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Poster Presentation Abstracts

A Comparison of Ground Reaction Force During a Standing Back Tuck Compared to a Vertical Jump

Shaun Andersen [3], Shannon Curtin [1], Edward Dakay [2], Victor Sarmiento [1], Cordero Roche [3]
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Faculty Research Mentor: John Mercer, Ph.D.
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A back tuck is a countermovement jump with the addition of a backwards-rotating somersault performed with the knees held in close to the chest during the flight phase of the jump. Although the back tuck is a foundational skill in many acrobatic disciplines, there is currently a lack of research examining the biomechanics behind the movement. Therefore, the purpose of this study was to compare the vertical ground reaction force (GRF) produced during a maximal effort vertical jump to those produced during a back tuck. Subjects (n=4 males, age 21.25 ± 0.43 years, height 66.45 ± 1.9, weight 75.92 ± 10.36 kg) with at least five years of experience in performing the back tuck. They performed five vertical jumps (without back tuck) followed by five standing back tucks. All jumps were performed starting and landing on a force platform with data collected at 1000 Hz over 5-7 seconds. We hypothesize that we will observe similar ground reaction forces (GRF) produced during the take-off phase of the movement but increased GRF during the landing phase of the back tuck vs. vertical jump. Furthermore, we expect to observe comparable results in terms of the acceleration, velocity, and positional data as they will be derived from the GRF data. The results of this study will provide insight into the additional forces exerted on the body during the back tuck compared to the vertical jump and ultimately lay the foundation for further research into injury prevention and proper back tuck technique.

Differences in Ground Reaction Forces of a Counter Movement Jump and a Standing Back Tuck: Automated Data Set Processing

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Historically, data in a biomechanics lab are processed using software such as Microsoft Excel or custom programming environments such as MATLAB. With the increase in wearable technology devices that collect large amounts of data, it is important to develop processing algorithms that are efficient and portable between different computing environments. The purpose of this study was to develop an efficient and portable way of processing large data sets to allow more time for analysis in our current and future studies. Specifically, our current study involved developing an algorithm to quantify and analyze ground reaction force data during a standing vertical jump and a standing back tuck using force platforms that were capturing data at 1000 Hz. To generate the data sets, four subjects completed multiple trials of vertical and back-tuck jumps starting and landing on a force platform. These movements can ultimately be analyzed using multiple different instruments that collect at high rates and generate 'big data' sets. We decided to implement our algorithm using the programming language C++ for its high efficiency, portability, and object-oriented style. Our algorithm required to automate the process included: reading in base information, constructing the corresponding number of subject objects, parsing the data, performing calculations and comparisons, graphing the data, and saving the results in a widely-supported format. Using C++, we were able to build a processing system that automated all processing quickly with just a few bits of input from the user such as number of subjects, conditions, and trials.

Poster Presentation Abstracts

Fashion History

Kassandra Andicoechea
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Faculty Research Mentor: Deirdre Clemente, Ph.D.
Department of History

For this research I will be looking into material history, in particular fashion history. This will be a research of the types of fabrics used, their history and how the public received it. Some materials can be seen as luxurious while others are deemed as cheap. Synthetics historically were not welcomed with open arms but today they are in almost all of our clothing. This research takes a closer look at those materials with the question of how did consumers regard these materials when first introduced to the masses? This research is being conducted by looking through magazines, diaries, and reviews.

Variation in Vessel Diameter Across an Environmental Gradient within the Hyper-variable Woody Genus Metrosideros on O`ahu

Morgan Arias, Elizabeth Stacy, and Paul Schute
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Faculty Research Mentor: Elizabeth Stacy, Ph.D. and Paul Schute, Ph.D.
School of Life Sciences

The woody genus Metrosideros (Myrtaceae) is a taxonomically difficult group that inhabits many niches on the Hawaiian Islands. Metrosideros is relatively new to Hawai`i (arrival ~ 4 million years ago) but has since diversified into a large number of morphologically distinct forms. On O`ahu, field observations indicate the presence of 10 taxa in the Ko`olau Range, eight of which occur in consistent sequence from low to high elevation on the many leeward ridges of the volcano. With increasing elevation, trees are exposed to increasing rainfall, wind and cloud cover. The goal of my work is to determine if there is a relationship between vessel diameter and environmental factors in Metrosideros. I posit that vessel diameter will increase with elevation due to water being most available at higher elevations. To test this, I am measuring the vessel diameters of both roots and shoots of eight taxa with 6-8 seedlings from each. The seedlings were derived from open-pollinated seeds and grown under uniform greenhouse conditions for three years. Vessel diameters are being measured with images obtained by microscopy of transverse stem sections. Approximately 200 root vessels and 300 stem vessels of each taxon have been measured through the computer application ImageJ thus far. Contrary to expectations, preliminary results suggest that vessel diameter may be greatest for two taxa occurring in dry areas and along windy, steep slopes and that vessel diameter of roots is greater than that of shoots for all but two taxa.

Poster Presentation Abstracts

Weathering Products in Soils Formed on Ultramafic Bodies

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Faculty Research Mentor: Elisabeth Hausrath, Ph.D.
Department of Geoscience

XRD data acquired by the Curiosity rover on Mars suggest that the Martian regolith possesses up to 50% iron and magnesium rich amorphous components. Identifying and understanding these amorphous materials on Mars can help us gain information on how much water may have been present in its past with implications on the environments of ultramafic terrestrial bodies in the solar system. In order to understand these potential environments on other planets, samples were collected from soils formed on ultramafic parent material in the Klamath Mountains, CA. Soil descriptions will be provided for each sample and samples will be examined using a suite of techniques including: Scanning Electron Microscopy, X-Ray diffraction, and Transmission Electron Microscopy. We are also synthesizing and dissolving Mg- and Fe-containing clay minerals that are potential weathering products in soils formed on ultramafic materials. This work will help to better understand potential water-rock interactions in Fe- and Mg-rich locations on Mars.

Polar Alignment of a Circumbinary Disc around 99 Herculis

Eric Becerril-Blas, Alessia Franchini, and Jeremy Smallwood
Department of Physics and Astronomy

Faculty Research Mentor: Rebecca Martin, Ph.D.
Department of Physics and Astronomy

99 Herculis is an eccentric binary star system with a polar aligned debris disc. We use PHANTOM, a smoothed particle hydrodynamics code, to understand how this system came to be polar aligned. We simulate how an initially misaligned circumbinary gas disc evolves to become almost polar to the binary orbit. Various inclinations and outer disc radii are considered, and we find that the polar alignment of the gas disc occurs on a timescale shorter than the lifetime of the gas disc. The debris disc that is observed represents the remains of the gas disc.

Poster Presentation Abstracts

Indel Rate Estimation in Sequences Between Protein Domains

Dylan Barth and Mira Han
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Faculty Research Mentor: Mira Han, Ph.D.
School of Life Sciences

In this project, we seek to describe indel (insertion and deletion) rates of genetic sequences between conserved domains of multi-domain proteins. These segments historically have been ignored because they are not conserved across species, and thus cannot be aligned accurately. To bypass this complication, we will estimate indel rates of these segments based on length alone with a birth-death Markov chain model similar to those used in microsatellite mutation models. We will test the hypothesis that there is stronger selection on the distance between tandem homologous domains than on the distance between domains of different origin; we expect that sequences between homologous domains will have lower indel rates than those that are unrelated.

The Role of Non-B DNA in Bacillus Subtilis Stationary Phase Mutagenesis

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Stationary phase mutagenesis happens when mutations occur in cells showing no growth. In the bacterium Bacillus subtilis, the process of transcription influences stationary phase mutagenesis. However, the exact mechanisms of how transcription controls mutagenic events in non-growing cells are still unknown. One hypothesis being investigated is that transcription generates the formation of non-B DNA structures that can block active transcription and trigger Transcription Coupled Repair (TCR). TCR is a DNA repair pathway that interacts with paused RNA polymerases. This interaction subsequently directs repair factors to regions of the genome undergoing active transcription. During stationary phase, this mechanism of repair is mutagenic because of the activation of error-prone polymerases. G4 DNA, a type of non-B DNA, can block RNA polymerase and trigger Transcription Coupled Repair in vitro. I will test the hypothesis that G4 structures promote mutations in highly transcribed genes by blocking RNA polymerase and triggering transcription-coupled gratuitous mutagenesis. As a proof of concept, we conducted experiments with gene constructs that contained a non-B DNA structure, known as a Stem-Loop Structure, and measured its effects on transcription pausing. We showed that the presence of stable stem-loop structures were associated with transcription pausing. Further studies will provide insight into the mechanism generating stationary phase mutations. This new insight will yield a better understanding on novel mechanisms that lead to evolution in all organisms.

Poster Presentation Abstracts

GABA Changes in a Mouse Model of Alzheimer's Disease

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Department of Psychology

Alzheimer's disease (AD) is a neurodegenerative disorder marked by progressive learning and memory deficits and overall cognitive decline. There are three core pathological hallmarks seen in AD: accumulation of beta amyloid protein, neurofibrillary tangles, and chronic neuroinflammation. The mechanisms by which these pathologies correlate to loss in neuronal integrity is still being examined. Gamma aminobutyric acid (GABA) is the primary inhibitory neurotransmitter in the brain and is involved in many roles including learning and memory. Alterations in GABA levels have been shown to be reduced in AD patients and mouse models. The aim of this study was to evaluate several protein markers that are involved in GABA signaling and behavior in an AD mouse model at different time points. The findings of this study showed the time point at which learning and memory deficits are observed along with the accumulation of amyloid beta plaques. Additionally, we saw reductions in protein levels of GABA receptor subunits in the hippocampus, a brain region involved in learning and memory.

Use of Laryngeal Ultrasound in the Vocal Pedagogy Laboratory

Daniel Cihigoyenetche
School of Music

Faculty Research Mentor: Kimberly James, Ph.D.
School of Music

In this research, I evaluate if laryngeal ultrasound would be a viable and necessary resource in the vocal pedagogy laboratory. I begin by looking at the other tools in the laboratory that are used to examine the same area. This is to see what information we are currently missing. This included procedures like a stroboscopy and laryngoscopy, which are both views of the top horizonal plane of the vocal mechanism. I then move into how a laryngeal ultrasound has been used in a medical setting to identify vocal issues. I continued by researching how the equipment could be used to evaluate speech and how to enhance the singing voice. The study concludes with the pros and cons of using a laryngeal ultrasound in a vocal pedagogy laboratory and whether or not it would be a useful tool in enhancing good and healthy singing.

Poster Presentation Abstracts

Effects of Cholesterol on Development and Triglyceride Content of Drosophila

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Faculty Research Mentor: Allen Gibbs, Ph.D.
School of Life Sciences

The purpose of this study was to see if cholesterol affects the triglyceride content of the fruitfly, Drosophila melanogaster. We studied populations of flies that have been selected for starvation resistance and have evolved to be extremely obese. In previous years, high sugar-low yeast diets were found to cause slower development and even greater lipid storage in these flies. Dietary yeast contains cholesterol, an essential nutrient that Drosophila can not synthesize. We hypothesized that adding cholesterol to the diet would reduce triglyceride content. We supplemented high sugar diets with 20-160 mg/L of cholesterol. We found that triglyceride levels of flies reared on the highest cholesterol concentrations were similar to those of flies reared on a normal (medium sugar and yeast) diet.

Mfd Protects Cells Against Oxidative Stress

Natalie Contreras, Holly Martin, and Eduardo Robleto
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Faculty Research Mentor: Eduardo Robleto, Ph.D.
School of Life Sciences

All cells experience oxidative stress. Oxidative species, generated during respiratory metabolism, are cytotoxic and genotoxic to cells. Interestingly, mutations, caused by oxidative stress, have been associated with speeding evolution and benefiting organisms. Thus, exposure to oxidants can be both detrimental and beneficial to cells. While the cellular benefits and detriments associated with oxidative stress are well documented, the molecular mechanisms balancing such events are not well understood. This study examined the survival of strains of Bacillus subtilis differing in Mutation frequency decline (mfd) when exposed to different oxidants. Four B. subtilis strains (wildtype, mfd-, mfd complement, and mutY-) were grown to saturation (stationary phase) and then exposed to the oxidants tert-butyl hydroperoxide (t-BHP) or diamide during incubation. After oxidant exposure, we plated cells on Tryptose Blood Agar Base (TBAB) for overnight growth and counted the colonies from cultures that were either treated with an oxidant or untreated to estimate percent survival. Our study found that defects in the mfd or the mutY genes compromised the ability of cells to survive exposure to t-BHP (an oxidant that is cytotoxic and genotoxic). Intriguingly, survival after exposure to diamide, a protein oxidant, was affected by Mfd but not by MutY. We suggest that Mfd, the transcription-coupled repair factor encoded by mfd, plays a novel role in managing oxidative stress in B. subtilis.

Poster Presentation Abstracts

Probing the Metabolism of "Planoflexus" and its Possible Symbioses with Thermophilic Plants

Jonathan K. Covington, Leanna Little Dog, Nancy O. Nou, and Brian P. Hedlund
School of Life Sciences

Faculty Research Mentor: Brian P. Hedlund, P.h.D.
School of Life Sciences

The genus "Planoflexus" is the first cultivated member of a novel class of Chloroflexi, previously known as the TK-10/TK-17 phylogenetic cluster. Our previous research has demonstrated that "Planoflexus" consumes plant stress hormones and produces indole-3-acetic acid (auxin), a major plant growth hormone. This research looks at "Planoflexus" and its potential ecological interactions with grasses potentially identified as Distichlis spicata (saltgrass), which thrive in high-temperature soils at the margins of Great Boiling Spring in Gerlach, NV. We tested the ability of stress hormones to stimulate the growth of pure cultures of "Planoflexus thermophilus" G233 and "Planoflexus flavus" YIM 72310 by adding compounds to a complex medium at 0.05% (wt/vol) concentration. The aromatic compounds syringic acid and p-coumaric acid stimulated growth of both strains; however, azelaic acid, cis-jasmone, and vanillin did not seem to affect growth. Next, we will use quantitative PCR to enumerate "Planoflexus" in hot spring sediments, the rhizosphere, the rhizoplane, and within plant root tissue to determine whether there is a symbiosis. Future experiments will also probe whether "Planoflexus" stimulates plant growth or thermotolerance. These results suggest "Planoflexus" may benefit plants growing near their upper temperature limits and is part of a broader pattern of important interactions between microorganisms and plants and animals.

The Diversity of Bacteria Found in Distichlis Spicata at High Temperatures

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Faculty Research Mentor: Brian P. Hedlund, Ph.D.
School of Life Sciences

Some prokaryotes thrive at high temperatures, with hyperthermophiles having optimal growth temperatures above 80˚C. However, multicellular eukaryotes are sensitive to high temperatures, limiting their distribution in geothermal systems. We have observed the monocot Distichlis spicata (saltgrass) growing around the edges of Great Boiling Spring (GBS) in Gerlach, Nevada, in soils with temperatures ranging from 36 °C to 45 °C. We hypothesize that symbiotic bacteria associated with D. spicata may contribute to growth and/or thermotolerance near the upper temperature limits for plants. To test this, we sampled four plants from the edges of GBS and cultured microorganisms from soil, rhizosphere, rhizoplane, and root tissues at both 40 °C and 60 °C. Temperature loggers were placed where plant root samples were obtained and temperature changes over time were recorded. Approximately 100 strains were isolated from rhizoplane and root tissues and identified by 16S rRNA gene sequencing. In parallel, DNA was isolated from all samples and sent for deep sequencing of the 16S rRNA gene using universal PCR primers and Illumina technology. The bacteria uncovered in this study may represent symbionts that play a role in plant thermotolerance, particularly those that are endophytic or specific to the rhizoplane. Upcoming analyses of microbial production of indole-3-acetic acid (auxin) could provide corroborating evidence. Future experiments with pure cultures of microorganisms and plants will be required to address the hypothesis unequivocally.

Poster Presentation Abstracts

Magnesium Isotope Investigation of Hawaiian Lavas

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Department of Geoscience

The Hawaiian Islands and seamounts are a result of oceanic intraplate volcanism fed by a mantle plume. Basalts erupted here are used to study the internal structure of the Earth, specifically the mantle. Trace element geochemistry is utilized to understand partial melting processes while radiogenic isotopes are used to track different source compositions. The geochemistry of volcanic eruptions changes over time due to variations in melting material and the degree of crystallization. The magma crystallization observed is primarily controlled by magnesium-rich olivine, followed by clinopyroxene, plagioclase, and other accessory phases. Mauna Kea volcano has a well-documented eruptive history characterized from the active shield-stage of volcanism, dominated by tholeiitic basalts, to the post-shield stage, dominated by alkalic basalts. The geochemistry of shield stage basalts is controlled by olivine crystallization. Post-shield basalts experience high degrees of fractional crystallization that include clinopyroxene, ilmenite, and plagioclase. Can this crystallization history be tracked by using isotopes of magnesium? At high MgO (wt%), there is little variation in the isotopic ratio of magnesium. However, at lower MgO (wt%), variation in the isotopic ratio increases, suggesting the presence of fractionation by different crystal phases. Pairing major and trace elements with magnesium isotopes will help us understand why magnesium isotopes vary at low MgO (wt%). Integrating magnesium isotopes and testing their application in a relatively well-understood setting, Hawaii, will allow us to further its development as a new geochemical tool.

The Search for Metastable Phase in Manganese Disulfide (MnS2)

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Materials like minerals, semiconductors, insulators, and metals can demonstrate significant physical and chemical changes under extreme conditions; using a diamond-anvil cell (DAC), it is possible to simulate in a laboratory the high-pressure and high-temperature conditions present in the interior of planets. My current sample of interest is Manganese Disulfide (MnS2), a mineral that forms in the mantle of the earth. This mineral has a pyrite-type crystal structure like that of FeO2 (fool's gold), and exhibits remarkable magnetic and electronic properties under high-pressure and high-temperature conditions. Previous work has shown that at ~11 GPa (over 100,000 atmospheric pressures), the sample undergoes a structural phase transition to an arsenopyrite phase. This structure was confirmed using X-ray Diffraction (XRD). CO2 laser heating was conducted on the sample in order to relax it into its thermodynamic ground state – the arsenopyrite phase. Upon this transition, the material undergoes a dramatic volume collapse of ~22%. Amazingly, upon relieving the pressure, the sample back-transforms to its ambient pyrite phase as tracked and verified by Raman spectroscopy. More recent work has revealed a new phase by compressing the sample to significantly higher pressures of ~52 GPa. Interestingly, this new phase has been tracked on decompression to <5 GPa, at which point it back-transforms into the ambient pyrite phase, bypassing the arsenopyrite phase. We aim to solve the structure of the new phase conducting XRD studies, measure any change in conductivity with transport measurements, and gain insight in to the role of sulfur in high-temperature superconductors.

Poster Presentation Abstracts

Transposon Expression in Neurodegenerative Disease Models

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Retrotransposons have the ability to insert their sequence at another site within the genome. Due to their mutation causing characteristic, retrotransposons are assumed to contribute to several human diseases. In this project, the goal is to identify the retrotransposons that are differentially expressed in neurodegenerative diseases. In previous studies, transposon overexpression has been reported in Drosophila ALS models, and we found negative correlation between mitochondrial genes and retrotransposons expression in human somatic cells. Thus, we hypothesize that retrotransposon expression is increased in neurodegenerative diseases. In addition, we also hypothesize a negative correlation exists between mitochondrial genes and retrotransposon expression. We used RNA-seq data from iPSC derived models of human frontotemporal dementia and PARK7 knock-down Rattus Norvegicus models of Parkinson's disease. Expression of the samples were quantified with the programs TEtranscripts, Salmon, and Stringtie for transposable elements and genes respectively. We used DESeq2 to normalize the samples and identify differentially expressed transcripts. With this information, we will be able to further understand whether transposons are one of the factors that contribute to the progression of neurodegenerative disease.

Evaluating Long-term Change in Soil Seed Banks, Fertile Islands, and Rare Plant Communities in the Eastern Mojave Desert

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While soil seed banks are important ecologically, quantifying and accurately assessing soil seed banks in a simple and reliable way remains elusive. More specifically, the performance potential of two main methods of seed bank characterization (emergence and extraction), and the influence of perennial and interspace microsites (fertile islands) on seed banks, are poorly understood for desert ecosystems. This knowledge gap is especially important given that anthropogenic and ecological disturbances are accelerating within this biome. Master's student, Tiffany Pereira and I seek to assess soil seed bank characterization methods by collecting seed bank samples and from ten sites in Lake Mead National Recreation Area located in rare gypsum soil habitat. Samples will be placed in a greenhouse and monitored over a nine-month period to observe germination and identify emerging seedlings as an indication of seed bank density. We have tracked emerging species over a seven-month period, photographing their progress for identification purposes. We anticipate seeing differences in seed density between microsite collection sites and shrub interspaces. Soil seed banks are crucial for resilience, in the form of genetic storage, in response to poor reproductive years. Therefore, finished results will be compared to a previous seed bank study completed at the site in 2007. This provides a rare opportunity to evaluate long-term change over time of soil seed banks in rare-plant habitat of the Mojave Desert.

Poster Presentation Abstracts

Muscle Activity During a Sprint Start with and without Track Spikes: A Case Study

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Department of Kinesiology and Nutrition Sciences

In track and field, athletes practice sprint starts using track spikes and/or running shoes. However, it is not clear if the use of spikes influence sprint start technique. The purpose of this study was to compare muscle activity during the sprint start using shoes with (S) and without (NS) spikes.
Subjects (n=2; 1 experienced male sprinter, 1 novice female sprinter) completed 30m maximal effort sprints from starting blocks using S and NS. All starts were initiated from “go” with the back leg instrumented to record electromyography (EMG) of rectus femoris (RF), biceps femoris (BF), tibialis anterior (TA), and gastrocnemius (GA) muscles. Subjects performed 5s maximal voluntary isometric contractions (MVIC) for each muscle. All data were collected using a telemetry EMG system (2000 Hz). EMG data were analyzed for the first 3 strides (zero offset removed, full wave rectified). Average EMG was calculated for each muscle. Data were normalized to MVIC and percent difference between conditions was calculated and compared qualitatively.
Qualitatively, EMG was influenced by shoe type for each subject. For example, RF EMG was 13% lower during S vs. NS whereas TA was 35% greater during S vs. NS for both subjects. Interestingly, BF was 9.3% higher using S vs. NS for Subject 1 but 9.3% lower for Subject 2. Likewise, Subject 1 had 25% more GA activity but Subject 2 had 7% less activity during S vs. NS. EMG appears to be influenced by shoe type; however, sprint start experience may also play a role in study outcome.

Identifying Stem Cells for Vertebrate Eye Regeneration

Joel Jimenez Vargas, Cindy Kha, and Kelly Tseng
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Faculty Research Mentor: Kelly Tseng, Ph.D.
School of Life Sciences

Humans do not have the ability to repair eye tissues. However, some animals do have this ability. The South African clawed frog, Xenopus laevis, can regenerate the retina and lens of a mature tadpole or adult eye. Interestingly, current studies in the Tseng lab have shown that when the embryonic eye is removed, a fully functional mature eye is regenerated after 5 days. The regenerate eye structure for one to five days post-surgery has been studied, but the regenerate eye structure at time points before 1 day has not been examined. Studying the first day of embryonic eye regeneration will aid in identification of the stem cells that participate in regeneration. We examined the regenerate structure of X. laevis’ tadpoles within the first 18 hours after surgical removal of the eye tissues to determine whether the origin of the regenerative cells is the retinal pigmented epithelium (RPE) progenitor cells. Histological techniques including paraffin embedding and sectioning of tissues was used to obtain 10 mm sections of the tadpole eye. The sections were stained with hematoxylin and eosin (H&E) to visualize cellular structures of the regenerating eyes at 6, 12, and 18 hours post-surgery. The results of this project will help to assess the regenerating eye structure after surgical removal and determine the origin of those cells. Further research in eye regeneration can lead to future clinical applications and help the 250 million people with visual impairments.

Poster Presentation Abstracts

Implementation of an Efficient Transposon Expression Quantification Algorithm

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Transposable elements are DNA sequences that can copy themselves, creating highly repetitive regions of the genome. Due to the repetition of these sequences, in-depth analysis is usually ignored. TEtranscripts is able to quantify the expression of transposable elements within RNA-seq data. The program itself has been written in the programming language Python using an interval tree. We are looking at translating the program into C++, using a C++ Library called Mappable. Mappable uses Curiously Recurring Template Pattern (CTRP), which gives Mappable the flexibility to work with various data structures. By converting TEtranscripts to C++ and using the Mappable library we aim to increase performance by cutting down runtime and reducing the memory usage. Efficient quantification of transposon transcripts will allow transposon analysis to be a standard part of general RNAseq analysis and advance our knowledge on transposon biology.

Nutrient-dependent Biofilm Formation in OprF Mutants of Pseudomonas Aeruginosa

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Biofilms are communities of microbial cells encased by a secreted extracellular matrix. Because most bacteria naturally reside in biofilms, it is important to understand all aspects of their growth. Using Pseudomonas aeruginosa, a model biofilm organism and an opportunistic human pathogen, we previously identified proteins in the extracellular biofilm matrix. One such protein, OprF, is the major outer membrane porin and is the only non-specific porin in P. aeruginosa. Here we show that OprF mutants formed significantly less biofilm than wildtype when grown in Tryptic Soy Broth (TSB). In contrast, a previously published study showed that OprF mutants formed significantly more biofilm than wildtype when grown in Lysogeny Broth (LB). We hypothesize that this difference in phenotype is due to the nutritional differences between LB and TSB. We will test the effect of specific nutrients on P. aeruginosa biofilm growth using standard static biofilm assays with manipulated media. Overall, this work will contribute to our understanding of the effect metabolism has on biofilm formation.

Poster Presentation Abstracts

Petrographic Study of Lavas from Ulleungdo Island, Republic Of Korea

Hyejeong Lee
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Faculty Research Mentor: Shichun Huang, Ph.D. and Minghua Ren, Ph.D.
Department of Geoscience

This research inspected thin sections of basalts from Ulleungdo Island, ROK (Republic of Korea). Ulleungdo Island was formed about 9,000 years ago by a gargantuan volcanic eruption. Broadly, this island is composed of igneous rocks, mainly basalt and andesite, that are results of the cooling and solidification of magma with deep origin. Twenty-eight volcanic rocks have been collected. Thin sections were made from those rocks. They were polished down to 1-micron sized diamond potassium spray, and aluminum. The rock is porphyritic, with feldspar, biotite, and Fe-oxides phenocrysts, the size of phenocrysts is typically couple of millimeters. The thin sections have been observed under optical microscope. Some pseudomorphic shaped minerals are composed of calcite and other minerals, such as feldspar, apatite, and Fe-oxides. In order to better understand the mineral assemblages, secondary electron microscope and electron microprobe have been used to study the correlation of the minerals and their chemistry. Many pseudomorphic minerals are actually composed of carbonate and albite (An. < 1%) with relict feldspar (An. 56%). Carbonates show corrosion contact with plagioclase, indicating that there are many geological events had occurred before the eruption of the volcano.
Future work will include classification of each minerals of these samples and correlate those results to geological events in Ulleungdo Island.

Cultural Impacts on Perception of Auditory Rhythm and Tempo

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Listeners perceive foreign speech as faster than native speech, even when both are the same speed. This phenomenon is called the 'Gabbling Foreigner Illusion.' This illusion may occur because language-specific experience is necessary to temporally parse speech into intelligible units as it unfolds over time. Similarly, one study reported that people tap faster to music that is culturally unfamiliar than to music that is culturally familiar. Like the gabbling foreigner illusion, lack of cultural expertise with music might interfere with listeners' capacity to find temporal units (the beat), leading them to perceive the tempo of the music as faster. We directly addressed the question of whether listeners are less accurate at perceiving the beat and tempo of culturally unfamiliar music as compared to culturally familiar music by asking them to rate the tempo of music from various cultures (West African, American, Indian, Turkish, and Latin). Musical excerpts were presented in pairs and listeners chose which of the two was faster. We also asked listeners to tap along to the music and examined if their tapping speed corresponds to their perceptual judgments of tempo. We hypothesize that are primarily examining if listeners systematically rate culturally unfamiliar music as faster than familiar music,. This would suggesting that listeners experience a "gabbling foreigner illusion" for music, which we hypothesize. We asked listeners to tap along to the music and examine if their tapping speed corresponds to their perceptual judgments of tempo. In summary, this research is a first step towards investigating how our culture-specific experiences influence our temporal perception of music.

Poster Presentation Abstracts

Use of Vancomycin to Protect Hamsters from Clindamycin-Induced Colitis

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Introduction: Clostridium difficile is a bacterium associated with Clostridium difficile infection (CDI). There are approximately 29,000 deaths from CDI per year. Individuals who take antibiotics such as clindamycin are often predisposed to contracting CDI as it depletes protective gut bacteria. Diarrhea, swollen abdomen, kidney failure, and gastrointestinal bleeding are some of many symptoms associated with CDI. Vancomycin is an antibiotic often used to treat more severe cases of CDI. The infectious form of the disease are spores that are resistant structures formed by the bacterium. Spores can germinate into toxin-producing C. difficile cells when they are triggered by the bile salt taurocholate and amino acid glycine. Hamsters are highly susceptible to C. difficile spores and have been used as an animal model for CDI. In hamster CDI studies, clindamycin can be used to deplete gut bacteria before hamsters are challenged with C. difficile spores. However, clindamycin itself can promote colitis in hamsters. Since vancomycin protects from intestinal infections, we hypothesize that by using suboptimal concentrations, hamsters will be protected from colitis. Methods: Several different groups of hamsters were given different antibiotic treatment regimens. Group A received only clindamycin. Group B was given clindamycin and was also given three days of suboptimal vancomycin the day after. Group C received clindamycin and daily doses of vancomycin for five days. A week following that treatment, Group C received C. difficile spores to test for CDI. Results: All hamsters in Group A developed clindamycin-induced colitis. Group B did not develop colitis, showing that suboptimal amounts of vancomycin was able to protect the hamsters from colitis. Similarly, Group C did not develop colitis, but were still susceptible to CDI spores. Discussions/Conclusions: Suboptimal doses of vancomycin were able to protect hamsters from clindamycin-induced death. Even when reducing the number of vancomycin-treatment days from five to three, hamsters were still able to survive with no signs of distress. This model provides us a possible regimen for inducing CDI in the hamster model without clindamycin being a factor in hamster deaths. In future studies, we hope to further refine this method to use in hamster CDI studies.

Comparative Validity of Two Techniques for Center of Pressure Measurements

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Analysis of gait center of pressure (COP) is a critical component in biomechanics. It aids in the prevention, diagnosis, and rehabilitation of various physical impairments and diseases. The most prevalent methods for measuring COP are force platforms and pressure measuring insoles. While the validity and accuracy of both these techniques has been previously explored, these studies suffered from their limited sample size and lack of diversity in foot size. This study focuses on assessing the validity of both measurement tools using a larger number of participants (N = 65) and six various insole sizes. Participants walked over a force platform while wearing pressure measuring insoles secured within socks. The path length in the anterior-posterior direction, path width in the medial-lateral direction, and COP velocity in both directions were then compared. The results showed that both instruments provided comparable and correlated results in measuring path length (16.2 ± 1.6 cm (force platform) and 16.0 ± 1.4 cm (insoles), r=0.7528). However, the path width results were different: (1.6 ± 0.3 cm (force platform) and 0.8 ± 0.3 cm (insoles), r=0.0793). Similar behavior was observed for COP velocity measurements in both directions. T-test comparisons (α=0.05) between measures and instruments showed all differences (except path length) to be statistically significant. A larger difference in the path width is as expected due to the low number of sensors in the insoles and short measured distance in the medial-lateral direction. Results suggest either instrument should be sufficient in measuring COP, based upon purpose and accuracy required.

Poster Presentation Abstracts

Selective Separation of Cesium Fission Product Using β-diketones

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A typical nuclear reactor uses enriched uranium in the form of UO2 to produce electricity. In the process of producing energy, the uranium also produces fission products. In the context, of spent fuel reprocessing, the fission products are envisaged to be separated from the uranium. Uranium could be reused while the fission products would be placed in a storage waste form. Currently, nuclear reprocessing involves the dissolution of spent fuel in aqueous acidic solution or molten salt. In molten salt reprocessing, β-diketone such as hexafluoroacetylacetone (hfac) could be used to separate uranium from the fission products by forming volatile complexes. Among the fission products, cesium is one of the main elements of spent nuclear fuel. The reactivity of cesium with hfac in the presence of 1,4,7,10,13,16-hexaoxacyclooctadecane (18-Crown-6) has not yet been well studied.
Our research goal is to study the effectiveness of hfac and 18-Crown-6 to separate cesium from uranium. The method involves the dissolution of cesium hydroxide in methanol, followed by the addition of hfac and 18-Crown-6 under reflux conditions at 110 °C for one hour. The product solution was kept at 10 °C for two days resulting in the formation of colorless crystals. Single crystal X-ray diffraction analysis confirmed the formulation of [(18-Crown-6)Cs(hfac)]2[μ-(18-crown-6)]. Volatilization study is currently in progress.

Accuracy of Phage Genome Annotation Methods

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With the rise of antibiotic-resistant bacteria, interest in bacteriophage (viruses that parasitize bacteria) has grown significantly in recent years. Due to decreased sequencing cost, the number of sequenced phage genomes is growing at a geometric rate. Sequencing is followed by annotation which consists of identifying genes and translation initiation sites, then assignment of putative functions to gene products. Most phage genomes are annotated by auto-annotation with programs designed for prokaryotes. Accuracy metrics for these programs with respect to phage genomes are not available. The Escherichia coli phage Lambda was used to estimate accuracy metrics for several genome annotation methods. Discovered in 1951, Lambda is the most studied phage with nearly all gene functions demonstrated experimentally. Glimmer, GeneMark, GeneMark.hmm, GeneMarkS, GeneMarkS2, Heuristic GeneMark, RAST, and BASys were used to auto-annotate the Lambda genome. The program calls were compared to the reference genome in the literature and manually annotated with a commonly used technique of compiling auto-annotations from several programs, followed by elimination of false positives and false negatives. Sensitivity of the programs was in the range of 78.4%-86.3%, compared to 87.8% for manual annotation. Precision was in the range of 93.1%-96.7%, compared to 94.2% for manual annotation. Start calls were predicted with accuracy in the range of 81.0%-90.3%, compared to a rate of 92.2% in the manual annotation. These results show a slight improvement in accuracy of manual annotation over reliance on auto-annotations, particularly in start call predictions. This will allow researchers to make informed decisions when selecting an annotation program.

Poster Presentation Abstracts

Saponite Synthesis and Dissolution with Implications on the Aqueous History of Mars

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Smectites in Yellowknife Bay in the Sheepbed unit on Mars measured by the CheMin X-Ray Diffraction instrument on the Mars Science Laboratory (MSL) rover suggest an early aqueous history with implications for past habitable environments. Surface orbital detections of these iron-bearing minerals have been interpreted to be ferric (Fe3+-bearing), which contrasts with evidence of reducing conditions during the Noachian. It is likely that these clay minerals were altered from ferrous to ferric phases because of long-term oxidation. We will be closely studying synthesized ferrous and ferric phases of saponite and their spectroscopic signatures and properties. XRD analysis of saponite from Griffith Park, California is the closest match to CheMin data from MSL and will be used as a reference for our synthesized saponite. To understand potential past aqueous alteration of these Martian saponites, I am conducting dissolution experiments of the Griffith saponite to yield a dissolution rate constant at activities of water, aH2O, equal to 1.00 (0.01 M NaCl) at 25oC. Ultimately, our results will help us better interpret the past aqueous environment on Mars.

The Impact of Dance Experience and Cultural Background on the Perception of Musical Tempo

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Music is a universal element of the human experience. However, our personal musical experiences are dependent on our culture. Manifesting these auditory experiences through embodied ones, such as dance, changes the way we perceive different musical qualities. Musical speed, or tempo, is an important characteristic in determining how an individual will move to the music. To better understand the ways in which cultural familiarity and dance experience are involved with the perception of tempo, we will compare Latin dancers with non-Latin dancers. We will present sets of two Latin songs, and participants will decide which song sounds faster. One potential result would be that both Latin dancers and non-Latin dancers can accurately tell which song is moving faster, indicating that knowledge of dance and cultural familiarity does not influence our perception of musical speed. An alternative result would be that Latin dancers may interpret a song to be faster or slower than it actually is by focusing on the speed of the music, rather than the actual musical tempo, while non-Latin dancers would not. Effectively, dance training would have changed their perception of the speed of music, hindering their performance on this task. These results would inform us on the influence of culture and dance experience on the perception of tempo. Music is an integral component of our cultures and everyday lives and this work would help us understand how connected our body is to the music we listen to.

Poster Presentation Abstracts

Predicting KRAB-ZFP Binding Motifs in Co-Expressed Transposon Sequences

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Zinc finger proteins (KRAB-ZFP) are transcriptional regulators essential to the biological functions of living organisms that, through cooperation with their cofactors, repress transposon expression. By regulating transposable elements (TEs), KRAB-ZFPs are able to preserve the differentiation of embryonic cells as well as transcriptional homeostasis within organisms, making the DNA motifs of KRAB-ZFPs significant. Several KRAB-ZFP motifs have already been predicted through ChIP-seq. However, majority of the motifs are still unknown. Our hypothesis is that the set of transposons that are co-expressed with the same KRAB-ZFPs share a common DNA motif. To test this hypothesis, we analyzed the correlated expression patterns between KRAB-ZFPs and TEs. We searched for enriched sequence motifs in the co-expressed TE sequences. The results demonstrate similarities between the motifs identified from co-expression and the predicted motifs retrieved from previous ChIP-seq studies, suggesting that the hypothesis was supported. By identifying enriched motifs, we are able to delineate KZFP-TE pairs that are potential binding partners in specific tissues, and this information allow us to design efficient ChIP-seq experiments, targeting specific KZFP proteins in specific tissue context.

Further Characterization of K. Marxianus B0399 Inhibitory Activity Against Candida Albicans

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Kluyveromyces marxianus B0399 (TURVAL ® B0399 ®) has been proven to inhibit Candida albicans, the opportunistic yeast responsible for vaginal yeast infections and thrush. Our previous research has optimized this inhibition in regard to pH, temperature, and cell concentration, yet the specific method of this inhibition is unknown. Yeasts are known to inhibit other organisms through competition for nutrients, acidification of the medium, and the secretion of a killer molecule or “toxin”. We will test for C. albicans inhibition via nutrient competition by modifying the pour-plate assay to include varying levels of maltose (carbon source) and peptone (nitrogen source). If the inhibition is increased at high or low nutrient competition, this will provide insight into further research goals. Additionally, the assay will be run under microaerobic and anaerobic conditions to test the effect of oxygen concentration on the yeast inhibition. Since yeast are facultative anaerobes, it is possible that the inhibition of C. albicans by K. marxianus will be more prevalent in either aerobic or anaerobic conditions. After the conditions for growth and inhibitory activity of K. marxianus B0399 have been fully optimized, we hope to gain more knowledge as to the nature of this inhibition by investigating whether K. marxianus B0399 produces a killer toxin under these conditions.

Poster Presentation Abstracts

Amino Acid Synthesis at Extreme Conditions

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Though its known that amino acids are the precursors of life, it is still a mystery how life came to be. Many speculate that it occurred under extreme conditions like in the oceans where there was less ultraviolet radiation. Another theory is that meteors caring the building blocks of life seeded the earth. Many researchers have tried to solve the origin of amino acids by using UV radiation in their setup. The formation of these amino acids still remains a mystery. The purpose of this proposed experiment is to determine whether or not amino acids can be synthesized using x-ray radiation and pressure. We used a diamond-anvil cell (DAC) to create pressure for the chemicals and use a combination of ammonia formate, paraformaldehyde, and ammonia carbamate. These compounds thermally decompose into elements that are needed to synthesize an amino acid. Therefore, the goal of this study is to demonstrate that x-rays drive similar decomposition reaction. The experiment will be conducted in situin DAC. This experiment will give possible insight on the conditions necessary for amino acids to form on meteors in space.

Alterations in GABA Related Signaling in an Immunocompromised Mouse Model

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Faculty Research Mentor: Jefferson Kinney, Ph.D.
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Alzheimer's Disease (AD) is a progressive disorder that is characterized by a learning and memory impairment as well as a loss in higher cognitive functions. AD is traditionally characterized by the presence of amyloid ß (Aß) plaques and tau tangles, and more recently, a local inflammatory response. In the AD brain, the presence of these insoluble Aß deposits and neurofibrillary tangles further exacerbates the inflammatory response. The damage that accumulates from this chronic inflammation then magnifies the pathogenic processes that underlie AD. A number of mechanisms have been proposed in an effort to explain this characteristic neuroinflammation, including alterations in GABA transmitter levels. GABA is the primary inhibitory neurotransmitter in the brain and has been implicated in learning and memory. Using a mutant mouse model, we were able to induce an immune challenge and expect to see an increase in GABA B transmitter levels. We also expect to see an increase in GAT3 levels, the GABA transporter, both of which are consistent with the literature.

Poster Presentation Abstracts

Calculating the Modal Mineralogy of Aubrite Meteorites Using X-ray Computed Tomography

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The aubrites are a group of differentiated meteorites that formed in extremely reducing conditions, with oxygen fugacities ($fO2$) ranging from ~2 to ~6 log units below the Iron-Wüstite buffer. At these extreme conditions, elements that are lithophile (silica-loving) on Earth can behave as chalcophiles (sulfur-loving) or siderophiles (metal-loving), and FeO-poor silicates and exotic sulfides can form. Elemental partitioning among minerals at these conditions are still not well understood, thus studying aubrites could help better constrain elemental behavior. Only 30 aubrites exist; however, they display various textures, which can be difficult to identify in small samples. Identifying composite clasts can help in understanding the igneous history of the aubrite parent bodies. In order to distinguish different minerals and textures in larger samples, we use X-ray computed tomography (XCT), which is a useful, non-destructive analysis that can produce a 3D representation of a meteorite's textures, structures, and modal mineralogy. This study investigates the Norton County aubrite using XCT. Norton County is a fragmental impact breccia aubrite, and was an observed fall with a main mass of 1.1 tons. This large amount of material offers an opportunity to investigate a great volume of reduced, aubritic sample and study a more diverse variety of clasts. Here we report XCT results of two samples of Norton County (NC 15417) in order to constrain the 3D modal mineralogy of silicates, sulfides, and metals, and to identify unique clasts within the matrix.

The History and Pedagogical Practices of Civil War Reenactment Bands

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Research Faculty Mentor: Johnathan Lee, Ph.D.
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This paper focuses on the origins of Civil War Reenactment Bands in modern day America: both former union and antebellum south. It spans literature from the Civil War era (1861-1865). However, the origins of reenactment bands will focus heavily on the Civil War literature revised by Frederick Fennell and the Eastman Wind Ensemble 1958 album "Civil War, Its Music and Its Sounds." While there are a number of different opinions on how to run a reenactment band, invariably, the name Frederick Fennell is unintentionally uniform to the outset of every historical conversation in this research, making his work essentially the modern genesis of this activity. Throughout this research, I have interviewed a number of passionate band leaders and historians who outlined the practices that guide their own ensembles and historical records. I will discuss the historical origins of the ensembles and will query into the establishment of their pedagogical practices as it relates to pitch, instrumentation, and literature. General historians, separate from music historians, often misconstrue the questions on reenactment bands as a drummer or bugler in a larger reenactment, but few are aware of the groups that solely preserve the lives of musicians in this period. I anticipate that my conclusion will lead to a more detailed understanding of this niche but reverent participatory historical activity that fully outlines its inception and relevancy to music history at large.

Poster Presentation Abstracts

Genetic Effects on Transposon Expression

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Transposable elements are sequences of DNA that can copy and insert itself into the genome. Although they take up a large proportion of the genome, they were generally thought to be unexpressed. However, recent studies have found transposon transcripts in RNA-seq data. Studies have shown association between transposable elements and various diseases. In our eQTL (expression Quantitative Trait Locus) study, we hypothesize that certain genetic variants will have a significant association with higher levels of transposon expression. To test our hypothesis, we used software TETranscript to quantify transposon transcripts in RNA-seq samples of normal tissue, and we compared the expression level of transposons between samples with variants and samples without variants. We identified several candidate variants that show significant correlation with specific transposon expression. Studying these set of variants will help us understand how transposons are regulated in human tissue.

Predicting Material Properties using Radial Distribution and Machine Learning

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The pursuit of new technologies for cleaner energy conversion requires a new generation of advanced metallic alloys, ceramics, and semiconductors that can operate safely and effectively under extreme conditions. The properties of these materials are primarily influenced by their defects which include: surfaces, grain boundaries, and interfaces. These defects depend on synthesis conditions. Understanding material structures and how they influence physical properties is the key to developing materials to meet the needs of advanced energy applications. Recent investigations suggest that materials defects can occur in multiple phases characterized by drastic changes in material properties. Predicting the phase properties of material defects is challenging. First principles methods in computational materials sciences prove useful in probing the phase behavior of material defects, though they are incredibly expensive with regard to computational complexity. Recently, a substantial effort has been made to predict defect phase behavior using machine learning. In principle, machine learning models supplied with a substantial amount of well-conditioned data regarding material properties would be able to predict the phase behavior of defects in advanced materials with ease compared to first principles methods. The challenge is developing a descriptor for the data using the atomic structure of materials that will reproduce well-known material properties. A leading candidate for a descriptor is the radial distribution of atoms in materials.

Poster Presentation Abstracts

Intergenerational Disparities in Extremist Tendencies in Germany

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The most recent election in Germany yielded a surprising rise in far-right extremist support, with the most popular party (AfD) garnering 13% of the vote--the third most out of all the parties elected to the Bundestag. Preliminary surveys revealed an interesting phenomenon, where all of the landers (provinces) with the highest concentration of far-right supporters are situated in former East Germany, whereas relatively none of the support for this party came from West Germany. These surveys also showed a potential generational trend, where most of the far-right supporters in former East Germany were older voters, whereas support for the far-left party (De Linke) came from young voters in the same areas. This begs the question: does this trend exist across all of Post-Soviet Europe? Perhaps generations which grew up in Communist systems will tend to the extreme right in an effort to remove themselves from their Communist upbringings, while generations too young to have experienced Communism will tend to the extreme left in order to voice their displeasure for the government while simultaneously emphasizing the job market. In order to begin the study into this grand phenomenon, this project will look at the most recent German election in much finer detail. Using data from the European Social Survey, I will compare thousands of German citizens' party affiliations and political ideologies with their respective ages and residencies in order to find quantitative backing for this theory.

Conservation Genetics of Sigmodon Arizonae along the Lower Colorado River Including the Recolonization of an Extirpated Population in Nevada

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In this study, researchers addressed the possible genetic distinction of the new recolonized Sigmodon arizonae population in comparison to the disjunct populations outside of Southern Nevada. DNA sequencing and landscape phylogenetics were used to analyze the recolonization of the Sigmodon arizonae and the distribution of their population. The researchers can conclude from their current findings that the recolonized population of Sigmodon arizonae are genetically distinct from the other disjunct populations due to a lack of gene flow among them. Further research may indicate the the role of the Colorado river in promoting and maintaining species diversity in the desert sw; as well as how human activity is influencing the biological community

Podium Presentation Abstracts: Session I

Acute Gloss Progression Alters the Ratio of Translocator Protein Expressed on Different Glial Cells

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Faculty Research Mentor: Dustin Hines, Ph.D.
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The brain is the most metabolic organ in the body. The disruptions of the metabolic demand are central to mitochondria dysfunction and neuroinflammation associated with the pathogenesis of neurodegenerative diseases, stroke, and traumatic brain injury (TBI) among other central nervous system (CNS) insults. Any CNS insults activate astrocyte and microglia reactive process. Once the astrocytes and microglia undergo reactive astrogliosis and reactive gliosis, respectfully, they are known to migrate and hypertrophy their branches toward the site of the CNS insult to prevent disease progression. The 18kDa translocator protein (TSPO) correlates with reactive gliotic events in chronic activation, and it is known to be a biomarker for Alzheimer's disease. Through studies of images using confocal imaging, we investigated the upregulation of TSPO in reactive gliotic responses between early progression of CNS insults to severe stages of CNS insults. The use of colocalization and staining show elevated levels of TSPO in a wildtype control mouse model. Therefore, the formation of reactive astrocytes and reactive microglia and initial levels of TSPO could one day serve as a test for early detection for neurodegenerative diseases.

Building a Better Convention

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Conventions everywhere seem to all be the same, and are big business here in Las Vegas. From my own experience and what I hear, they follow this pattern: you park your car, walk to the check-in and registration, get your badge, you walk around, it's a little overwhelming at first, you see some booths, get the lay of the land, you come back, you might meet some people, learn some new things, maybe even do a little bit of business, and after a few days, you go home. Putting on conventions has become a conventional way of doing business. There seems to be a convention to conventions that we have all gotten used to.
This is definitely not the case with retail. With Amazon's acquisition of Whole Foods, there has been and will foreseeably be major disruption in the retail space and landscape. Current retail technology has heat maps for visitation, touch, and eye movement. Red signifies high visitation, items that are highly picked up and touched, areas of a sign or shelf space or stand that are highly gazed at. Much like Pandora, Google, Amazon and Netflix, where you can search for items that interest you by keywords, where you can get suggestions and recommendations based on the songs or movies or website topics you've visited before, my idea is for every convention, we provide a search engine and recommendation engine, so every convention becomes much more dynamic, relevant and current to the attendees and vendors, buyers and sellers.

Podium Presentation Abstracts: Session I

Undocumented Students in Higher Education: Resilience, Resources and Perceptions

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Department of Sociology

Nevada is one of the few states that is home to the largest share of undocumented immigrants in the country. This population made up 7.6 percent of the state's population in 2012 (Pew Research Center 2014). As a state, Nevada does not provide concrete legislation to address access to higher education for undocumented students, and as a result contains limited resources for such students. However, despite the lack of resources for these students, previous research has documented the resilience and persistence of these students. Stemming from the NUEVO Project, an initiative created to establish pathways to higher education for undocumented students, this study aims to explore and understand they ways faculty and staff perceive resources for undocumented students. Moving beyond the perceptions of students, this study will explore the ways faculty understand access to and barriers to resources for undocumented students. Finally, as this study is in its preliminary stages, it aspires to provide recommendations to aid undocumented students thrive in higher education.

The Role of PK11195 in Pruning Neural Circuitry

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Our brain regulates synaptic processes through excitation and inhibition. Increased excitation in the prefrontal cortex is associated with defects in the brain's neurocircuitry that's often found in neurodevelopmental disorders like autism. Higher densities of synapses and low inhibition can be found in the prefrontal cortex of autistic mice models. Drugs that increase inhibition in the brain tend to be sedative and addictive. A novel type of inhibitory receptor initially called the peripheral benzodiazepine does not cause sedative effect and could possible act to remodel circuitry during critical periods in development. The 18 kilo Dalton translocator protein (TSPO) and its antagonist PK11195 can both modulate the receptor and release of potential endozepines. We hypothesize PK11195 will balance the brain's neurocircuitry through inhibition by decreasing synapses. We used the golgi-cox staining method to look at pyramidal cells in both hemispheres of the prefrontal cortex in wild type mice and compared it with control and PK 5mg/kg injected mice. Our results show a lower density of synapses in the control group, lower density of mushroom spines and higher density of filopodia in PK injected mice. Overall these findings suggest a novel source of therapy that could be used for developmental disorders.

Podium Presentation Abstracts: Session I

Characteristics and Health Behaviors (CHeB) Study

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The present study aims to evaluate the correlation between adults' physical and mental health, with their facial appearance, and sex-typed beliefs and attitudes to investigate whether a person's health is best predicted by their own or others' judgments of these attributes. The study consists of two phases based on data gathered from 112 males and 112 females. During phase 1, we collected facial images and videos of the targets speaking, and ratings of their self-reported health, personally endorsed sex-typed beliefs and attitudes, and facial appearance. Preliminary analyses of these results showed that: 1) females' self-rated facial masculinity and males' personal endorsement of feminine attributes negatively predicted their physical health; and 2) males' self-rated facial masculinity positive predicted their mental health, whereas their self-rated facial femininity and personal endorsement of feminine attributes negatively predicted their mental health. We are currently working on phase 2 in which other adults will view the targets' photo and video while they rate their perceptions of the targets' health, sex-typed beliefs and attitudes and facial appearance. Findings will show whether self and others' ratings are related, which ratings are most predictive of a target's physical and mental health. Results have implications for understanding how person perception is related to health outcomes.

Investigation of Mexican-American Attitudes towards Pet Dogs

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Faculty Research Mentor: Shelly Volsche, Ph.D. and Peter Gray, Ph.D.
Department of Anthropology

From wild wolves to 'fur babies,' dogs have transcended their relationships with humans after years of domestication and evolved pet keeping dynamics. This research study explores human and dog relationships through a cultural perspective. My research specifically targets the Mexican-American population in Las Vegas in order to understand diverse levels of attachment towards dogs. The purpose of this study is to evaluate whether there are more positive attitudes towards pet dogs within Mexican communities, or if negative attitudes are still present like they have been in past Mexican traditions. While previous studies have presented increasing dog attachment bonds within Americans, I will instead focus on Mexican minorities in the Las Vegas community. Bilingual self-report surveys were distributed in order to examine gender, age, ethnicity, number of pets and dogs' living styles. In order to target the desired population, public venues such as dog parks, pet stores, ESL classes, churches and other cultural events within the Mexican community, were examined. Primary survey coding and projected results will most likely indicate that Mexican Americans also exhibit a strong level of attachment just as Americans have displayed in previous studies. Using SPSS Statistical Software, positive attitudes and high levels of attachment will determine if Mexican-Americans also display strong bonds with their pet dogs similar to American pet owners. Further research may focus on changing attitudes towards foster and assisted animal therapy dog programs within Mexican or Mexican American communities.

Keywords: dog attachment, pet dogs, Mexican-Americans, Americans

Podium Presentation Abstracts: Session I

Predictors of Adolescents' Stem Major Interests

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The United States currently faces a shortage of qualified workers in fields related to science, technology, engineering, and math (STEM). Further, despite gender similarities in math and science achievement, girls and women in the United States tend to be underrepresented in STEM fields. Accordingly, it is important to identify factors that encourage adolescents (particularly adolescent girls) to select a STEM college major. Drawing on Eccles' expectancy-value theory of achievement-related choices, the current study examines whether adolescents' self-expectancies and values will predict their potential college major choices in STEM above and beyond key social-contextual variables (e.g., SES and gender bias). I will also consider other factors such as gender, ethnicity, SES, self-reported grades, and gender bias in the study. Data were collected from 629 adolescents (Mage = 16.09). Participants attended a high school in northern California and predominantly identified as Asian American (86% of the sample). It is expected that adolescents' self-expectancies and values in math and science will be significant predictors of their STEM major aspirations. It is also expected that the associations will be moderated by participant gender. Hypotheses will be tested through hierarchical multiple regression.

Altered Fine Motor Coordination as an Early Predictor for Murine Models of Rett Syndrome

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Rett syndrome is a rare genetic neural developmental disorder occurring about 1 in 8,500 females that leads to a lifetime of dysfunctional symptoms. One major class of symptoms of the disorder are disruptions motor movement. The exact mechanisms in the brain of these motor movement disruptions remain to be elucidated. One piece of evidence is that during development, precise wiring is needed to allow for all the possible motor patterns that an animals is capable of. Further, genes such as MECP2 have been shown to be critical in creating the precise wiring that is needed for these complex and coordinated movements. We predicated that mutant animals with alterations in the MECP2 gene would have altered motor movements and in particular highly complex movements related to coordination. The MECP2 mutant mouse has become the well-studied model of Rett syndrome. Again, little research has been both done in the MECP2 mouse model and in humans looking at the developmental dysfunction in motor movements. In this study eight total wild type and MECP2 mice are placed in four behavioral tests to assay motor movement. The motor tests ranged from tests such as the open field test measuring broad motor movements to a fine motor test where animals were required to pull a string to receive a reward. The results in this study can be utilized to predicated early onsets of neurodevelopmental disorders.

Podium Presentation Abstracts: Session I

The Pathology of Las Vegas

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The characteristics of cities that are close in comparison with Las Vegas were examined; similarly, states that have similar characteristics as Nevada were examined. Characteristics studied mostly included the population and the total area of the city. Each state and each city studied was viewed as an independent living organism that was either showing or not showing different symptoms of having a pathology: an abnormal or a different way of behaving that deviates from the norm to the "less acceptable" end of the spectrum. Some of the most prominent general symptoms include but are not limited to: addiction gambling, suicide crime, mental health, and child abuse and neglect. The statistical findings of the cities are compared to the statistical findings of Las Vegas, while the statistical findings of the states are compared to the statistical findings of Nevada. After assessing the pathological symptoms in each city and state and having all of the statistical findings, one can study the difference and similarities among the cities and states. Together, these findings suggest that there is something about the environment of the city of Las Vegas that makes the symptoms of a pathology more prominent in this city compared to other cities in the country.

When is Cultural Appropriation in Art Acceptable?: An Analysis of the Assumptions and Premise of Cultural Appropriation in Art, and its Conditions

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It is vitally important to determine when cultural appropriation is acceptable within artistic practice. This phrase has increased in social, cultural, and political awareness. It is not commonly understood, and less easily defined. Within the arts, it is more nebulous, as appropriation and inspiration are at the heart of much of Western art particularly. The goal of this paper is to explore this ethical quandary, and set forth some clear, concise conditions for the use of cultural appropriation. For the purposes of this paper, cultural appropriation will be defined simply as the act of borrowing, or taking, elements of another culture outside of one's own. When taken as a neutral term, we must then carefully analyze how it should be applied, and how it should affect the judgement of the success and ethics of artwork. This paper explores why the act of cultural appropriation is not immediately seen as unacceptable in the arts. Rather than setting an encompassing list of necessary and sufficient conditions to define acceptable, or unacceptability, this paper dispels common conditions put forth as sufficient in proving unacceptability, and then puts forth new sufficient conditions.

Podium Presentation Abstracts: Session I

The Mind of Cixous: Cases of Différance

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At the forefront of écriture féminine, Hélène Cixous, an Algerian-born Jewish writer from France redefines literature of the latter half of the 20th Century. Her work is largely unknown by the masses and is essentially non-existent in American and British literary studies due to the nature of her writings. The purpose of my research this summer has been to investigate the complexity of all of her writings from the late sixties and the entire seventies. The goal was to establish a framework in which Cixous could be more digestible for the average reader, those who are unaware of the vast philosophical, poststructuralist, deconstructionist, and literary canon that is woven so seamlessly within the narratives of Cixous. The intertextuality found in her works would then be expanded upon, in order to form what I call "The Mind of Cixous." Thanks to the functionality of écriture féminine and its unconscious writing of what the author truly feels and the addition of centuries of literary work by various authors across the world, Cixous leaves a puzzle for the reader to piece together, the whole picture being the entirety of Cixous' Being. I set about this research project not only with the goal of showcasing Cixous to the world, but to understand the complexity of the human psyche through a multidisciplinary approach.

Podium Presentation Abstracts: Session II

Identifying New Materials for Practical Hydrogen Storage

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Nanoporous metal-organic frameworks (MOFs) are solid-state materials that have metal ion centers linked together by organic molecules. Due to the nanopores, MOFs have a high surface area, and their synthesis can ensure specific channel and pore measurements. MOFs with unsaturated, transition metal centers show great promise for efficient and practical hydrogen storage applications due to molecular hydrogen forming Kubas complexes with transition metals. These Kubas complexes are interactions generally stronger than van der Waals and weaker than chemisorption which is an indication of practical, reversible hydrogen storage at temperatures and pressures closer to ambient conditions. However, many synthesized MOFs either lack reported values all together or values reported are inaccurate due to variations in hydrogen characterization techniques. By performing hydrogen characterization on six MOFs with promising structures and unreported or inaccurate hydrogen storage values, MOFs that were previously not of interest for hydrogen storage can be identified.

Impact of CVN Hammer Size

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Faculty Research Mentor: Ryan J. Sherman, Ph.D.
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Previous studies have found that the Charpy V-notch (CVN) impact energy test is the most practical and useful small scale test used to correlate with fracture toughness, an important mechanical property in many applications. The CVN test is a pendulum-type impact test typically used as an acceptance test to predict notch-brittle behavior, which indicates potential for catastrophic failure in structures. Due to this, impact testing is typically required by construction codes for bridges and other fracture critical structures.

Impact test results have been established to depend significantly on variables such as specimen size, notch geometry, anvil and striker geometry, impact velocity, energy losses from the machine, and bearing friction. The purpose of this research, consisting of two main phases, is to determine the significance of hammer capacity on the results of the test. The first phase consists of two steps: using one hammer to initially establish a CVN curve, which will be used to determine the transitional temperature, the temperature when the failure of a specimen is between brittle and ductile behavior, and predicting the number of samples needed from each lab of the second phase to have statistically significant results.

The second phase consists of using multiple hammer capacities with a round-robin approach by multiple laboratory comparisons, each site testing the previously determined statistically significant number of specimens

Podium Presentation Abstracts: Session II

Premature Fatigue Failure of Cantilever Sign Structures

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With the (seldom) passing of every windy day in Las Vegas and the frequent passing of thousands of cars, buses, and trucks, the cantilever sign structures which we commonly refer to as pedestrian crosswalks or traffic lights, weaken and are more likely to achieve premature fatigue failure. Although you might not think so, the wind gusts that collide with these structures, whether they be natural or vehicle-induced, apply a load to the structure. This repeated application of a load results in fatigue. The goal of this research project is to discover the loading conditions resulting in the vibrations that cause the fatigue, so they may be prevented in the future. Since this is a long-term research project, we are still in the planning phase. We are collaborating with the Nevada Department of Transportation who has allowed us to install sensors on a new pedestrian crosswalk that they will be situating on Boulder Highway later this year. As of current, we will be installing strain gauges to measure tensile and compressive strain, an anemometer to collect windspeed, and thermocouples to determine the temperature. We will be utilizing a data logger to collect and analyze all of this data. With the data collected, we hope to discover the exact loading conditions which are resulting in the premature fatigue failure of these cantilevered sign structures in order to prevent this issue and better protect our community.

Metal Complexes Derived from FcCOONa and DTBbpy Ligands

Natalie Johns, Samundeeswari Mariappan Balasekaran, Sendil Kumar, Pradip Bhowmik, Frederic Poineau
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M2(FccpCOO)4(DTBbpy)2(NO3)2 (M= La...Lu except Pm and Ce) (FccpCOO= ferrocene carboxylic acid, DTBbpy= 4,4'-di-tert-butyl-bipyridyl) metal complexes have been optimally synthesized and obtained in the solid state. These compounds were characterized by single crystal X-ray diffraction. A trend was found in the bond distances between the crystal series' dinuclear centers, which has been studied using DFT analysis. In similar chemistry using Zn, Pb, and Cd, both mono and dinuclear structures were reported. Complexes with trivalent transition metals (gallium and indium) have not been reported. A study of the atomic radius' effects on the overall crystal structure in this chemistry is underway. Indium and gallium complexes are currently being synthesized and will be analyzed once a single crystal is obtained. Knowledge of how the atomic radius affects the overall structure of the complexes will provide a path to find an optimal metal and ligand combination for medical application in the future. As of yet, this work builds knowledge in fundamental inorganic chemistry.

Podium Presentation Abstracts: Session II

Density Functional Theory based Analysis and Investigation of Solid Zirconium

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A density functional theory (DFT) based analysis and investigation was performed for solid zirconium (Zr) in hexagonal close packed (hcp), body centered cubic (bcc), and omega crystal structures by changing unit-cell volumes. The total free energy of each structure from ab initio DFT calculations unmistakably indicate that Zr is found to be in hexagonal close packed (hcp) crystal structure under ambient conditions, and two possible structural transformations may occur under pressure. Lattice constants and volume compression data were calculated and examined for each structure. The volume compression data is found to be in good agreement with the available experimental data. By calculating the enthalpy of the structures, the transition pressure is found to occur near 20 GPa from hcp to omega phase, which is in good agreement with previous experimental observations [1, 2]. DFT analysis provides atomistic insight in pressure-induced structural transformations of solid Zr, a subject currently under controversy. Zr plays a primary role in cladding material for nuclear fuel, being able to recover Zr from the wasted cladding material is crucial. Having a fundamental understanding of each product in the Zr recovery process is necessary in order to optimize and improve the purification process.

[1] Akahama et al., J. Phys. Soc. Jpn. 60, 3211 (1991).
[2] Stavrou et al., arXiv:1804.02616 [cond-mat.mtrl-sci] (2018).

Resolution of Low Coverage Region of Paenibacillus larvae Bacteriophage Ulf Genome

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American Foulbrood Disease (AFB), an infection caused by Paenibacillus larvae (P. larvae) has contributed to the global decline of honeybee populations. The Amy-Tsourkas laboratory seeks to characterize a group of viruses (phage) that target and kill P. larvae. Characterizing these phage could potentially lead to the identification of novel therapeutics for infected hives. To that end, we are building a bioinformatics library containing the genetic information (DNA sequences) of as many of these phage as we can isolate. Curating this genome library allows our laboratory to compare and contrast these phage and assign putative functions to their genes. Previously, we sent the genomic DNA of three unique phage to be sequenced with the goal of adding their genome information to our library. We were unable to obtain the complete genome sequence of one of these phage, designated “Ulf”. A genomic region of 3000 base pairs displayed poor sequence coverage. To resolve this issue so that we can be confident in our sequence data, we cultivated Ulf to obtain sufficient virus to harvest for genomic DNA. Complications arose and techniques for growing Ulf were amended to accommodate a low preliminary concentration. Obtained genomic DNA was used in a polymerase chain reaction (PCR) to amplify the desired genomic region that had previously displayed poor sequence coverage. The 3000 bp DNA fragment was purified by gel electrophoresis and then submitted for sequencing.

Podium Presentation Abstracts: Session II

Analysis of Pressure Distribution and Non-Hydrostaticity within the Diamond Anvil Cell

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Diamond anvil cells are routinely used in high pressure and high temperature experiments. Studying materials under these extreme conditions provides indispensable contributions to materials science and engineering, and broadens our understanding of the physical world around us. However, major obstacles in these studies include the accurate characterization and uniform application of pressure. The purpose of this experiment is to test for, and reduce, significant pressure variances within the diamond anvil cell. Ideally, pressure is applied on a sample equally from all directions, in what is known as 'hydrostatic' pressure. Non-hydrostatic pressure during an experiment negatively affects the pertinence of results by causing inhomogeneous stress on a sample. Therefore, it is important to improve hydrostaticity in the diamond-anvil cell by whatever means. In our study, we implement 2 sample chamber designs for use in a diamond anvil cell: two holes and a single hole (standard) using a laser driller. The pressures in each sample chamber are measured using the widely used ruby fluorescence method. With silicon oil as a pressure transmitting medium (PTM), ruby fluorescence measurements will be taken in steps at pressures < 30 GPa. Results of the high pressure study are presented and its implications are discussed in this presentation. Structural changes and pressure data will be factored in with data from other future experimental gasket designs and coupled with different pressure transmitting media.

Sun-Driven Environmental Remediation

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As environmental issues continue to increase in both number and severity as a consequence of human activities, natural resources such as clean water are becoming increasingly scarce while demand only continues to grow. Consequently, some of the most effective measures taken appear to be bioremediation tactics and their synthetic counterparts. A critical area of interest are photocatalytic materials that use the introduction of ultra violet (UV) and visible light to induce an oxidation reaction, often resulting in the production of a hydroxyl group radical, that can proceed to decompose pollutants or deactivate certain microbes in a given medium. These materials have the potential to operate using only light emitted from the sun, thus being free from the need for human-supplied energy. Organic pollutants are of interest since humanity generally does not have an efficient means of removing them from water, and they pose a grave threat to marine and human life due to their extreme toxicity and bioaccumulation/bio-magnification abilities. The most effective designs for a photocatalyst have proven to be a z-scheme configuration where the reduction and oxidation abilities of the materials are maximized. Photocatalysts remain elusive in their ideal morphology, chemistry, and photocatalytic abilities for specific applications. Therefore, the purpose of this study is to design and test an effective z-scheme photocatalyst for water purification purposes, targeting the Methyl-Blue and pollutant.

Podium Presentation Abstracts: Session II

Examination of Neuronal Circuitry in the Enteric Nervous System

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The enteric nervous system regulates motility and secretion in the gastrointestinal tract that is critical for obtaining nutrients for an organism through both excitatory and inhibitory mechanisms working in concert. Similarly, the central nervous system uses glutamate (excitatory) and γ-amino butyric acid (GABA - inhibitory) signaling for most neuronal communication. The role that GABA and inhibition play in the gut have gone largely unstudied, and still little is known about the gut-brain connection. The enteric nervous system signals the gastrointestinal tract to regulate synchronous and pulsatile movement termed peristalsis. These movements are thought to be regulated by GABA and have been shown to increase force and frequency of colonic contractions. Our objective is to increase our understanding of the structure and GABAergic control of the enteric nervous system. We will examine the enteric nervous system through Golgi-Cox and immunohistochemical staining of whole mounted intestinal tissue. By increasing our understanding of the functions of the enteric nervous system at a neurochemical level, we are better equipped to develop new treatments, as well as, open possibilities for prevention and diagnosis of digestive disorders.

Additively Manufacturing a New Model Bridge Competition

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Additive manufacturing is another term for 3-D printing, which is where a machine is able to construct three-dimensional models from computer aided drafting (CAD) programs such as SolidWorks and SketchUp. Utilizing additive manufacturing as a construction tool for a model bridge competition will allow for more intricate designs. This competition has been created to provide a new way for students to design model bridges in addition to developing important skills with CAD programs. Several bridge designs have been created for the purpose of creating realistic representations of each year's challenges, and one design was selected to be 3-D printed for testing. Once the printed model bridge is structurally tested, the next phase is to create parameters that will determine bridge failure during loading. There are several unique challenges for each year's competition, along with different constraints per division. There are four divisions, elementary, middle, and high school, along with a college level division. As the divisions ascend, the students have different maximum dimensions for their bridges, volume restrictions, and the college division has several modifications to make designing more challenging. Each year's competition has a small story which simulates an actual engineering experience where the students have deliverables as well as constraints. Currently there are seven different versions of the competition which will be used once per year, and versions may be added or removed over the next few weeks. This project aims to encourage students to learn how to use CAD programs and how to efficiently design structures.

Podium Presentation Abstracts: Session II

The Future of Lake Mead

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Located within the Southwestern United States, the Colorado River System provides fresh water for approximately 40 million people. Lake Mead, which is a vital part of the Colorado River System, provides fresh water for the states of Arizona, California, and Nevada, as well as some water apportioned to Mexico. This amounts to approximately 20 million people, or half of the total population served by the Colorado River System, that is reliant upon Lake Mead alone. Since 2000, however, Lake Mead has been suffering from a historic drought now approaching 19 years in duration. Not only has Lake Mead's water elevation dropped drastically since 2000, but the lake's water storage has fallen over 50 percent since 2000. Lake Mead is currently at high risk of falling below it's first critical level of 1,075 feet in elevation. Once this happens mandatory water rationing will go into effect in Arizona, California, and Nevada. This research will take an extensive look at the water supply and demand of Lake Mead to determine what may happen to the lake in the coming years. We will take into account variables such as evaporation, temperature, and climate change to see how and if they are related. Through the use of correlation and covariance functions, we will attempt to determine any synergy between variables over a period of time. The desired result is an accurate climate model for Lake Mead to reliably predict its future water storage.

Indel Rate Variation in Protein Loops

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Protein loops are parts of the protein structure that do not correspond to the regular structures such as alpha helices or beta sheets. Studying protein loops and their conformations is key to understanding many biological processes, because these regions not only connect secondary structures, but they also participate in the function of the protein, such as binding ligands or interacting with other proteins. The comparison of loop structures most often involves the comparison of different amino acid chains or nucleotide substitutions in a given region, but the insertions and deletions (indels) are often ignored. in this project, we aim to understand whether the indel rates are higher in structured vs unstructured parts of proteins, and whether there are differences in the indel rates of different loop classes. We modified a program called PHAST (Phylogenetic Analysis with Space/Time Models) to estimate different rates of insertion and deletion events in homologous sequences. By combining the information on the protein structure and sequences from PDB and ENSEMBL, we identified the regions of the sequence that correspond to loops. We plan to estimate the site-specific indel rates across these loops to understand the variation in indel rates between different classes of loops.

Podium Presentation Abstracts: Session II

Synthesis of Diallyl Ethers with BPANHTf

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The traditional synthetic methods toward the diallyl ether compounds have shortcomings such as the use of toxic metals, harsh reaction conditions, and low product yields. My current research project is the dimerization of allylic alcohols to synthesize biologically significant diallyl ethers using an environmentally friendly organocatalyst (BPANHTf). The significance of this research project is to synthesize the diallyl ether compounds in metal free catalytic conditions with different substituents in room temperature and discover its importance in biologically active compounds. I synthesize all the starting materials and use them for dimerization to generate the target diallyl ether products. The reactions are setup in optimized reaction conditions and further isolated using silica gel column chromatography. The characterization and purity of the target compounds are confirmed using 1H and 13C 400 MHz Nuclear Magnetic Resonance (NMR).

Metallography and Phase Analysis of RERTR Fuel Foils

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The Reduced Enrichment for Research and Test Reactors program (RERTR) has been developing low-enrichment metallic fuel systems that are comprised of a uranium-molybdenum fuel alloy with a zirconium diffusion barrier encased in Al-6061 cladding. These fuel foils are produced for use in research and test reactors and they originate from the Idaho National Laboratory. During its production, these metallic uranium fuel plates are in risk to undergo eutectoid decomposition of metastable g-U(Mo) alloy into a-U and g'-U2Mo. This decomposition takes place due to hipping or friction bonding performed on the foils. As a result of the decomposition, there are concerns related to the limitations imposed on the fuel's performance due to the eutectoid phase transitions limiting its service life. The present research aims to obtain quantitative phase information of the eutectoid decomposition phase in order to validate the fuel's viability. In pursuance of such results, grinding, fine-polishing and metallographic microscopy were the tools employed to achieve the necessary evidence from the fuel-foils microstructure. Our results show consistent results in the phase quantification. The eutectoid phase formation ranged between 6% and 28% of the total analyzed microstructure with carbide inclusions ranging from 1% to 8% of the total area. The results demonstrate the efficiency and reproducibility of the method of phase quantification through optical imaging and quantitative image analysis.

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