in voting practices throughout the state in order to understand how Shelby County v. Holder (2013), which struck down the pre-clearance provision of the VRA will affect the future of the voting rights narrative and access to the ballot for Floridians. In exploring these concepts, primarily through oral histories, court cases, and congressional testimony, I hope to illuminate the detrimental consequences of suffrage challenges: a population unsure of their ability to affect change. Suffrage is one of the greatest weapons of a democracy and cannot be used lightly.
Cell-biological Studies of the Interactions of DAXX and p53

Death domain-associated protein 6 (DAXX) is involved in many cellular processes, most notably transcription repression by coordination with tumor suppressor protein p53. This occurs through the attachment of small ubiquitin-like modifiers (SUMO) on p53. The SUMOylated p53 interacts with SUMO interacting motifs (SIMs) on DAXX, and the two proteins complex within the nucleus in what is known as a PML body. I identified several critical domains for this interaction through transfection and immunofluorescence microscopy techniques as well as statistical analyses. Although human cells express three SUMO paralogs (SUMO1-3), I found that DAXX preferentially interacts with SUMO1-modified p53. I believe that these new data will impact our understanding of cancer-cell biology due to the tumor-suppressing activity of p53.

Implementation of Renewable Energy in Developing and Developed Nations: Outlooks to 2040

With increasing concern over the environmental effects of burning fossil fuels, the call for a more sustainable resource base has never been louder. Both developed and developing nations depend on an assortment primary energy sources to produce electricity, like coal, natural gas, biomass, oil and renewables. Each of these sources have their benefits and shortcomings. This literature review intends to explore the current state of energy in the United States and developing countries of Kenya, Morocco and South Africa. We will explore the production and consumption trends, projections and future plans regarding electricity generation and distribution through new and existing sources. Then, we harness collective studies to highlight upcoming technologies like smart grid, smart meter, distributed generation, and hydrogen storage that may facilitate a greater percentage of renewable energy penetration in the United States market and abroad. As a product of this study, we present individualized models for each country of how their potential capacity for renewable technologies and energy efficiency can transform their energy sector to a more sustainable, diverse resource base for electricity generation.
**Fashion, Femininity, and the Revolutionary Body in Mid-Nineteenth-Century Hungary**

This project will explore the intersections between nationalism, fashion, and gender in Hungary between 1843 and the Ausgleich of 1867. Focusing on aesthetics as a vehicle for feminine power at a critical junction in Hungarian history, this thesis will contextualize women’s roles during the revolutionary period while charting the rise and fall of political fashionism in Hungary. Eminent newspapers such as A Pesti Divatlap, and Vasarnapi Ujság will form the backbone of this paper as publications such as these facilitated the dissemination of symbolic patriotism while simultaneously reinforcing the nascent Hungarian women’s movement. The topic of study engages with contemporary studies of nationalism, which emphasize gender and aesthetics, and contributes to the increasing body of work on Hungarian women. Within a modern context, a study of symbolic political expression is particularly pertinent as a progressively nationalist Hungary strives to accent its individuality within the culturally and economically blurred European Union.

**Executive Functioning and rt-fMRI Neurofeedback Success in Aging**

Executive functioning constitutes a crucial cognitive capacity, and there is broad evidence that it declines with age. Real-time fMRI (rt-fMRI) technology offers new potential to enhance cognitive performance, including executive functioning, through neurofeedback training. Specifically, participants can learn to self-regulate certain brain regions by providing visual feedback of the blood oxygen level-dependent (BOLD) response in those regions. Our project addressed two research questions: (1) Does higher initial executive functioning in older adults result in greater neurofeedback success? (2) Does neurofeedback training improve executive functioning in older adults? In our study, older participants (63 to 90 years) completed the NIH Toolbox Dimensional Change Card Sort (DCCS) task before and after engaging in a series of rt-fMRI neurofeedback trainings. During the trainings, participants learned to up-regulate either the anterior insula or the primary visual cortex by receiving contingent neurofeedback. Neurofeedback training success was determined by the number of training runs needed to achieve activation in the region of interest for 80% of the trials. Baseline executive functioning was measured as a composite of speed and accuracy on the DCCS task before training, and a positive training effect was measured as increase in DCCS performance from before and after training.
CD8 T Cell Derived IFN-γ: Nipping Respiratory Viral Replication in the Epithelial Bud

Several orthopox viruses cause clinical diseases in humans, such as variola virus (VARV), monkeypox, cowpox, and vaccinia virus (VACV). VARV, the etiological agent of human smallpox, is highly infectious by aerosol transmission in a susceptible population. Using a highly virulent respiratory VACV infection model to simulate the natural route of human smallpox and monkeypox infection, we found that large numbers of activated and functionally proficient CD8+ T cells are rapidly recruited to the lung. These are found in close proximity to virus-infected bronchial lung epithelial cells and release interferon γ (IFN-γ) to inhibit VACV replication and dissemination to visceral tissues. To enhance virus spread, vaccinia virus has evolved complex strategies to direct the formation of actin tails propelling them toward neighboring cells. Investigating the precise molecular mechanisms of action of IFN-γ, we discovered that interferon γ attenuates VACV-induced actin polymerization by inhibiting the Wiskott-Aldrich syndrome protein (NWASP) and ARP2/3 (Actin Related Protein) interaction and nucleation of actin filaments in mouse and human lung epithelial cells. Our observations uncover an unexpected role for IFN-γ during virus spread and have important implications for discovery of future vaccines and therapeutics for existing and emerging human respiratory virus infections.

The Parallels of Invasion

My research project draws parallels between our anxiety about “invasive-ness” and the plant hydrilla’s strategies for dominating aquatic ecosystems. The Parallels of Invasion, portrays hydrilla’s invasive strategies as a metaphor to understand negative feedback loops perpetuated by humans with respect to both how we treat the environment and how we interact with one another. Specifically, I am fascinated by the way hydrilla reproduces through stem fragments that break off and form new communities in short spans of time. In my project, an immersive video-animation artwork, the audience encounters a poetic interpretation of hydrilla engulfing a body of water. My piece juxtaposes how hydrilla clogs and chokes our waterways with the way people apprehend the idea of invasion. Also interesting is that each dense mat of hydrilla is a singular ecosystem supporting the life cycles of many organisms. I desire to elicit both awe for prodigious reproductive power of these plants and invite the audience to recognize how both humans and the hydrilla self-organize. In my work I dissect and examine both the structures found in the natural world as well as the systems of knowledge that we take for granted in order to initiate dialogs about the human condition.
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**RESEARCH FIELD:** Physical Sciences

**Colossal Piezoresistance in Strained La0.67Sr0.33MnO3 (LSMO) Thin Films**

Piezoresistance is a change in electrical resistance as a result of applied strain. A known mechanism leading to piezoresistance is the presence of both insulating and metallic regions within a material. This phenomenon is called phase separation. It has been shown that the compound (La1−yPry)1−xCaxMnO3 (LPCMO) exhibits colossal piezoresistance (CPR) at low temperatures, below 100K, due to phase separation. However, for use in many applications, such as sensors, materials must exhibit CPR near room temperature. We chose to study La0.67Sr0.33MnO3 (LSMO), because it transitions from a metal to an insulator at approximately 350K. While LSMO crystals do not show CPR, the strain caused by growing ultrathin LSMO films on SrTiO3 (STO) was expected to cause phase separation. By using a three-point beam bending method to control additional compressive and tensile strain, we were able to observe CPR in LSMO thin films at room temperature.

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**RESEARCH FIELD:** Vet Med

**Effects of HIV Protease Inhibitors on Protein Trafficking in Babesia bovis**

Babesia bovis is a malaria-like parasite responsible for causing Babesiosis. Recently, researchers have discovered a protein trafficking motif (PEXEL-like motif, or PLM) that gets cleaved in Babesia bovis. The PLM appears to be analogous the PEXEL used by Plasmodium falciparum to traffic proteins across the parasitophorous vacuole membrane (pvm). This discovery is surprising because there is no reason to predict that Babesia would undergo this protein cleavage. Unlike Plasmodium, Babesia does not have a pvm. This difference was originally overlooked due to minor differences in the encoded sequences of Babesia proteins, which do not produce recognizable PEXEL motifs. However, PLMs can be found with a more biased search, and some B. bovis proteins are proteolytically cleaved during export. Plasmeptins are proteases in Plasmodium which cleave amino acid chains at the leucine site of the PEXEL. Because Babesia has been found to experience the same cleavage, the hypothesis that protease cleavage may be affected by local structure more than by sequence specificity was developed. In aiming to understand how the processing works and how it contributes to Apicomplexan infections like Babesiosis, cleavage inhibitors were utilized to stop the processing of these proteins, thereby rendering the protozoa unable to produce an infection.
Effects of Oxytocin on Cognition and Social Functioning in Young and Older Adults

The purpose of this research is to identify whether oxytocin (OT) affects cognition and social functioning in young and older adults. OT is a hormone that naturally occurs in the brain and the body. Evidence suggests that OT promotes social connectedness and bonding. Close to nothing is known about the OT system in aging and very little on its effect in cognition. The aim of this research is to determine effects of baseline OT levels on cognitive and social performance level, with a particular focus on age differences. Blood draws were conducted to determine baseline plasma OT levels in 48 young participants and 54 older participants. Participants then filled in a series of paper tests measuring their cognitive and social functioning. Preliminary results suggest highest levels of baseline plasma OT in young women and the lowest levels in older men. Relationships with functional measures will be evaluated. The results from this project have the potential to inform treatment approaches targeted at improvement of cognition and social functioning in aging.

Precipitation Modeling of Mg\(_{17}\)Al\(_{12}\) in Mg-Al Alloys Using TC-Prisma

Recent commercial interest in aerospace and automotive industries in conjunction with the Materials Genome Initiative has led to significantly increased research in the field of computationally driven Mg alloy development. In this study, the computational software TC-Prisma was used to model the nucleation and growth of the Mg\(_{17}\)Al\(_{12}\) precipitate in the Mg-Al alloy system. The resulting volume fraction, average precipitate size, and nucleation density of the precipitates as a function of heat treatment time were then compared to experimental results, and TC-Prisma input property values were optimized so that the computational model fit experimental data. In addition, microhardness tests were performed to determine the effect of volume fraction on hardness, and, ultimately, mechanical properties such as yield strength. These optimized input property values, along with thermodynamic and kinetic data, can be used for future Mg alloy development and design such as the optimization of heat treatment schedules and mechanical properties.
Dual Task Effects on Motor Performance in Healthy Younger Adults

Traditional views of cognitive-motor interaction suggest that when two things are done simultaneously, performance on one or both tasks declines. However, our laboratory recently observed that performing cognitively challenging tasks while pedaling on a stationary bicycle led to enhanced cycling speeds. The study’s purpose was to determine whether this phenomenon extends to similarly rhythmic modalities where there are increased balance demands. Herein we compared dual task behavior during stationary cycling and elliptical walking. Sixteen healthy young adults (9 males, 20 ±0.83 yrs) completed single task cycling, single task elliptical walking, dual task cycling and dual task elliptical walking. During the dual task condition, participants completed a battery of 14 tests spanning 6 cognitive domains. Cadence, measured in Revolutions Per Minute (RPM), was collected using a six-camera motion capture system. Dual task effects were calculated as (dual task – baseline) and were compared between modalities using repeated measures analysis. Cadence increased significantly during dual tasks in both modalities (p<0.05). However, dual task effects were significantly greater during cycling than during elliptical walking (all p<0.05). These findings suggest that the addition of cognitive challenges can significantly enhance motor performance but as the balance requirements of the task increase these benefits are reduced.

Recrystallization of a Biodegradable Mg-Ca-Sr Alloy

The properties of magnesium (Mg), including its susceptibility to degradation, high specific strength, and modulus similar to that of bone, make it an ideal candidate for temporary orthopedic fixation devices. However, the rapid dissolution of pure Mg is a major limitation that must be addressed due to concerns of hydrogen evolution during degradation. Recently, a Mg-1.0wt.%Ca-0.5wt.%Sr alloy was shown to be biocompatible and possess favorable degradation and mechanical properties, with a strong relationship observed between grain size and degradation rate. Grain size evolution and recrystallization of rolled alloys were studied as a function of percent deformation, temperature, and time using quantitative metallography and mechanical analysis. At 30% thickness reduction at room temperature, hardness results confirmed the recrystallization behavior. This information will be used in future studies on the effect of grain size on degradation behavior.
The Effects of a Pain and Analgesia on Mouse Temporal Operant Behavioral Responses

Knowing the duration of drugs is very important, as post-operative relief can vary depending on the conditions. Experiments evaluating analgesic drugs in a time course study are costly in terms of time, money, and supplies. We hypothesized that use of a novel temporal paradigm would be effective for studying the duration of action of both pain-causing and relieving substances. We tested male, wild-type mice (C57BL/6, n=12) using a repeated 1 minute interval sessions once every hour for a duration of 6 hours. We utilized the Orofacial Pain Assessment Device (OPAD, Stoelting Co.) to test the pain at three temperatures (32 °C, 42 °C, and 44 °C), using the standard reward licking event/stimulus contact event pain ratio (lick/face ratio). Pain was induced through the application of capsaicin to the face of the mice. Morphine (2 mg/kg, s.c.) was used as a standard analgesic. We found that capsaicin significantly decreased the lick/face ratio and morphine significantly increased the lick/face ratio as compared to naive, baseline levels at the hot temperatures. We showed how drugs can be tested effectively over a period of 6 hours with a smaller sample number than previously used, saving time, money, and resources. This approach may provide a better way to evaluate novel analgesic drugs in the future and help minimize the number of animals needed to study these drugs.

Pulmonary Vascular Pruning in Response to Radiation

The lungs are highly sensitive to radiation. Following irradiation, acute endothelial cell damage and inflammation leads to blockage of the lumen of small arterioles. Prolonged occlusion leads to resorption (pruning) of these microvessels can lead to downstream radiation pneumonitis and long-term fibrosis. This cascade of events is hypothesized to occur in patients receiving radiation therapy (RT) for lung cancer. Quantification of vascular pruning due to the loss of small arterioles is important in evaluating current and future treatment plans for the estimated 221,200 new cases of lung cancer in 2015. Using in-house software, extraction of the vascular structure from three-dimensional (3D) X-ray computed tomography (CT) and quantification of the morphological features of the vascular tree can be used to compute the changes over time in the total vascular structure post-RT. After scanning and analyzing several representative patient data sets of 3D CT scans, a trend was discovered in the pruning of the vascular tree post-RT beginning 2-3 months post exposure that progressed through 7-8 months, followed by a partial recovery shortly starting from 9-10 months. These results demonstrate for the first time the ability to measure changes in vascular anatomy non-invasively in humans following radiation exposure.
**Blocking Tat binding to HIV TAR RNA by Novel Peptoids for AIDS Therapy**

HIV/AIDS currently affects more than 30 million people in the world. With this research, we hope to minimize the harmful effects and work to one day eradicate this malicious disease. Non-coding 7SK snRNA is believed to play an important role in the recruitment of P-TEFb by viral protein Tat to stimulate HIV processive transcription. Steady state fluorescence spectroscopy has been used to probe the conformational landscape of HIV-2 TAR and 7SK-SL4 RNA and monitor the conformational changes upon Tat binding. We demonstrated that as in the case of HIV-1 TAR, both HIV-2 TAR and 7SK-SL4 sample heterogeneous ensembles in the free state and undergo distinct conformational transitions upon Tat binding. Furthermore, cyclic peptide derivatives have been previously reported to target TAR RNA and block Tat binding, exhibiting potential anti-HIV activities. Herein, we designed and synthesized cyclic peptoids to target HIV TAR RNA using both combinatorial chemistry concepts and structure-based ligands design methods. The binding behaviors of our cyclic peptoids can be monitored using steady state fluorescence spectroscopy, a methodology we have already established. Moreover, RNA microarray technology will be employed to further facilitate the screening procedure, leading to the rapid identification and verification of hit compounds.

**Rural Latino Adolescents’ Perceptions of Family Dynamics**

Latinos face barriers that contribute to poor mental health. Familismo is a unique Latino cultural value that emphasizes the supportive role of the family. The specific aims of this study are to: (1) describe the evidence on how familismo relates to mental health in Latinos and (2) examine rural Latino adolescents’ perceptions of their family environment. This is a secondary data analysis. The sample consists of N= 28 Latino adolescents. An in-depth review of literature was performed to examine current evidence on familismo and mental health. NVivo software was used to categorize adolescent interview transcripts using the Family Environment Scales (FES). The evidence supports the protective role of familismo on mental health in Latinos. The literature identified the potential for familismo to mitigate negative effects of stressors faced by the Latinos. The interview descriptions showed a strong presence of familismo in Latino adolescents’ family environment. They described their families as having a strong sense of cohesion and expressiveness. Our findings are consistent with previous evidence that shows the predominant role of Familismo in Latino culture. However, unique conflicts (i.e. fear of being undocumented) that are specific to Latino immigrants’ are not addressed in the FES scale.
Electrostatic Interactions in Sliding Clamp Dynamics and Loading

Gram-negative bacteria, like Escherichia coli, represent a serious threat because they can become antibiotic resistant. Sliding clamps and clamp loaders are proteins that are essential for cell growth and DNA replication making them a novel target for new antibiotics. Sliding clamps are oligomeric ring-shaped proteins that encircle DNA while binding to DNA polymerase, ensuring the polymerase remains attached to the DNA. The sliding clamp requires a clamp loader, which uses ATP binding and hydrolysis to open and close the clamp around the DNA. This project focuses on the dynamic structures of clamps and how clamp dynamics contribute to biological activity. The goal of this project was to determine whether electrostatic interactions also contribute to biological activity in clamp loading. To do this, we measured the effects of different salt (NaCl) concentrations on the ability of the clamp loader to open and close the clamp. We also mutated charged residues at the interface of the clamp monomer to measure their contribution to clamp stability and loading. Clamp loading activity was measured in fluorescence-based assays under equilibrium conditions and in real time to determine how ionic strength and mutation of charged residues at the clamp interface affect clamp loading reactions.

Effects of Small Molecule Targeting Agents on Novel Osteosarcoma Cell Lines

Osteosarcoma is the primary bone cancer in pediatrics and canines, yet there is no durable cure for advanced disease. Commercially available osteosarcoma cell lines do not mimic the cancer from patients and often will not grow in mice. These studies established the growth characteristics of novel canine (HMPOS and POS) and human (OS521 and OS156) cell lines in vitro and in mouse models. Molecular targeting assays were performed to evaluate the effects of inhibitors of Src tyrosine kinase (Dasatinib), Cathepsin L (KGP94), and mTOR (Rapamycin). These cells were characterized using migration, invasion, clonogenic cell survival, and proliferation functional assays, protein expression, and intravenous and intertibial xenograft studies. All four cell lines grow in vitro. The OS156 and HMPOS are easily cultured and exhibit tumor growth in the mouse models that mimic typical patient cancers. Additionally, Rapamycin demonstrates an accumulation of cells in the G1 phase of the cell cycle, inhibited migration, and slower proliferation. These results agree with studies reported in other models of mTOR inhibition. In conclusion, the studies indicate that all four cell lines would be appropriate for further in vitro and in vivo studies, including expanded small molecular targeting agent assays.
Non-Resonant Electrodynamiv Wireless Power Transmission via Rotating Magnet Receivers

The main objective of this work is to develop and optimize a non-resonant electrodynamic wireless power transmission (EWPT) system. An alternating magnetic field continuously rotates a permanent magnet in a 3D printed, receiver coil housing. This system allows for simultaneous, off axis power transmission. One potential application of EWPT is a more position independent wireless charging method integrated into low power mobile devices such as wearable technology. Previous receiver designs achieved wireless power transmission up to 291 mW at 1 cm (power density of 73.4 mW/cm³) and 7.3 mW at 22 cm. This project presents the current state of the ongoing research, and what was learned.
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<tr>
<th>Faculty Research Mentor</th>
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