Office of
UNDERGRADUATE RESEARCH
THE UNIVERSITY OF UTAH

2018 Summer Symposium

THURSDAY, AUGUST 2, 2018
9:00AM - 12:00PM
CROCKER SCIENCE CENTER
UNIVERSITY OF UTAH

2018 SUMMER SYMPOSIUM

Thursday, August 2, 2018
9:00 AM – 12:00 PM
Crocker Science Center
University of Utah

The Office of Undergraduate Research is grateful for the generous support of the Office of the Vice President for Research.

We are also thankful for the development of the Summer Research Program Partnership, which is a new collaboration among the Chemistry Research Experience for Undergraduates (REU), the Huntsman Cancer Institute's PathMaker Cancer Research Program, the Native American Summer Research Internship (NARI), the Physics & Astronomy REU and Summer Undergraduate Research Program, and the Summer Program for Undergraduate Research (SPUR). Together, these programs are serving more than 90 undergraduate researchers in Summer 2018.

Finally, we would like to express our utmost pride and congratulations to the students, graduate students, and faculty mentors without whose efforts and dedication this event would not be possible.

PROGRAM SCHEDULE

NOTE: All student presenters MUST check-in

Snacks available at 10:15 AM in Room 205/206

8:30 – 9:00 AM	**CHECK-IN & POSTER SET-UP**
9:00 – 10:30 AM	**POSTER SESSION I (ODD POSTERS)**
10:30 AM – 12:00 PM	**POSTER SESSION II (EVEN POSTERS)**
12:00 – 12:15 PM	**POSTER TAKE-DOWN**

SCHEDULE OF PRESENTATIONS

POSTER SESSION I
9:00 – 10:30 AM

Poster 1
Presenter: Sara Alektiar (University of Michigan)
Mentor: Matthew Sigman (Chemistry)
Electrocatalytic Bis(bipyidine)ruthenium Hydroxylation of Tertiary and Benzylic C-H Bonds

The Sigman and Du Bois labs recently reported a methodology that employs a bis(bipyridine)Ru catalyst operating in acidic water to achieve oxidation of tertiary and benzylic C-H bonds in the presence of basic amines. The published method requires a stoichiometric amount of periodic acid to generate and turnover the active catalyst species. Efforts toward the development of an electrocatalytic method for generating the active catalyst in solution are disclosed. Performing the reaction electrocatalytically eliminates the need for periodic acid. Furthermore, the absence of periodic acid opens the possibility for broadening the functional group tolerance as well as reducing the amount of waste generated.

Poster 3
Presenter: Azeem Mohammed (University of Utah)
Mentor: Randy Jensen (Neurosurgery)
Knockout of hypoxia induced factor 1α using CRISPR

Hypoxia is the lack of oxygen in cells and tissues, and has been found to correlate with more aggressive tumor growth in benign and malignant brain tumors. Hypoxia-Inducible Factors (HIFs), especially HIF-1 α, are overexpressed in hypoxia, and implicated in promoting tumor growth and metastasis. We are currently using CRISPR to knock out HIF-1 in various brain cancer cell lines. CRISPR is a gene editing complex made up of two components; Cas9 and gRNA (guide RNA). The gRNA guides CAS9 to bind DNA at a specific site, then cuts it. This is repaired by the error-prone non-homologous end joining mechanism, causing frameshifts and a inactive protein. Methods: I have been extracting DNA from a large number of glioma cells using a simple deproteinization procedure. This method involves "salting out" the cellular proteins by precipitation with saturated NaCl, followed by centrifugation and alcohol precipitation of the DNA, which is quantitated with a Nanodrop. Extracting DNA from cell lines is important to our overall hypoxia research- essentially, it is how we verify if the cell lines are changing over time. With increasing cell passage number, genetic changes accumulate. This is tested by extracting the DNA and sending for genotyping to "barcode" the cell lines at the end of the experiments so they can be compared with the original barcode. These first steps are crucial to the overall research because it establishes a baseline for not only our lab but for other labs that request our primary cell lines. In the end our research is an byproduct of multiple efforts and even the smallest protocols or research efforts aide in the process of finding a solution for benign and malignant brain tumors.

Poster 5
Presenter: Thea Benally (University of New Mexico)
Mentor: Katsu Funai (Physical Therapy and Athletic Training)
The Effects of Exercise Training on Skeletal Muscle Energy Efficiency

Obesity is a major risk factor for cardiovascular and metabolic diseases, and more than one-third of Americans are considered obese. Obesity occurs when daily energy intake exceeds total daily energy expenditure. Therefore, the major ways to combat obesity are through altering diet (energy intake) and physical activity (energy expenditure). The purpose of the study is to determine if exercise training has an effect on skeletal muscle energy efficiency in mice. Male C57BL/6J mice were subjected to treadmill training 5 days a week over a course of 5 weeks. During the first week of training, mice ran at 12 m/min with a 5% grade level for 30 minutes, followed by a grade level increase to 10% for the remaining four weeks. Age and gender-matched sedentary mice were used as a control group. After training, whole-body energy expenditure and respiratory exchange ratio were measured. Skeletal muscle accounts for approximately 20% of resting and 90% activity-induced increase in whole-body energy expenditure, we hypothesized that exercise training increases the energy efficiency of skeletal muscle contraction. To assess this, we measured oxygen consumption of isolated mouse skeletal with or without electrically-stimulated contraction. In a separate set of experiments, we also measured the ratio of ATP produced per O2 consumed in muscle fibers using high-resolution respirometry and fluorometry. We hypothesize that exercise training will decrease the energy expenditure of skeletal muscle measured with an electrically-stimulated condition and with high-resolution respirometry.

Poster 7

Presenter: Jonah Barber (University of Utah)
Mentor: Dmytro Pesin (Physics & Astronomy)
Electrical pump-and-probe experiments in a 2D viscous electronic liquid

In clean metallic systems like graphene, there is evidence that electrons flow like a viscous fluid. This raises the question of what properties of the usual fluids translate to the electronic case, and what new features can one expect in this new situation. In this work, we investigate theoretically the possibility of viscous pumping using a time changing gate potential, and the Coulomb drag effect. Both phenomena - the drag effect, and gating - are consequences of the charged nature of the electronic liquid. We show that a typical double layer dual-gated heterostructure, typically used in drag experiments, can simulate the propulsion of micro-organisms in conventional liquids in the limit of strong coupling between the layers. In general, the two layers are described by coupled Navier-Stokes equations. We present analytical solutions and numerical simulations of these equations in interesting cases.

Poster 9

Presenter: Karissa Wang (University of Utah)
Mentor: Martin Tristani-Firouzi (Pediatrics)
Correction of mutation in atrial fibrillation susceptibility gene NFATc1 using CRISPR-Cas9 systems

NFATc1 is a gene that has been linked to Atrial Fibrillation (AF). The Tristani Lab has identified a mutation in NFATc1 which has been found in only patients with early-onset AF. This project employs the use of CRISPR-Cas9 gene-editing systems to try to correct the mutation in NFATc1 and examine whether this grants normal function to stem cells differentiated into cardiomyocytes.

Poster 11

Presenter: Mina Castro (University of Utah)
Mentor: Timothy Smith (Psychology)
The Effect of Online Communication on the Heart

This study is investigating how online social interactions, along with consideration of their valence, can impact cardiovascular reactivity. Moreover, cardiovascular health is a major public health concern. The purpose and goal of our research is to determine a specific proxy for cardiovascular disease. Our research is simultaneously testing two theories: Polyvagal Theory and the Neurovisceral Integration Model to determine how social interactions affect high-frequency heart rate variability (hf-HRV). Hf-HRV is linked to better cardiovascular health.

In this factorial design study, we are assigning participants to one of three qualities: positive, neutral, and negative. This is accomplished through a simulated online interaction setting. Participant physiological data is collected via electrodes intermittently throughout the study as they undergo various tasks. Participants are randomly assigned to either regulate their emotions or to express them freely. In data gathering, the theory comparison is utilized to determine whether social interactions promote good hf-HRV. Evidence is suggesting that participants who are actively practicing emotional regulation are linked to having higher hf- HRV. Therefore, this evidence may also suggest that hf-HRV is linked to better cardiovascular health implications in this population. Our social environments can be partially responsible for cardiovascular health outcomes.

Poster 13

Presenter: Kristina Herman (St. Norbert College)
Mentor: Valeria Molinero (Chemistry)
Effect of Size and Shape of Structure-Directing Agents in Zeolite Nucleation

Zeolites are a structurally diverse set of aluminosilicate crystals with small, well-defined pore sizes that allow them to function in size-selective catalysis, liquid and gas separation, and gas storage. Because these applications are often reliant on size- or geometric-specific crystalline structures, it is necessary to understand how properties of the structure-directing agents (SDAs) impact the production of different zeolites. Experimentally, zeolites are produced through the interactions of two types of particles: aluminum oxide or silica tetrahedral-binding particles (T) and an organic cation that acts as the SDA. It is interesting to note that the same zeolite can be produced with a variety of SDAs. It is thought that frustrated attraction between the SDA and the tetrahedral-binding particles, much like the interactions that lead to the formation of a micelle, lead to the formation of complex 2- and 3-dimensional networks of the zeolites. In the present study, we performed molecular simulations of a binary mixture that embodies the tetrahedral binding properties of silica into a single particle T modeled with the monatomic water (mW) potential. Recent work in the Molinero group nucleated new zeolites in simulations by using spherically symmetric SDA particles and by changing the concentration of T particles to

SDA or the strength of the interactions between the molecules, ε. In this study, the SDA was modeled as both a dimeric and trimeric rod with different bond lengths, rather than a monomeric sphere. Parameters from three previously modeled zeolites (Z1, Z3, SGT) were used to determine the effects that the dimer and trimer have on the formation of these zeolites. The changes in the size and structure of the SDA led to observable architectural changes in the modeled zeolites and opened the window to the ability to fine-tune the geometry of the 3-dimensional structure using properties of the SDA.

Poster 15

Presenter: Kevin Beaver (Lebanon Valley College)
Mentor: Shelley Minteer (Chemistry)
Designing redox shuttles for salt-tolerant microbial fuel cells

Saline wastewater constitutes a sizable fraction of the total amount of wastewater produced worldwide, and industrial developments are expected to increase this proportion in the future. While bacteria are typically used for the biological treatment of wastewater, high salt concentrations can inhibit this process due to cell dehydration, causing bacteria death. However, some bacterial species have developed the capability to tolerate high salinity, opening for their application in saline wastewater treatment. *Rhodobacter capsulatus* (*R. capsulatus*) is a photosynthetic purple-bacterium that may be able to withstand high salinity, due to an evolved mechanism where compatible solutes or ions are accumulated intracellularly to balance osmotic pressure in saline solutions. By establishing electron transfer between this bacterium and electrodes, a microbial fuel cell can be built, allowing the harnessing of electricity while degrading contaminants. As a result, a self-powered treatment for saline wastewater could be envisioned, where the only necessary energy input is light. More remarkably, the generated current could be used to monitor the decontamination process. *R. capsulatus* has not been reported to establish an effective transfer of electrons directly to the electrode of a microbial fuel cell, probably due to its unique membrane structure. However, mediated electron transfer can be performed, where a redox intermediate is used to shuttle electrons from the bacteria to the electrode surface. A wide variety of benzoquinone substitutes can act as a mediator for this process, competing with the quinone center in the *R. capsulatus* electron transfer chain. Herein, we aimed to determine the required properties in a mediator for enhanced electron transfer between *R. capsulatus* and a carbon electrode. Accordingly, several soluble benzoquinone analogs were utilized experimentally to study mediated electron transfer performance. Finally, the data collected were used to create a computational model that predicts the effectiveness of a mediator based on its properties.

Poster 17

Presenter: Camila Nieto (University of Utah)
Mentor: Nicola Camp (Internal Medicine)
Tumor Genomics as a Route to Clarifying Inherited Genetics in Multiple Myeloma

Multiple myeloma (MM) is a malignancy of the plasma cells and one of the more common hematological malignancies (incidence 6.3/100,000 per year). Incidence continues to increase (0.8%/year), and although treatments have improved, the majority of patients do not survive 5 years. A greater understanding of susceptibility to and survival from MM is needed, particularly identifying the role of germline and somatic profiles with risk, treatment response, and survival. For over 20 years, large population-based studies in Sweden and Utah (>15,000 MMs) have consistently highlighted the familial nature of myeloma. Familial clustering has also been replicated in epidemiologic studies. Genetic epidemiology studies of germline genetic risk variants are beginning to bear fruit for both risk and survival of MM, but much remains to be discovered. Clinically, many cytogenetic subtypes have been defined, and some have been shown to associate with treatment response, however, on the whole precision therapeutics is lacking. One major obstacle to advances in germline gene discovery and genomic medicine is the inability to adequately model tumor diversity. We recently described a novel approach to define quantitative tumor dimensions. We pioneered the idea in breast tumors, illustrating that the dimensions were powerful to map novel germline susceptibility loci, and predict survival and response to treatment. In this project, we are building a resource of biospecimens for MM patients, including both tumor and germline DNA and RNA, so we can utilize the same tumor dimension approach for myeloma. Subsequent DNA and RNA sequencing experiments and our novel analytics will be performed on our local tumor and germline biospecimens. We will also incorporate the publicly available coMMpass study data to define myeloma tumor dimensions, replicate, and associate these with germline variation and clinical endpoints.

Poster 19

Presenter: Licia Lopez (University of Kentucky)
Mentor: Isaac Hall (Internal Medicine)
Right-Sided Kidney Transplants Are Associated with Early Graft Failure in the Setting of Delayed Graft Function

There has been some debate about using right versus left kidneys (RKs vs. LKs) for transplantation. For this study using Organ Procurement and Transplantation Network data, we compared rates of delayed graft function (DGF, temporary dialysis support in the first week post-transplant) and death-censored graft failure (dcGF, return to permanent dialysis or

re-transplantation) in RKs and LKs from the same deceased donors. We used paired analyses of kidneys from the same donor transplanted between 1999-2011 to control for donor factors. We fit conditional logistic regression models for DGF and Cox proportional hazards models for dcGF and controlled for multiple recipient factors. Out of 66,643 recipient pairs, 27% of RKs experienced DGF versus 25% of LKs (P<0.001). The adjusted odds ratio for DGF in RKs compared with LKs was 1.17 (95% CI: 1.14-1.21). The adjusted hazard ratio for dcGF within the first 6 months for RKs compared with LKs was 1.15 (1.04-1.26) but decreased to 0.84 (0.73-0.96) beyond 6 months. These data reveal that RKs are slightly more likely than LKs to develop DGF and dcGF within the first 6 months, though beyond 6 months, RKs may have a slight survival advantage. Because these differences are small and the risk of death on the kidney transplant wait-list is high, we conclude that kidney side should not be a major consideration during the kidney transplantation process. More research is needed, however, to determine potential reasons for these small differences in outcomes between right and left kidney transplants.

Poster 21

Presenter: Morgan Farley (University of Arizona)
Mentor: Angela Fagerlin (Population Health Sciences)
Predictors of Participants Who Bring a Care Partner to a Diabetes Education Program

Diabetes is the seventh leading cause of death within the United States and the leading cause of kidney failure, lower-limb amputations, and adult-onset blindness. These, and other complications, can be avoided or delayed with education about treatment and diabetes self-management. Presence of a social support system can influence diabetes outcomes. Studies show that increased social support is linked to higher patient adherence, positive self-care behaviors, and improved glycemic control. This project analyzes patients who are enrolled in the Diabetes One-Day Education and Care Program facilitated by the Utah Diabetes and Endocrinology Center. Patients are encouraged to bring a care partner with them to the interdisciplinary program that includes group and individual education. Of the 83 enrollees, 28 (33.7%) brought a care partner; of those, 19 (67.9%) brought a spouse/domestic partner. Patient demographic factors and psychosocial measures will be analyzed to test for associations with the presence of a care partner. We will use chi-square tests to test our hypotheses: (1) patients with one or more disadvantages (e.g. underrepresented minority, physical/cognitive impairment, lower education) will be less likely to bring a care partner to the program and (2) individual factors, such as high perception of social support, will increase the likelihood of a disadvantaged patient bringing a care partner. Findings from this study will identify barriers that influence a patient's perceived social support, which may affect their overall health outcomes. Future programs can be developed to provide social support to patients who otherwise do not have access to it.

Poster 23

Presenter: Tyrell Natewa (University of Utah)
Mentor: Bhagirath Chaurasia (Nutrition and Integrative Physiology)
Regulation of FGF13 by ceramides and its role in development of obesity

Over-nutrition, inflammatory cytokines and other stress stimuli promote the accumulation of sphingolipids. Studies suggest that sphingolipid, ceramides play essential roles in the development of metabolic dysfunction that accompanies obesity, particularly in the adipocyte. Systemic and adipose tissue-specific inhibition/deletion of serine palmitoyltransferase (Sptlc), the first enzyme essential for sphingolipid biosynthesis, in mice markedly altered adipose morphology and metabolism. To identify the molecular mechanisms linking ceramides to the regulation of thermogenic activities, we performed microarray in adipose tissue isolated from mice fed high fat diet (HFD) and treated with myriocin, a pharmacological inhibitor of Spt. We identified fibroblast growth factor (Fgf)13 as the only transcript that was modulated by both pharmacological and genetic inhibition of Spt in vivo and ex vivo. FGF13, a non-secretory protein of the FGF family is expressed in the adipocytes and its expression is modulated by obesity in mice and reversed by ceramide synthesis inhibition. Furthermore, cold exposure selectively decreases Fgf13 expression in the white adipose tissue, supporting the supposition herein that it plays a role in modulating metabolic homeostasis. Interestingly, inhibition of Fgf13 using adenoviruses bearing shRNA against Fgf13 in primary adipocytes leads to increases markers of browning/beiging, improves basal, maximal, and uncoupled respiration. Collectively, these data suggest that increase in browning/beiging ensuing following ceramide inhibition is putatively mediated by Fgf13.

Poster 25

Presenter: Meg Rosales (University of Utah)
Mentor: Man Hung (Orthopaedics)
Prediction of oral health outcomes in the era of precision medicine

Background: Across the globe, dental caries, also known as cavities, are a common oral health issue. Without proper treatment, they may result in loss of teeth and diminished quality of life. However, dental caries are also quite preventable. This study utilized multiple machine learning methods to create an automated tool that can predict and

diagnose root caries and tested the accuracy of the various methods. Methods: Demographic, physical examination, and oral health data were taken from the 2015-2016 National Health and Nutrition Examination Survey (NHANES). Due to an imbalance in the number of cases of presence vs. absence of root caries, sampling with replacement was used to create a balanced dataset. The data were divided into randomized training and test sets with 80% as training and 20% as test data. Tests of significance determined the top 15 most relevant input variables. An automated tool for identifying cases of root caries was created by applying supervised machine learning algorithms in WEKA 3.8.2 and Python 3.7.0, to the data. Performance metrics, including accuracy, sensitivity, specificity, and AUC (area under the receiver operating curve) were calculated. Results: Of the classifiers, Support Vector Machines (SVM) performed best with a root caries detection accuracy of 97.1%, precision of 95.1%, sensitivity of 99.6%, and specificity of 94.3% and an AUC of 0.997. Age was the feature most strongly related to root caries. Conclusions: To date, this appears to be the first study using machine learning to construct a predictive model for root caries. This work will aid in the detection, prevention, and treatment of root caries and assist in the development of computer-assisted tools for personalized predictions.

Poster 27

Presenter: Erin Feeley (University of Utah)
Mentor: Erin Castro (Educational Leadership & Policy)
Year One Program Evaluation for the University of Utah Prison Education Project

This study consists of a year one program evaluation for the University of Utah Prison Education Project (UPEP). UPEP is a college-in-prison program that was developed through years of dialogue and relationship building in the local community and was launched in Spring 2017 out of a Praxis Lab supported by the University of Utah Honors College. Following a rigorous admissions process during Summer 2017, the Project initiated programming in two correctional facilities at the Utah State Prison in Draper in Fall 2017. During the 2017-2018 academic year, UPEP facilitated two college-level non-credit-bearing courses per semester in each facility. During this period, UPEP supported additional extracurricular events and opportunities on Campus and in the Prison. The purpose of this study is to conduct a process evaluation of the programming and engagement offered during the first year of operation. The secondary purpose of this study is to identify and quantify some of the preliminary impacts UPEP has had on incarcerated students, non-incarcerated volunteers, and the greater campus community. This evaluation will consist of several surveys designed for distinct populations of program participants that utilize Likert scale, yes and no, and short response questions. The surveys have been developed through a conscious benchmarking effort across the field of higher education in prison as well as through several informal focus group discussions conducted on Campus and in the Prison. While the results of the survey are still forthcoming, the data is expected to have significance for the Project's decision-making and development during the 2018-2019 year and beyond. Additionally, the evaluation is expected to help the Project better articulate its value to the University of Utah, the Utah State Prison, the state of Utah, and the broader community. Ultimately, these data are critical for supporting the Project's quality, longevity, and growth, especially as it seeks funding to make the transition to for-credit programming.

Poster 29

Presenter: William Steiner (University of Utah)
Mentor: Micah Drummond (Pathology)
The Effects of Metformin on Recovery of Muscle Mass and Mitochondrial Function in Older Hindlimb Unloaded Mice

Intro: Aging results in impaired recovery of muscle mass and function after periods of disuse. Inadequate restoration of muscle loss can lead to weakness, decreased physical function, and mitochondrial (mito) dysfunction. Evidence suggests that the widely prescribed FDA approved insulin sensitizer metformin, may enhance recovery of muscle after disuse-induced atrophy. Purpose: To compare muscle mass and mito function between mice provided with metformin (MET) vs placebo (PLAC) after 7 days of rec from hindlimb unloading (HU). Methods: A cohort of young (3 mo, n=6) and old (24 mo, n=8) mice were subjected to 14 days of HU via tail suspension, followed by 7 day return to normal ambulation. Muscle weights were measured (absolute and relative to body weight) to determine aged-related impairments in rec. A follow-up study was performed on old only mice, where one group was provided with MET (n=5) (vs PLAC, n=5) in their drinking water for the entire 21 days (14d HU+7d rec). Muscle mass and mito function (red and white gastrocnemius separately) using the Oxygraph-2K (Oroboros Instruments, Austria) were measured. Molecular targets of MET (AMPKα & Acetyl-CoA carboxylase) were analyzed with western blotting. Results: Rec of gastroc muscle mass was impaired in both MET and PLAC aged mice as compared to young. Direct comparison between MET and PLAC groups demonstrated a trend towards improved rec of the gastroc muscle mass with MET treatment (absolute: P=0.0999, relative: P=0.1189). Mito respiration for all complexes (per mg dry muscle) were different between red and white gastroc however no differences were found in mito function nor cellular signaling with MET vs PLAC. Interestingly, absolute gastroc weight and white gastroc complex 1&2 coupled respiration was positively correlated (R2=0.0325, P=0.0419). Conclusion: MET may assist in rec of gastroc muscle mass in aged mice, however metformin may not influence mito function nor AMPKα and ACC signaling during 7d of rec from HU. Rec of muscle mass is associated with greater complex 1&2 respiration in the white gastroc.

Poster 31

Presenter: Dakota Kennedy (Lewis & Clark College)
Mentor: Shelley Minteer (Chemistry)
Heterogeneous C-H Bond Activation via Palladium-Catalyzed Electrochemical Oxidation

The activation of C-H bonds through palladium-catalyzed reactions is a popular functionalization technique in organic syntheses, as it allows the production of high-value products which are useful in the preparation of synthetic materials and pharmaceuticals. Palladium-salts have shown the capability to effectively catalyze these reactions; however, these syntheses require strong chemical oxidants which pose setbacks including high costs, hazardous synthesis conditions, inefficient atom economy, and the formation of unwanted side products. Recent research has shown the possibility to obtain homogeneously catalyzed C-H bond activation by using an electrical current as an "oxidizing species," bypassing the necessity for harsh chemical oxidants, and allowing for a significant improvement to the traditional method. In order to further improve electrochemical Pd-catalyzed C-H bond activation, particular interest has been focused on the use of heterogeneous catalysis, rather than the more expensive and complicated setup of homogeneous catalysis. Furthermore, the possibility to perform C-H bond activation using a heterogeneous catalytic surface may allow for the functionalization of more complex compounds. Accordingly, here are reported the results obtained for an electrocatalytic method to achieve C-H bond activation using a simple reaction chamber in heterogeneous conditions with a solid palladium electrode. The electrochemical characterization of the catalytic process was observed by means of cyclic voltammetry and amperometric current vs. time tests. The effects of several experimental parameters including reactant concentration, experiment duration, and electrode potential were investigated for their effect on the reaction.

Poster 33

Presenter: Kason Glover (University of Utah)
Mentor: Chelsea Harmon (Chemistry)
Synthesis of GE81112 and Analogs to Investigate Unique Binding Site on Bacterial Ribosome

Drug-resistant strains of bacteria have created a sense of urgency for identifying and developing antibiotics with unique targets within the bacteria. Natural product GE81112 is a promising candidate for such development, due to its unique binding in the protein-protein interface of the 30S subunit, thereby blocking ribosomal assembly. Moreover, three unique congeners have been isolated and shown different antibiotic potencies. Based on these correlated differences in structure and potency, two specific functionalities within the molecule have been identified as significant in its binding activity. This project's primary goal is not only to access GE81112 synthetically, but also to develop a broad range of analogs in order to better understand the mechanism of action against bacterial infections. This understanding is a fundamental step toward a peptidomimetic compound with improved potency and bacterial penetrance, characteristics that are essential for an effective and novel antibiotic.

Poster 35

Presenter: Gnoulelein Tako (University of Utah)
Mentor: Douglas Mackay (Oncological Sciences)
Toward a Better Understanding of NUP153 Function

The nucleus is protected by a membrane which segregates the DNA from the rest of the cell. This membrane is studded with nuclear pore complexes (NPCs) which allow or deny access for anything coming to or from the nucleus. The NPC is made up of around 30 different proteins that are called nucleoporins or NUPs, which historically have been studied for their roles in nucleocytoplasmic transport. Here in the Ullman lab, we are focused on understanding additional, non-canonical functions of NUPs. NUP153 (153 for its molecular weight) is one such protein; we have found that NUP153 is involved in timely progression through abscission, nuclear envelope breakdown and reformation, postmitotic NPC assembly, and DNA damage repair. In order to move along with the project, more resources that will allow for controlled expression of NUP153 and other engineered mutants were needed. My project was mainly focused on designing and cloning specific NUP153 domain constructs into a plasmid that allows for inducible controlled expression. These plasmids will be used in future experiments to further understand the diverse roles of NUP153 and promise to reveal additional functions of this versatile protein.

Poster 37

Presenter: Brent Riley (University of New Mexico)
Mentor: Adriana Vieira de Abreu (Biology)
Prevention of Hypoglycemia Unawareness in Type 1 Diabetes with Tricyclic Antidepressants

Hypoglycemia is the most prevalent clinical complication in the daily management of diabetes and is the major obstacle to normalizing blood sugar. Hypoglycemia unawareness (HU) involves the loss/diminution of warning symptoms to low blood glucose that would normally prompt a corrective behavioral response (e.g., eating food). The development of HU

puts people with insulin-treated diabetes at high risk for severe hypoglycemia. With a goal of identifying existing drugs that could restore hypoglycemia awareness, we tested the hypothesis that treatment with serotonergic-norepinephrine reuptake inhibitors would prevent the development of HU in a rodent model. To test this hypothesis, 10-week old male Sprague-Dawley rat were randomized to treatment with placebo or tricyclic antidepressants imipramine (5mg/kg) or amitriptyline (10 mg/kg) during the induction of hypoglycemia unawareness protocol with 2-deoxglycose preconditioning. Following treatment, hypoglycemia awareness was determined in the treatment groups by subjecting rats to insulin-induced (4.3 U.kg-1.min-1) hypoglycemia (~45 mg/dl). The awareness of hypoglycemia was quantified by measuring the increase in food intake during insulin-induced hypoglycemia. As compared to placebo treatment, antecedent treatment with both tricyclic antidepressants imipramine and amitriptyline prevented the development of HU in our rodent model as noted by the restoration of a normal food intake response to insulin-induced hypoglycemia. In conclusion, 1) serotonin and norepinephrine pathways may mediate the development of HU, and 2) for people with insulin-treated diabetes tricyclic serotonergic-norepinephrine reuptake inhibitors may have potential clinical utility as a pharmacological agent that prevents the development of hypoglycemia unawareness.

Poster 39

Presenter: Lisa Wilson (University of Utah)
Mentor: Lisa Giles (Pediatrics)
Examining Parent and Child Measures in the context of a Multi-Disciplinary Headache Clinic Visit

Background: Persistent and/or severe headache is a common complaint in pediatrics, reported by about 17% of children ages 4-18 years. Pediatric patients with chronic pain, including headaches, are at increased risk for depression, anxiety and school absenteeism. There is limited literature on the clinical utility of current headache disability measures. Using available measures, the current study will examine the psychological and clinical profile of a typical headache patient presenting for services at an outpatient multi-disciplinary pediatric headache clinic. Methods: 658 patients, ages 3-18 years, were seen in the headache clinic from November 2016 to June 2018. Complete demographic and parent/self-report data for measures of disability (PedMIDAS, Functional Disability Inventory), pain cognition (Pain Catastrophizing Scale), and mental health symptoms (Pediatric Symptom Checklist) is available for 291. In addition to describing a typical clinical profile, functional disability, school days missed in the prior 3 months, and mental health symptoms will be analyzed comparatively. Results: Preliminary data from our sample and prior research will guide statistical questions. Analyses are not yet complete as our IRB is currently under expedited review. Clinically, the mean age of patients in our sample is 13 years and mostly (>60%) female. Patients report most often moderate to severe functional impairment due to headaches. Future Directions: It is important to understand the clinical profile of pediatric headache patients given the potential effect of headaches on emotional well-being and overall functioning. Findings will aim to examine the psychological comorbidities, functional impairment, and demographic characteristics of pediatric headache patients.

Poster 41

Presenter: Abigail Ambrose (College of Wooster)
Mentor: Vikram Deshpande (Physics & Astronomy)
Design and Implementation of Surface Acoustic Wave Devices for Carbon Nanotubes

Surface Acoustic Wave (SAW) devices and carbon nanotubes (CNTs) are used in many electronics and sensors. This study looks at incorporating SAW devices into CNTs. For this, the SAW device was designed using the characteristics of Y-cut quartz as the piezoelectric substrate with the goal of achieving a 1 GHz SAW frequency. For a 1 GHz SAW frequency, the fingers of the SAW device are designed to be 0.9 μm and there are ten fingers on each side of the device. The device was then created by depositing chromium and PMMA onto the substrate and then using electron-beam lithography to write the desired pattern. Gold was then deposited onto the substrate. The chromium and PMMA were removed, leaving only the desired pattern in gold. This device can then be placed in a probing station to observe the surface acoustic wave produced from the geometry of the device. Following this observation, the SAW device will be applied to CNTs.

Poster 43

Presenter: Julia Larkin (University of Utah)
Mentor: Eric Poitras (Educational Psychology)
Voice-Activated Digital Assistant: An Application for Teacher Professional Development and Technology Integration

As the job of a teacher is demanding, digital classroom assistants help off-load duties. Funding the amount of necessary assistants can become a financially daunting task. Voice-activated digital assistants are becoming increasingly more prevalent in the classroom, allowing teachers and students to interact and receive information. In doing so, students may interact with an agent that serves as either a teacher or a peer. The objectives of this study were two-fold: (1) develop a semi-automated workflow to author conversational trialogues leveraging metadata embedded in open educational resources and, (2) create a prototype version of the agent for usability testing. The semi-automated workflow combines the use of unsupervised and supervised machine learning algorithms to analyze unstructured text crawled from the web.

In particular, the approach is applied to analyze metadata defined through standardized schemas for the semantic web. As an example, we compare and contrast several modes of dialogue, showing how an agent can teach a subject matter (i.e., learning by transmission), but also may be taught a topic by a student (i.e., learning by teaching). We discuss the implications of the authoring framework for designing conversational agents as instructional aids for teachers in the classroom in an automated manner.

Poster 45

Presenter: Laura Snelling (University of Utah)
Mentor: John Horel (Atmospheric Sciences)
Investigating the Weather Conditions Near Wildfires

Each year wildland fires across the United States impact recreational land use, urban structures, and the safety of wildland firefighters. Understanding the weather surrounding wildfires is vital to preventing dangers associated with them and can be useful in developing effective ways to combat wildfires. Currently fire weather forecasters provide detailed weather information to support wildland firefighting operations with research underway to improve those forecasts. The objective of this project is to improve understanding of fire weather conditions by collecting and analyzing weather data near wildfires and how weather conditions affect fire behavior. A particular focus has been to investigate two local fires in Utah: (1) the Trail Mountain Fire, which started after a prescribed burn in central Utah escaped containment due to unexpected high winds and (2) the Dollar Ridge Fire, which accounted for the loss of over 70 structures and 56,000 acres of burned land near Strawberry Reservoir.

Another major goal of the project is to help advance web applications that can potentially be used to assist firefighting operations by displaying the geographic locations in which red flag conditions are occurring. Red flag conditions are the weather and fuel conditions that may increase the potential for a wildfire to start or for wildfires to experience significant growth. In order to update the web application, current fire weather operation plans developed by U.S. federal agencies were referenced. The varying red flag criteria across the U.S. were documented and compiled into an interactive QGIS map that could be transitioned into web applications that display current weather conditions and map areas that are experiencing red flag warning criteria.

Poster 47

Presenter: Billy Chien (Indiana University)
Mentor: Stavros Drakos (Internal Medicine)
The Role of the Pentose Phosphate Pathway in LVAD-Induced Myocardial Recovery from Heart Failure

Heart failure is a crippling disease that has a high prevalence of 2-3% within the United States. A common therapeutic treatment for heart failure (HF) is mechanical unloading by Left Ventricular Assist Devices (LVADs). It has been reported that LVAD treatment leads to improvements in the cardiac function of a subset of HF patients (responders). Glucose via glycolysis serves as the major energy substrate in failing hearts, however studies show that upon LVAD unloading, glycolytic intermediates do not enter the TCA cycle as they normally would. We hypothesize that glucose is channeled into accessory cardio-protective/repair pathways such as the pentose phosphate pathway (PPP) to facilitate the myocardial recovery seen in responders to LVAD treatment. To investigate this hypothesis, we obtained myocardial tissue samples from HF patients at the times of LVAD implantation (pre-LVAD) and LVAD explantation or cardiac transplantation (post-LVAD); as well as, control samples (donors) from non-failing rejected hearts. The tissue samples were then analyzed using gas chromatography-mass spectrometry (GC-MS) to determine metabolite levels, RNA sequencing to determine transcription levels, and western-blot to determine the levels of enzymes involved in PPP. Although the metabolomics studies are still currently being processed, a preliminary dataset with a smaller sample size shows a trend towards increased PPP metabolites in post-LVAD responders. Western-blot analysis shows that glucose-6-phosphate dehydrogenase (G6PDH) and transketolase (TKT), major enzymes in the PPP, are significantly increased in post-LVAD responders. Furthermore, TKTL1 mRNA expression is upregulated in this group as well. These results suggest that more glucose is being shuttled into the PPP, which leads to increased cardiac recovery in responders. However, corresponding results from the full metabolomics study are needed to strengthen this claim. Additionally, future metabolic flux studies using stable isotope labeled 13C-glucose tracers are planned to track the precise pathways of glucose metabolism.

Poster 49

Presenter: Samira Rosenthal (University of Minnesota, Morris)
Mentor: Joshua Bonkowsky (Pediatrics)
Drug Screening for Potential Adrenoleukodystrophy Treatments Using a Zebrafish Disease Model

Adrenoleukodystrophy (ALD) is a disease characterized by degradation of myelin in the central nervous system (CNS). ALD causes significant morbidity and mortality, and there are virtually no treatments. We have created a disease model

for ALD in the small vertebrate organism zebrafish (*Danio rerio*). The mutant ALD zebrafish develop disease characteristics similar to human ALD patients. This includes motor dysfunction, very long chain fatty acid (VLCFA) accumulation, as well as CNS apoptosis and demyelination. Our goal is to identify possible treatments that slow or prevent disease progression in the ALD mutant zebrafish. We tested a library of 2560 FDA-approved drugs (Microsource Spectrum Collection). Drugs were administered to fish as mixtures of four compounds and behavior was measured to assess motor function recovery. The behavioral components analyzed were average velocity, max velocity, duration of total movement, total distance traveled, and active velocity. Promising compounds were then tested in a secondary behavior screen, which consisted of testing individual compounds at a lower concentration. We identified four promising compounds for further testing. For each compound, we will measure VLCFA levels by administering drugs then testing whole fish extracts using tandem mass spectrometry. We will conduct TUNEL staining for apoptosis and Olig2:dsRed staining to count the number of oligodendrocyte precursor cells, which are indicative of myelin levels. Our intention is to take the most promising compound forward towards clinical trials.

Poster 51

Presenter: Rohan Barkley (University of Utah)
Mentor: Jared Rawlings (School of Music)
Fusing STEM Content with Hip Hop and Electronic Music to Create Educational Songs

Students spend countless hours learning through traditional lecture & textbook methods when studying STEM content (Ruiz-Gallardo, 2016). The conventional way of teaching STEM subjects is by instructing students to memorize or comprehend the detailed material from lecture slides and textbooks (Bernot, 2014). However, research methods and effects of educational music simplifying scientific information are infrequently examined. The purpose of this study was to examine and explore collaborations with musicians to create four audio samples that break down information in biology and chemistry. These audio samples aimed to lyrically and sonically simplify conceptual material from the fields of biology and chemistry. The procedure entailed examining the scientific concepts and mechanisms, devising engaging and educational song lyrics, producing the songs using Ableton Live 10 and Maschine, and mixing and mastering the songs. The entire creative process resulted in four electronically-produced songs: "Biochemical Romance," "Transcription & Translation," "DNA Replication," and "Nucleophiles & Electrophiles." These educational songs could be used as an alternative teaching resource and serve as a platform for high school and college students to learn not just general biology and chemistry, but upper-division coursework in those fields, too. Furthermore, this info-entertainment platform could extend to cover content in other STEM-related fields such as physics, mathematics, and various engineering studies.

Poster 53

Presenter: Julia Peek (University of Utah)
Mentor: Ilya Zharov (Chemistry)
Nanoparticle Catalysts for Suzuki Cross-coupling

Catalysis is used for accelerating chemical reactions, which can significantly reduce the reaction cost. The use of catalysts is abundant in pharmaceuticals, petroleum, and synthetic fuel industries. Although transition metal-based catalysts are the most abundant, they have specific limitations such as the high cost of metals and the difficulty involved in separation from product. Catalytic membrane reactors (CMR) are one popular type of catalytic reactor and are unique in that they combine the "reaction" and "separation" step. The separation occurs between unwanted byproducts or within the catalyst itself. I have synthesized Au and Pd silica supported nanoparticles in order to catalyze a Suzuki cross-coupling reaction. Before designing and characterizing a CMR made of Au or Pd coated silica nanoparticles I demonstrated that the Suzuki cross-coupling reaction will take place in bulk conditions with the metallic catalysts I have prepared. Each trial was given 24 hours to complete at room temperature or 60 C in the presence of nitrogen gas; they were then characterized by analyzing progress of reaction and presence of the product, biphenyl, by thin-layer chromatography (TLC). I found that both Au and Pd catalysts are active in the selected conditions and produced the best yield at room temperature, although Pd gives a better percent yield than Au (approximately 70% compared to a 15% yield, respectively). Either Au or Pd supported nanoparticles would be adequate catalysts to make a catalytic membrane; however, considering that palladium gives a higher conversion percentage, this will be the material that we will continue to work with to make and optimize a catalytic membrane.

Poster 55

Presenter: Abigail Friese (University of Utah)
Mentor: Scott Anderson (Chemistry)
Temperature and Sublimation Measurements of a Single Graphite Nano-particle

The field of nanotechnology is rapidly growing and there are still many unknowns within it. Before nanoparticles can be used safely in industry, we have to know about their fundamental properties, this is because they behave very differently than their macro sized counterparts. For instance, nanoparticles can emit different colors as they change in size[1], they

can react differently in chemical reactions [2], and they melt at different temperatures [3], and much more! This experiment is looking at carbon nanoparticles which are widely released into the atmosphere by factories and automobiles in the form of soot. In particular, this experiment is focusing on graphite nanoparticles, which is a major component of soot particles. The instrument that is being built is a mass spectrometer that can track measurable mass loss and gain in single nanoparticles without destroying them in the detection process, allowing us to observe these particles indefinitely. We can also react these particles with other chemicals, this allows us to obtain valuable information about the chemical kinetics, emission, surface chemistry and more of the nanoparticles that we are observing. [1]Madan, Singh, et al. "Effects of Size and Shape on the Specific Heat, Melting Entropy and Enthalpy of Nanomaterials." Egyptian Journal of Medical Human Genetics, Elsevier, 11 Oct. 2016, www.sciencedirect.com/science/article/pii/S1658365516300796
[2]"Gold Nanoparticles: Properties and Applications." Sigma-Aldrich, The Journal of Pharmacy and Pharmacology, www.sigmaaldrich.com/technical-documents/articles/materials-science/nanomaterials/gold-nanoparticles.html.
[3]Thanh, Nguyen T. K., et al. "Mechanisms of Nucleation and Growth of Nanoparticles in Solution." Chemical Reviews, vol. 114, no. 15, 2014, pp. 7610-7630., doi:10.1021/cr400544s

Poster 57

Presenter: Marissa Little (Weber State University)
Mentor: Chenge Zhang (Biology)
Using Gene Therapy To Correct The CFTR Gene

There's approximately 1,000 people diagnosed with Cystic Fibrosis (CF) each year worldwide, 75% of which are diagnosed by the age of two. Cystic Fibrosis is a life-threatening disease. The patient's lifestyle can be drastically affected as they get older. Typically, they die before the age of 40 due to lung complications. Cystic Fibrosis is a recessive genetic disorder caused by mutations in the cystic-fibrosis-transmembrane conductance-regulator (CFTR) gene, a chloride ion channel. Cystic Fibrosis affects the cells that produce mucus, digestive enzymes, and sweat. The chloride ion channel does not function correctly which then causes mucus and other fluids to become thick and sticky, leading to the patient's passageways and ducts becoming plugged. The organs affected most by Cystic Fibrosis are the lungs, pancreas, liver, and intestines. Gene therapy being used to treat Cystic Fibrosis is attractive for two main reasons; first, the disease arises from a single gene defect. Second, the lungs are accessible through noninvasive techniques to treat it. Scientists and clinicians from the UK Cystic Fibrosis Gene Therapy Consortium are currently in phase III of a gene therapy trial. Their experimental trials are showing to be very promising and safe in helping the patient's lungs perform better. Gene therapy shows that it will soon be able to correct the CFTR gene affecting people's gastrointestinal tract. One of the major problems with the gastrointestinal tract being affected is that the pancreas cannot produce digestive enzymes to breakdown food and absorb nutrients; this causes people with Cystic Fibrosis to be malnourished and underweight. In correcting the genetic makeup, patient's digestive organs would then be able to produce the needed enzymes to properly digest food. Previous attempts of gene therapy will be reviewed, and a possible improved approach will be discussed regarding CFTR gene insertion.

Poster 59

Presenter: Alice Curtin (Carleton College)
Mentor: Anushka Udara Abeysekara (Physics & Astronomy)
VERITAS Observations of Very High Energy Gamma-rays from Microquasar SS433

SS433 is a binary system with an A-type star that is orbiting a black hole. The system emits two jets of relativistic particles that produce very high-energy gamma-rays when they interact with the interstellar medium. Two very high energy gamma-ray observatories, VERITAS and HAWC, observed the region around SS433. VERITAS observed SS433 for 50 hours between 2009 and 2018 while HAWC observed SS433 for 1017 days between 2014 and 2017. VERITAS data was analyzed using two different analysis packages: Event Display and VEGAS. Event Display analysis identified gamma-rays coincide with SS433 with a marginal gamma-ray significance just below five sigmas. However, VEGAS analysis did not identify gamma-ray emission. We explored possible reasons for the discrepancies between the two analysis packages. HAWC was able to detect gamma-ray emission from SS433. We simulated HAWC data onto the VERITAS camera to compare the measurements made using HAWC with those made using VERITAS. In this presentation, I discuss the discrepancies between Event Display and VEGAS, possible reasons for these discrepancies along with possible solutions and the correlation between HAWC and VERITAS measurements.

Poster 61

Presenter: Tyler Bodily (University of Utah)
Mentor: Edward DiBella (Radiology & Imaging Sciences)
Cardiac Perfusion with Continuous Multi-Slice MR Imaging

More individuals are suffering from cardiac diseases than ever before. We are in need of faster and more precise means of diagnosing patients who suffer from heart diseases. MR imaging is quickly becoming an effective means to analyze and

diagnose patients for coronary artery disease. This research hopes to successfully produce and quantify cardiac perfusion (blood flow into the heart muscle) in patients who suffer from coronary artery disease using 2D csms (continuous multi-slice) MR imaging. Throughout MR imaging breath holds were not used and both rigid and deformable registration was used to correct cardiac and respiratory motion. Rather than using successive sat pulses after each beat continuous sat pulses over several heart beats were used. Data was processed and displayed using the fermi model and run through Matlab.

Poster 63

Presenter: Coby Hudac (University of Utah)
Mentor: Aylin Rodan (Internal Medicine)
Bestrophin-1 Chloride Channel in Drosophila Melanogaster

Bestrophin-1 is a swell-activated chloride ion channel that has been found in *Drosophila melanogaster*. Flies with a loss of function mutation in the *bestrophin-1* gene were shown to have increased sensitivity to a high salt diet compared to wild type, shown by an elevated rate of lethality for *bestrophin-1* mutants vs wild type on high salt food. Additionally, wild type function could be restored in the *bestrophin-1* mutants using a genomic rescue construct. I have researched the water weight and excretion behavior of *bestrophin-1* mutants on normal and high salt food to better understand the function and importance of *bestrophin-1*. I developed new assays to measure both water weight and excretion. Also, I have been conducting experiments on flies with rescued *bestrophin-1* function in specific regions of the Malpighian (renal) tubule and gut to learn more about where *bestrophin-1* is required for normal salt sensitivity and excretory behavior. I have observed a significant increase in excretion in *bestrophin-1* mutants compared to wild type, as well as an elevated rate of lethality in response to water deprivation stress. No significant difference in water weight was observed, though similar experiments with increased feeding times are ongoing. This research will be important to fully understand the physiological mechanisms by which *Drosophila* maintain ionic and osmotic balance.

Poster 65

Presenter: Jessica Bigley (Washington University in St. Louis)
Mentor: Anandh Babu Pon Velayutham (Nutrition and Integrative Physiology)
Effect of blueberry supplementation on vascular NADPH oxidases in db/db mice

Background: Cardiovascular disease is the leading cause of death in the United States. Diabetes greatly increases the risk of cardiovascular disease such as atherosclerosis. Recently we demonstrated that blueberry supplementation reduces vascular inflammation and improves vascular dysfunction in diabetic mice. NADPH oxidases (NOXs) are ROS generating enzymes that play a major role in vascular homeostasis and vascular pathology. An increased NOXs in vascular endothelium contributes to vascular inflammation and dysfunction in diabetes. We investigated the effect of blueberry supplementation on vascular NOX signaling in diabetic mice. ***Methods:*** Seven-week old male diabetic *db*/*db* mice were either fed standard chow (*db*/*db*) or chow supplemented with 3.8% freeze-dried blueberries (*db*/*db*+BB), which is equivalent to ~240 g in humans, for 10 weeks. A control group of non-diabetic mice were fed standard chow (*db*/+). Gene expression analysis of NOX1, NOX2 and NOX4 in the aortic vessels was determined by qPCR. Briefly, mRNA was isolated from aortic vessels using RNeasy plus mini kit, cDNA was synthesized using the reverse transcription kit, and qPCR analysis was completed with SYBR Green. The gene expression levels of NOXs were calculated by normalizing to the level of GAPDH. ***Results:*** In our study, vessels from *db*/*db* mice exhibited an increased expression of NOX2 and NOX4 without a change in NOX1 expression compared to *db*/+ mice. Blueberry supplementation decreased NOX4 expression in *db*/*db*+BB compared to *db*/*db* mice indicating the possible role of NOX signaling. ***Conclusion:*** Blueberry supplementation may benefit diabetic patients by preventing the vascular complications associated with diabetes.

Poster 67

Presenter: Catrina Oberg (Wheaton College)
Mentor: Jon Rainier (Chemistry)
Synthesis and Stability of Very Long Chain Polyunsaturated Fatty Acids

Age-related Macular Degeneration and Stargardt's Disease are eye disorders that cause progressive degeneration of the macula, a small area of photoreceptor cells at the center of the retina, leading to blindness. Very Long Chain Polyunsaturated Fatty Acids (VLC-PUFAs) constitute approximately two to four percent of all retinal fatty acids and evidence suggests that there is a connection between even lower concentrations of VLC-PUFAs in the retina and both Age-related Macular Degeneration and Stargardt Disease 3. VLC-PUFAs are synthesized *in vivo* from precursor long chain polyunsaturated fatty acids through the action of the elongation protein ELOVL4. Currently there are no biosynthetic methods to synthesize VLC-PUFAs so organic synthesis of the compounds is needed in order to study the effects of VLC-PUFAs in the retina. In collaboration with the Bernstein group, the role of VLC-PUFAs on Stargardt Disease 3 is being studied in mouse models through externally-fed synthetic VLC-PUFAs. The purpose of this present study is to synthesize a deuterated analogue of the VLC-PUFA C32:6 n-3 and to conduct short-term decomposition

studies to determine its stability, in particular its stability to oxidizing conditions. To study the susceptibility of VLC-PUFAs to oxidation, samples have been exposed to a variety of oxidizing environments and the decomposition has been monitored using ^{1}H NMR and TLC. The results will be used as a starting point for investigations into the long-term stability and viability of VLC-PUFAs and their decomposition products.

Poster 69

Presenter: Shaistah Din (Hillcrest High School)
Mentor: Srividya Bhaskara (Biology)
Detection of changes in DNA and chromatin using immunofluorescence

Immunofluorescence microscopy is the practice of using a light microscope that operates within certain wavelengths to view and analyze repair proteins. It enables fluorophores to view the location of the attached antibodies. Markers of DNA damage and repair is revealed through the size, brightness, and overall abundance of the antibody present at various locations in the cell. The antibodies show where the damage on the proteins occurred, which then leads to a better understanding of the origin of DNA damage. We also look at chromatin by using specific antibodies for histone modifications. In the immunofluorescence technique, we utilized a chemically fluorescent labelled primary and secondary antibody on suspension and adherent cells. The secondary binds to the primary in the process and thus, the antigen joins with the antibody. Before doing the process, the cells went through different treatments and derived from different mouse genetic backgrounds. The treatments that we implement leave the DNA more vulnerable to harm. We are looking at DNA damage markers and chromatin marks associated with DNA damage and examine the correlation between chromatin marks and DNA damage. We can visualize both by performing co-immunofluorescence, which I could successfully perform in Bhaskara's lab. The ultimate goal is to find the origin of various locations of DNA damage and the distributions of the many proteins in the cell to offer us a better understanding of what is happening to DNA during major biological processes.

Poster 71

Presenter: Taylor Russell (University of Utah)
Mentor: Nicole Mihalopoulos (Pediatrics)
Health Implication of Gender Perceptions In Patients In An Adolescent Medicine Clinic

A person's gender identity often develops based upon the perceptions of others. Research on physical and mental health challenges of transgender/gender non-binary (TNB) individuals has not explored how these individuals think others see them, and the possible health implications of a mismatch between self-image and perception by others. We hypothesized that any discrepancy between gender self-perception and perception of gender by others is associated with negative health outcomes. To test this hypothesis, we performed a retrospective chart review of 196 patients, seen from September 2017-June 2018, at an Adolescent Medicine Clinic. The patient-completed survey obtained information about patient's gender identity, self-perceived gender and how the patient thinks others perceive their gender (5-point Likert scale for masculinity, femininity, and androgyny). Of the 196, 72% were assigned female at birth (AFAB). Of these, 61% were cisgender, 39% were TNB. The 28% assigned male at birth (AMAB) were 37% cisgender, 63% TNB. Preliminary findings show discrepancy between self-perceived gender and perception by others was 0.6 points for AFAB TNB and 0.2 points for AFAB cisgender. AMAB TNB compared to AMAB cisgender had discrepancy of 0.3 points and 0.4 points, respectively. Analyses will include mental and physical health information (including: depression, anxiety, self-harm, suicidal ideations, substance use) within 6 months of the time of survey. TNB adolescents may be at greater risk for mental and physical health problems than cisgender adolescents. This research will present more understanding about the health needs of gender diverse populations so more inclusive and individualized services can be implemented.

Poster 73

Presenter: Alyssa Cassity (Smith College)
Mentor: Anushka Udara Abeysekara (Physics & Astronomy)
Observing the Extended Gamma-Ray Source Geminga with VERITAS

The Very Energetic Radiation Imaging Telescope Array System (VERITAS) is an observatory in southern Arizona, USA, with a sensitivity to gamma-rays in the energy range between 85 GeV and > 30 TeV, and a field-of-view of 3.5 degrees. This research work analyzed 5 hours of VERITAS observations on Geminga, a nearby supernova remnant emitting very high energy gamma-rays, that were taken between August 2012 and February 2013. We analyzed this data set using a technique called the Matched Runs Method, which was developed at the University of Utah to observe extended gamma-ray sources that are similar to or larger than the field-of-view of the VERITAS camera. The Matched Runs Method involves pairing each observation of the source with an observation taken at a different location in the sky. We closely match a variety of parameters, such as elevation and weather conditions, to ensure that the second observation will provide an accurate estimation of the background radiation for our source. During my research, we also developed a

program to automate the process of selecting a good background match for a given observation. In this presentation, I will discuss both the results from our analysis of the Geminga data set and our program for selecting good matched runs.

Poster 75

Presenter: Nicole Orabona (The Pennsylvania State University)
Mentor: Michael Simpson (Metallurgical Engineering)

Electrochemical Analysis of $MgCl_2$/KCl/NaCl Molten Salt Candidate Heat Transfer Fluid for Concentrating Solar Power

Solar energy is one of the leading candidates for alternative energy, however the intermittent nature of energy harvesting puts a strain on the electric grid. If energy storage could be integrated with solar energy collection, this problem could be solved. Concentrating solar power (CSP) plants collect thermal energy rather than converting it directly to electricity. This presents the opportunity to store the collected energy and convert it to electricity as needed by the electric grid. The implementation of chloride salts provides higher thermal stability at higher temperatures than the existing thermal energy storage (TES) materials, such as oils and nitrate molten salts. Putting these chloride salts into the application of concentrating solar power (CSP) plants will result in an increased efficiency of storage due to the thermodynamic benefits of collecting energy at higher temperatures. However, the problem with this solution is the corrosivity of the chloride salts, which is caused by impurities such as oxide ions, and hydroxide ions. To measure these impurities, cyclic-voltammetry (CV) measurements were performed in molten $MgCl_2$/KCl/NaCl (60/20/20 mol %). The CVs were obtained at 500 °C at varying scan rates of 100, 200, and 300 mV/s. Through these measurements, a consistent profile of the salt was obtained, as well as verification of the OH^- and Mg^{2+} reduction peaks. Dissolution of Mg metal successfully reduced the OH^- peak height. It also produced a large, broad oxidation peak that is possibly due to the presence of soluble Mg metal. This theory will be tested using titration techniques in order to determine changes in the concentration of O_2/OH^- in the salt. Further research is needed to investigate the oxidation peak associate with soluble Mg metal in the salt.

Poster 77

Presenter: Cole Scholtz (University of Central Missouri)
Mentor: Scott Anderson (Chemistry)

Size-Selected Pt clusters as Electrocatalysts for in situ Oxidation of Glycerol

Glycerol is an abundant byproduct of biodiesel production that can be oxidized into a variety of higher-value products, which can serve as feedstocks for pharmaceuticals and other industrially significant chemicals. Glycerol oxidation often implements harsh conditions or multiple equivalents of oxidants, so a greener alternative comes in the form of electrochemical catalysis. Previous studies have shown that the electrochemical oxidation of glycerol is very susceptible to changes in catalyst surface and electronic structure, as well as electrolyte pH. The use of size-selected Pt clusters as model electrocatalysts can provide unique insights into the properties of catalysts and how they relate to activity. Our group has the unique capability to create atomically-resolved cluster electrodes using an ultra-high vacuum instrument and an in situ electrochemical set-up, allowing for size and electronic analysis of model cluster catalysts and electrochemical studies via cyclic voltammetry without exposure to unwanted adsorbates. Due to the abundance of undercoordinated sites on cluster catalysts, they possess unique chemistry that can vary with the addition of a single atom. The high amount of size selectivity when making model cluster catalysts can potentially lead to tailorable electrocatalysts for glycerol oxidation and other electrochemical processes. For example, ethanol oxidation activity was found to correlate to cluster size as well as electronic structure. In collaboration with theory groups, this project aims to study how the size and electronic properties of Pt cluster electrocatalysts influence glycerol oxidation.

Poster 79

Presenter: Jessica Villegas (University of Utah)
Mentor: Richard Warner (Chemistry)

Cloning the 4-Ig variant of B7H3 and B7H3 CRISPR knockout in melanoma cells for protein function studies

Immunotherapies involving checkpoint inhibitors hold great promise for melanoma patients. For example, CTLA4 and PD1-targeting antibodies used together in Phase III clinical trials have resulted in tumor diminishing responses in up to 60% of patients. Our goal for this summer research project has been to make components necessary for testing the immune nature of the co-signaling molecule, B7H3. The purpose being to expand upon current knowledge of B7H3's function and determine the usefulness of B7H3 for immunotherapies. B7H3 is in the same protein family as PD-L1 (aka. B7H1) which is a signaling ligand of the PD1 checkpoint receptor, and thus B7H3 is a likely candidate for successful immune checkpoint blockade. B7H3 is unique among its family members for having both a short form (2-Ig) and also a longer (4-Ig) variant. The lab goal is to test the function of both of these variants. During the summer, we have attempted

cloning of the 4-Ig variant into an expression vector by molecular cloning (including PCR, restriction digest, gel purification, ligation, E.coli transformation, followed by digest and sequence verifications, and making large-scale maxi preps of the DNA plasmid). At this point, this part is ongoing and hasn't been completed yet due to cloning issues along the way. As a second approach, we have used Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) knockout toward B7H3 to remove its expression from B16 mouse melanoma cells to allow examination of B7H3's function in melanoma tumors. We transfected B16 F0 cells with CRISPR guides and Cas9 and a G418 repair insert, conducted G418 selection for 12 days, isolated clones, and tested clones by DNA and Western Blot for B7H3 expression; which shows our successful generation of CRISPR clones for the study of B7H3's involvement in melanoma.

Poster 81

Presenter: Zonnie Olivas (University of Arizona)
Mentor: Mary Beth Scholand (Internal Medicine)
Prevalence of Depression in a University of Utah Idiopathic Pulmonary Fibrosis Cohort

Idiopathic pulmonary fibrosis (IPF) is a severe form of interstitial lung disease characterized by the progressive scarring of lung tissue with a prevalence of 13 to 20 people per 100,000 worldwide. It is common for IPF patients to experience multiple comorbidities including depression. Depression is of particular interest as previous IPF studies have shown a high depression prevalence of 12-49%. In this project we characterized the prevalence of depression in the University of Utah IPF cohort, containing 227 IPF patients. Of the 227 patients, 130 took the PROMIS-Depression questionnaire, which we used as an indicator of depressive symptoms. We stratified the IPF cohort by demographic categories of sex and ethnicity. The prevalence of depression amongst female IPF patients (n=35) averaged 50.69 with a standard deviation of 8.12. Comparatively, the prevalence of depression amongst male IPF patients (n=95) averaged 50.74, with a standard deviation of 8.24. The prevalence of depression amongst patients who identified as Hispanic/Latino (n=10) averaged 53.59 with a standard deviation of 8.68. Patients who identified as non-Hispanic/Latino (n=118) had a slightly lower average of 50.61 and a standard deviation of 8.12. Subsequent analysis will compare the prevalence of depression in the IPF cohort to that of a control non-IPF cohort to determine if there is a statistically significant difference. The characterization of demographic variables that are associated with the development in IPF can predict depression predisposition and help with clinical management to increase patient quality of life.

Poster 83

Presenter: Galen Bergsten (University of Utah)
Mentor: Gail Zasowski (Physics & Astronomy)
Building Simple Stellar Populations to Probe Galaxy Composition

While the universe is filled with galaxies new and old, their actual formation and evolution is a topic thus far limited to observations of our own Milky Way. The ability to study individual stars in detail in our stellar playground has made it possible to identify structural trends throughout the Milky Way that hint towards its formation and evolutionary history. Since the Andromeda Galaxy (M31) is close enough to resolve some individual stars, we have a unique opportunity to study whether trends between the chemical properties and kinematics of stars we observe in our own galaxy also appear in our nearest neighbor. Here we create a spectral "hypercube" consisting of synthetic stellar spectra from SDSS ASPCAP files in multiple combinations of temperature, surface gravity, and two chemical composition parameters. By using artificially generated population curves of varying age and metal abundance to represent simple stellar populations (SSPs) along with the SSP-generating program PopStar, composite spectra are made from the hypercube to mimic populations of similar properties. We assess stellar spectra from the Milky Way to determine which sections of the spectrum are most sensitive to alpha enhancement, which are tested on the synthetic populations to display similar features on a galactic scale. In addition to the spectral hypercube serving as a resource for multiple upcoming projects within the Milky Way, we will continue our work by using these results in conjunction with high resolution infrared spectroscopy of M31 taken from SDSS IV's APOGEE-2 project to investigate the chemical composition, structure, and evolutionary history of both the Andromeda Galaxy and our own Milky Way.

Poster 85

Presenter: Claire Ticknor (University of Utah)
Mentor: Jill Shea (Surgery)
Constructing Neurotrophic Gradient-Generating Peripheral Nerve Conduits and Assays to Measure Functional Outcomes

Severe injury and trauma often results in peripheral nerve injuries. With current surgical practices such as the use of autografts, regeneration from nerve injuries is slow and incomplete resulting in loss of motor and sensory function. Previous studies indicate that the combination of a synthetic nerve conduit and neurotrophic factors aide in the regeneration process. It is also known that nerves will grow toward a chemotactic gradient. This study aims to demonstrate that a nerve conduit that implements a neurotrophic gradient can improve functional recovery following peripheral nerve damage. To do this, biodegradable gradient-producing nerve conduits are manufactured. The gradient

device is composed of multiple pieces, all constructed from poly-L lactic acid (PLLA). There are two concentric tubes (an inner and outer conduit) enclosing a reservoir from which neurotrophic drugs will diffuse through holes that are cut with a laser into the inner conduit. Location and size of the diffusion holes is altered resulting in varying gradient patterns. Two, o-shaped endcaps are placed between the inner and outer conduits and are then sealed to prevent drug leakage. Drug diffusion from the device is initially tested using a fluorescent dye. After implantation of the devices across a nerve gap, a functional assay is employed to assess recovery following a peripheral nerve injury. After designing and manufacturing a horizontal ladder rung test, healthy mice are trained to walk over at a constant pace. After being injured, the mice are then run across the ladder again and differences in functional ability are identified from counting how often and to what extent their leg slips off a rung. Full functional recovery is ideal after a peripheral nerve injury and the gradient design conduit has the potential to expedite this optimal recovery.

Poster 87

Presenter: Elisha Sneddy (University of New Mexico)
Mentor: Deanna Kepka (College of Nursing)
Addressing HPV Vaccine Knowledge in the Native American Community and the Need for Culturally Tailored Educational Materials: A Literature Review

The human-papillomavirus (HPV) is associated with 6 cancers and genital and respiratory warts. Although there is a safe and effective vaccine for HPV, as of 2016, only 4 out of 10 teens in the US have completed the HPV vaccine. American Indian women have been observed to have higher rates HPV infections with multiple strains, and higher rates of oncogenic HPV infections compared to the general population. The purpose of this review was to examine the literature surrounding HPV vaccine uptake in the American Indian community. A scoping review was conducted to identify English language, peer-reviewed articles from the PubMed database. A total of 8 articles published between 2011 to 2016 were included. The majority of articles were quantitative, while 3 were qualitative in design. All studies were cross-sectional. Only one article featured an experimental design. Relevant factors based on the PRECEED framework were identified. *Behavioral* factors included younger age of sexual initiation and higher numbers of sexual partners; *lifestyle* factors included educational level, number of pregnancies, and vegetable and alcohol consumption habits. *Environmental* factors include concerns about stigma and difficulty communicating about HPV. *Predisposing* factors included knowledge about HPV and HPV-related cancers, and cultural barriers. *Enabling* factors include clinic policies regarding HPV vaccination, and geographical distance to access healthcare. *Reinforcing* factors include fear of side effects and mistrust of the healthcare system. Findings from this study will guide the development of a culturally tailored educational HPV brochure for the young adult American Indian population.

Poster 89

Presenter: Randy Chou (Brown University)
Mentor: Stavros Drakos (Internal Medicine)
The One-Carbon Pathway and cardiac function recovery post LVAD treatment for heart failure patients

A substantial portion of the population suffers from chronic heart failure. Mechanical unloading by way of a left ventricular assist device has proved to be an effective interventive treatment. Following removal of the LVAD, most heart failure patients continue to show HF symptoms and worsening cardiac function(non-responders), however a subgroup showed substantial recovery (responders). Metabolic and energy balance perturbations during mechanical unloading have been implicated in these responses. Prior studies have revealed that LVAD-induced mechanical unloading causes an increase in glycolysis without increase in TCA cycle activity. A possible explanation is that the pyruvate, produced from glycolysis, is funneled into an alternative pathway. We hypothesize that the glycolytic intermediates are channeled into the cardioprotective and repair pathway one-carbon metabolism, resulting in the cardiac recovery response. To test this hypothesis, we performed metabolomics using GC-mass spectrometry and western blotting on human cardiac tissue obtained at the time of the LVAD implant (pre), LVAD explant (post), and control samples (donors) from non-failing hearts. The preliminary metabolomics indicate an upregulation of one-carbon metabolites, serine and glycine in the responders compared to non-responders post-LVAD. Furthermore, western blot of key one-carbon enzymes, PHGDH and SHMT1 shows responders with a higher concentration compared to non-responders. Since one-carbon metabolism is a major source of NADPH, levels of the antioxidant were examined using an assay kit. As expected, levels were higher in post-LVAD responders compared to non-responders. Although data from GC-MS with a larger sample size is currently in progress, these findings indicate an association of increased one-carbon metabolism to cardiac recovery in post-LVAD patients. By trying to understand the metabolic adaptations in the recovering heart, this study's ultimate goal is to intervene in patients with no signs of cardiac recovery after LVAD unloading to mimic the metabolic profile of respon

Poster 91

Presenter: Tarlynn Tone-Pah-Hote (University of Minnesota, Morris)
Mentor: Joseph Yost (Neurobiology & Anatomy)
Roles of kmt2d in Zebrafish Heart Development

INTRODUCTION: Congenital heart defects (CHD) arise from abnormal development of the heart and major blood vessels. Recent studies linked mutations in the ubiquitous histone methyltransferase *KMT2D* with CHD and Kabuki Syndrome. Despite the growing body of evidence that *kmt2d* functions during myocardium development, it has not yet been possible to assess the effects of *kmt2d* loss in other cardiovascular tissues. OBJECTIVE: Study heart phenotype in *kmt2d* zebrafish mutants to assess myocardial contribution to heart phenotype. METHODS: Using CRISPR/cas9 technology, *kmt2d* null mutants were generated that recapitulate the phenotypic features of human Kabuki Syndrome. In order to study heart development, the germline mutant *kmt2d*^{zy59} was crossed with the transgenic line *tg(kdrl:GFP) to label endocardium/endothelium*. *kmt2d*^{zy59}*;tg(kdrl:GFP)* cardiovascular phenotype was characterized by immunofluorescence with specific antibodies: MF-20, zn5, anti-GFP/kdrl and DAPI. Super resolution confocal microscopy images were 3D rendered with Imaris software. RESULTS: We found significant bradycardia in *kmt2d*^{zy59} embryos compared with their wild-type siblings. The shape of myocardial cells of the ventricle were not significantly different between wild type and *kmt2d*^{zy59} mutants. However, the number of myocardial cells is significant between wildtype and mutants. Further, mutants expressed the myocardial cell marker zn5 ectopically rather than exclusively at the atrioventricular valve. CONCLUSIONS: Characterizing cardiovascular development in mutant *kmt2d*^{zy59} zebrafish gives insights into the mechanisms that contribute to heart defects in Kabuki Syndrome.

Poster 93

Presenter: Logan Draper (University of Utah)
Mentor: Andrey Rogachev (Physics & Astronomy)
Electrical and noise characterization of perovskite solar cells at different temperatures

Organic perovskite solar cells are an important emerging technology with the capability to compete with Silicon and other solar cells. Here we perform I(V) and noise characterization of the solar cells with the composition ($CH_3NH_3PbI_3$) in the temperature range T=100-310 K and at different levels of light intensity. The studied solar cells display very strong memory effect, that is the current via devices depended strongly on the past history of the light exposure and voltage variation. The memory effect becomes progressively stronger at lower temperatures. To mediate this effect prolonged light exposure (30-60 min) was performed before the start of each I(V) run. We found that the I(V) characteristics display clear deviation from the classical exponential variations. Nevertheless, the gross characteristics were consistent with the "text-book" behavior: the open circuit voltage was roughly independent of light intensity and closed-circuit current was proportional to the light intensity. We will also present and discuss the noise spectra of the devices.

Poster 95

Presenter: Kimberly Chapman-Natewa (University of New Mexico)
Mentor: Owen Chan (Internal Medicine)
Effects of Astrocytic Glutamate Oxidation on Glycogenolytic Activity in Response to Hypoglycemia

Patients with diabetes often face the challenge of hypoglycemia which stems from excess insulin administration and an impaired counterregulatory hormone response. The mechanisms behind this latter defect are not fully understood. However, exposure to hypoglycemia can lead to excess lactate production in the brain that prevents it from sensing hypoglycemia and triggering an appropriate hormone response. In the brain, lactate is derived from the breakdown of glycogen (glycogenolysis) in astrocytes. Hence, we investigated the intracellular mechanisms that can trigger excess glycogenolysis. A decrease in ATP is a major stimulus for glycogenolysis. The stimulatory neurotransmitter, glutamate, can be oxidized in astrocytes to generate ATP. Importantly, recurring exposure to hypoglycemia reduces brain glutamate levels. We hypothesize that a reduction in astrocytic glutamate oxidation will increase glycogenolysis during hypoglycemia. To test this hypothesis, we cultured rat primary astrocytes in media containing differing glucose and glutamate concentrations for 15 and 30-minutes. All astrocytes were initially incubated in 2.5mM glucose media for 24hrs. After 24hrs, we incubated a subset of astrocytes in media containing 0.5mM glucose and either 0, 10 or 100uM glutamate and 1) measured lactate levels in the media using a fluorometric assay and 2) quantified glycogen levels in astrocytes. We will repeat these experiments in the presence of a glycogen phosphorylase inhibitor to prevent glycogenolysis and associate glutamate oxidation with glycogenolysis and lactate production. Understanding the mechanisms that contribute to defective counterregulatory responses is important for developing therapeutic strategies to treat and prevent hypoglycemia in patients with diabetes.

Poster 97

Presenter: Anna Jacobsen (University of Utah)
Mentor: Sarah Franklin (Chemistry)
Clarifying the role of Smyd5 in heart disease

The increasing prevalence of heart disease in the United States means that researchers need to develop better treatments, which requires deeper understanding of heart disease and failure. One characteristic that arises on the path to heart failure is cardiac hypertrophy, the growth of cardiomyocytes in response to hemodynamic stress. While the thickened heart muscle alleviates the overload temporarily, this growth stiffens the muscle, leading to decreased overall function. Since hypertrophy hastens heart failure, it is important to comprehend the pathophysiology of cardiac hypertrophy on a cellular level. The Franklin lab studies the role of the Smyd protein family in heart disease. These proteins are histone methyltranferases, meaning they modify the proteins surrounding DNA, altering gene expression. This epigenetic transformation has significant implications for cell growth regulation. Experiments performed in the Franklin lab include inducing hypertrophy in animal and cellular models to measure the impact of overexpression and knockout of the Smyd proteins on the development of heart disease. My first objective this summer was to confirm the suitability of a cellular model of cardiomyocytes used by the lab, the H9c2 cell line. H9c2 cells are myoblasts, or muscle cell precursors, that can be differentiated into myocytes. I treated these cells with differentiation conditions, then tested expression of cardiac markers at different time points to track the progression of a cardiac muscle-like phenotype. My second objective was to test whether Smyd5 ameliorates hypertrophic growth in cultured cells. I performed knockdown of Smyd5 in 3T3 cells using siRNA to impede expression. My third objective was to infect H9c2 cells with a titration of Smyd5 adenovirus to ascertain the best multiplicity of infection. I treated infected cells with phenylephrine and imaged them to see morphological changes. These data combined establish a baseline for future experiments using H9c2 cells that will combine Smyd5 knockdown or overexpression with phenylephrine-induced hypertrophy.

Poster 99

Presenter: Mandy Robison (University of Utah)
Mentor: Ryan Stolley (Chemistry)
Transition Metal Free Access to Vinyl Cyanamides

N-Heterocycles are important structures with wide utility in organic synthesis, especially in pharmacology and medicine. Due to their prevalence, access to substituent controlled, stereo-controlled and regio-controlled heterocycles is paramount. Additionally, the discovery of new reactivity motifs are required to provide their facile access. To this end, previous work in our group provided access to vinyl cyanamides, an important and underexplored building block in the synthesis of N-Heterocycles. Vinyl cyanamides are analogous to enamines with a combination of an electrophilic site that can provide access to a number of cyclization reactions such as hetero Diels-Alder, Aza-Bergman cyclization and a myriad of other reactions. We have developed a simple transition metal free two-reaction sequence to afford a number of aryl-substituted vinyl cyanamides. Currently, this method has only been successful in using a variety of styrenes as an olefin source, but it allows for the use of several halogen sources. Our results show that amino bromide products are afforded in a range of 42 to 85 percent yields. We have observed trends that show increased yield when electron-withdrawing groups are substituted at the para-position in styrene. Competition experiments utilizing TEMPO in our standard reaction suggests the mechanism does not proceed through a radical pathway, and provides for Markovnikov products. We are exploring additional means of synthesizing vinyl cyanamides through Wittig chemistry using cyanamide-containing ylids. We are continuing to explore the use of additional olefin sources using standard reaction conditions.

Poster 101

Presenter: Sayro Paw (University of Utah)
Mentor: Akiko Kamimura (Sociology)
Evaluation of English education for free clinic patients

The purpose of this study is to provide and evaluate English classes to non-US born free clinic patients. Free clinics provide free or reduced fee primary care services to underserved populations. This study is conducted at the Maliheh Free Clinic which provides free primary care services to the uninsured who live below the 150% federal poverty level in Salt Lake City. Uninsured free clinic patients have limited time and financial resources to improve their English and would continue being dependent on interpreter or other language services in health care and other settings. This study fills the gap that previous studies have ignored - the perspective to teach English on site to immigrant patients with limited English proficiency, and evaluate such program. This project consists of the following components: English classes, observations (field notes) of English classes, and a brief survey about English learning and satisfaction of a class. Participants are adults aged 18 years old or older. The English classes provide new medical terms to patients whose native language is not English and to help them be less dependent on interpreter.

POSTER SESSION II
10:30 AM – 12:00 PM

Poster 2
Presenter: Kristy Wen (University of Utah)
Mentor: Joel Harris (Chemistry)
Confocal-Raman Microscopy Determination of Temperature-Dependent Partitioning of PAHs in C18-modified Silica Particles and Interdigitated Hybrid-Bilayer Particles

A current challenge in chromatography is separating compounds of similar molecular weight and hydrophobicity, such as polycyclic aromatic hydrocarbons (PAHs). High density C18 stationary phases with highly ordered acyl chains have been reported to more strongly retain planar versus non-planar compounds. This shape selectivity may be due to the partitioning of planar compounds into 'slots' between adjacent trans-conforming acyl chains in the C18 stationary phase. Recently, hybrid bilayers have been formed within C18-modified silica particles for use in biomimetic separations. Characterization of these materials has revealed that the acyl chains from the upper phospholipid leaflet interdigitate into the substrate C18 chains, leading to a highly-trans acyl chain structure. Upon heating, these highly ordered bilayers exhibit a melting transition, eliminating trans-character of the bilayer acyl chains. This melting behavior makes temperature-dependent shape selectivity a possibility. Here we report on confocal Raman microscopy-monitored temperature dependent pyrene partitioning performed in interdigitated DMPC hybrid-bilayer particles. As temperature increased, the trans-character of the acyl chain in the hybrid bilayer becomes disordered, and the concentration of pyrene within the particle decreased. This suggests that temperature-dependent acyl-chain structure impacts pyrene partitioning, consistent with the above hypothesis. Interdigitated DSPC hybrid bilayer particles were also tested for pyrene retention. Upon heating, the ordered trans-character of the DSPC hybrid bilayer maintained due to its very melting transition, but the partitioned concentration of pyrene is also decreased. Temperature-dependent pyrene partitioning for the DMPC and DSPC hybrid bilayers allow the comparison of the partitioning enthalpy for hybrid bilayers across a phase transition versus in a fully gel phase.

Poster 4
Presenter: Bailynn McKay (University of Utah)
Mentor: Allie Grossmann (Pathology)
The role of the small GTPase ARF6 in melanomagenesis

Melanoma, an aggressive skin cancer, is the fifth most common cancer in the United States. It is estimated that 91,270 new cases of melanoma and 9,320 deaths will occur in 2018[1]. Mutations in *BRAF* are found in ~52% of melanomas[2]. We have found that the small GTPase ARF6 is activated in melanoma and facilitates disease progression and metastasis. Using a clinically relevant genetically engineered mouse model (GEMM) of melanoma[3], we will determine if *Arf6* is necessary for $BRAF^{V600E}/Cdkn2a^{Null}$ melanomagenesis. Tumors evolve from Cre-induced gene mutations in normal melanocytes/melanoblasts and closely mimic sporadic melanoma in patients. Cre is delivered by the RCAS/TVA retroviral system that allows for tissue- and cell-specific targeted infection of mammalian cells genetically engineered to express the viral receptor (TVA). The dopachrome tautomerase (DCT) promoter drives expression of TVA specifically in melanocytes. Because both familial and sporadic melanomas have loss of function mutations in the cyclin-dependent kinase inhibitor 2A (*CDKN2A*), mutant *Braf* alleles are crossed with a *Cdkn2a* floxed allele, which is required to generate tumors in the BRAF model. DCT-TVA;$Cdkn2a^{lox/lox}$ mice were crossed to $Braf^{CA}$ mice that carry a conditional $Braf^{V600E}$ allele that is Cre activated (CA), and to conditional $Pten^{lox/lox}$ mice. Using this approach mutant BRAF is expressed from its endogenous promoter[4, 5]. To induce tumors, 20ml of viral producing DF-1 cells (1×10^5 cells) containing Cre are injected subcutaneously into the flank of newborn DCT-TVA::$Braf^{CA}$;$Cdkn2a^{lox/lox}$ mice, herein referred to as $Braf^{CA}$;$Cdkn2a^{f/f}$. We crossed DCT-TVA::$Braf^{CA}$;$Cdkn2a^{f/t}$;$Arf6^{f/t}$ to DCT-TVA::$Braf^{Ca}$;$Cdkn2a^{/f}$;$Arf6^{f/f}$. Our goal is to select the DCT-TVA::$Braf^{CA}$;$Cdkn2a^{f/f}$;$Arf6^{f/f}$ offspring to expand the colony for experimental testing. Based on Mendelian genetics, we hypothesize that 75% of offspring will be $Arf6^{f/f}$. We generated 6 offspring and two (33%) were $Arf6^{f/f}$. Thus, we have begun to successfully produce the appropriate mouse cohorts to test *Arf6* necessity in melanomagenesis.

Poster 6

Presenter: Rylee Cardon (University of Utah)
Mentor: David Kieda (Physics & Astronomy)
Optically adjustable High Voltage system for Stellar Intensity Interferometry

My research project will allow us to outfit the VERITAS telescopes with Stellar Intensity Interferometry abilities potentially leading to other telescopes being outfitted as well. The high voltage system is controlled using optical fibers because long control wires and AC power supplies can generate a lot of electronic noise in the data. This research involved programming an Arduino Yun to act as a Pulse Width Modulator (PWM) and an on/off switch for a high voltage modulator to control the high voltage supply using light-emitting diodes(LED's). The high voltage modulator will control the high voltage transmitted to the Photomultiplier Tubes (PMT's) on the telescope. This project will allow the PMT's to have more controllable gain (the number of electrons per photon) that can be changed according to the brightness of the star. This project allows the high voltage to be consistently and accurately set to the same value every time allowing for more consistent results.

Poster 8

Presenter: Daryan Singer (University of Arizona)
Mentor: Michael Deans (Neurobiology & Anatomy)
Auditory Hair Cell Orientation and Planar Cell Polarity

Based on 2006 research, non-Hispanic American Indian and Alaskan Native population had the highest prevalence of age related sensory hearing loss . Previous studies have determined restoration of hearing through the regenerative repair of the damaged inner ear will require reproduction of development processes, therefore better understanding of these processes will aid in future therapies. Sound is detected by sensory receptors called hair cells located in the Organ of Corti of the cochlea which is a small boney tube that spirals through the inner ear. The function of these hair cells is dependent upon a sophisticated structure called the stereociliary bundle which is deflected by the overlying tectorial membrane. The polarized orientation of the stereociliary bundle is critical for their function and has been shown in a chick model that bundle orientation is influenced during development by the overlaying tectorial membrane. In contrast, development of bundle orientation in the mouse is highly dependent on planar cell polarity (PCP) proteins such as Van Gogh-like 2 (Vangl2). However, in the absence of Vangl2, misoriented bundles may reorient. To account for this, we hypothesize that much like the chick, the orientation of mouse bundles is also influenced by the tectorial membrane. To address this, we will intercross mutant mice missing the Vangl2 gene and Tecta mutants lacking a tectorial membrane and evaluate the potential for misoriented stereociliary bundles to reorient.

Poster 10

Presenter: Jay Rordame (University of Utah)
Mentor: Inese Ivans (Physics & Astronomy)
Exploring the magnesium potassium relationship of globular cluster NGC2808

In an effort to determine the history of the Milky Way we are exploring chemical abundance relationships in globular cluster NGC2808, an old massive cluster located in the southern sky. Tracing elements and their relationships will tell us more about the types of processes, like supernova, that occurred when the cluster was younger, and enriched the abundances to the level that we see and measure them today. These processes all create different amounts of the chemicals, and knowing how much of each element are in a star can tell us about how common or rare the process was when these stars were born. In pursuit of this we have obtained high resolution near-infrared spectra taken by the Apache Point Observatory Galactic Evolution Experiment (APOGEE) project, part of the Sloan Digital Sky Survey. The stars we target were found by starting at the center of the cluster, extending an area with radius 10 arc-minutes, then applying an expectation maximization algorithm to a model of the nearby galactic regions radial velocities compared to the radial velocity of the cluster to determine if a star is a member of the cluster. Initially using abundances determined by the APOGEE teams automatic data pipeline, the abundances will be further constrained using a local thermodynamic equilibrium spectral line analysis code to generate a synthetic spectrum, which are compared to the observed spectrum. Particularly of interest is a possible anti-correlation between potassium and magnesium, whose origin is unknown and needs more data to solve, but may point to an unusual system of an evolved giant star with a companion. The evolved star produces potassium which is then deposited onto its lower mass companion, which then evolves to burn magnesium reducing that elements abundance. Also interesting is a possible trend with titanium and aluminum, which hasn't been seen before in this cluster, and whose origin is unknown.

Poster 12

Presenter: Brennan Theler (University of Utah)
Mentor: Taylor Sparks (Materials Science and Engineering)
Utilization of Machine Learning to Build a Price Prediction Model for Raw Minerals Sourcing

Materials scientists build materials with an eye towards performance, but businesses interested in new materials must also have an eye on economic aspects of materials. Most new materials require a wide range of minerals, and businesses must ensure sufficient supply exists and account for price volatility. Machine learning is a tool commonly used to predict future outcomes, but have not been used in the materials science field for large-scale predictions. Using data from the United States Geological Survey and other sources, a large and comprehensive dataset describing the minerals market in several attributes from 1998-2015 was collected. This dataset was normalized and fed into a set of different machine learning regression algorithms to look for predictive ability on the chosen attributes (mineral price, oil price, inflation index, current price, and total production) on next year's mineral price. The models returned show predictive ability, with r-squared scores just under .7, but with a significant amount of error, partially stemming from the normalization method used, and partially from the highly interpolative nature of the data and model parameters. Work on improving normalization methods and increasing the model's predictive ability at extreme ends of the dataset are ongoing.

Poster 14

Presenter: Carm Shouldis (University of South Dakota)
Mentor: Bryan Gibson (Physical Therapy and Athletic Training)
Effects of Virtual Reality on Motivation for Health Behaviors among Hispanic Adults with Prediabetes

Hispanics are at an increased risk for Type 2 Diabetes Mellitus (T2DM). The current study hypothesizes that a brief 3-minute Virtual Reality (VR) might increase motivation for health behaviors among individuals at risk for T2DM. Individuals at risk of T2DM were recruited from community clinics. Participants completed a baseline questionnaire that included demographics, risk perception, stage of change for healthy lifestyle, and emotions using 6-item state trait anxiety index (STAI). The first VR experience attempts to link increases in Hemoglobin A1C and risk of eye disease; participants gradually go blind as a building increases in height (a visual metaphor for increasing A1C) (Eye VR). After the Eye VR, participants repeated the STAI and provided qualitative feedback. The second VR experience is a draft first person narrative of someone that did not regularly see a dentist and subsequently experienced two heart attacks (Oral VR). After the Oral VR participants provided qualitative feedback and were consented to recontact. The follow-up questionnaire repeats measures from baseline also measures participants' subjective numeracy. Data analysis is ongoing but will include within-subjects changes in STAI, stage of change, risk perception, and will test whether subjective numeracy moderates the effect of the intervention. Analysis of qualitative feedback will also be analyzed to inform improvements in both VR experiences. Data collection is ongoing. Currently, the study includes 9 adults. Both quantitative and qualitative analyses will be completed prior to presentation. We will present the preliminary findings of a novel application of virtual reality to motivate health behavior change.

Poster 16

Presenter: Miles Robertson (Utah State University)
Mentor: David Belnap (Biology)
Creating Octahedral Particles

Polyomavirus capsids are polymorphic under different chemical conditions. The protein in play, VP1, is the primary building block of the capsid. Five VP1 proteins come together and form highly stable structures called pentamers. The number of pentamers associating together determines the curvature and symmetry of the viral capsid. Only one form is found in infectious virions, and the structure of this native icosahedral form has been studied. However, the detailed structure of the octahedral capsid is not well known. The goal of my research is to determine the detailed structure of the octahedral capsid by electron microscopy. Many particles are necessary for electron microscopy to be successful. Therefore, I have produced and isolated these octahedral particles to provide necessary data for solving the capsid structure. This capsid shape is created through a long process beginning with purification of the VP1 protein. A recombinant plasmid containing DNA for a protein tag linked to VP1 is inserted into E coli which then produces this protein upon induction. The cells are lysed and VP1 is purified by selection for the protein tag in a flow column, where VP1 is then cleaved from the tag. This purified protein then passes through three distinct chemical environments that give the conditions necessary to make the octahedral particles.

Poster 18

Presenter: Eavan Donovan (Carleton College)
Mentor: Jack Skalicky (Biochemistry)
The Roles of Human MIT Proteins in ESCRT Biology

Cell division allows cells to proliferate and pass on genetic information. In contrast, cell checkpoints halt the cell cycle until errors have been searched for. Just as air traffic control gives permission for flights to come and go, proteins that function in abscission checkpoints look for mitotic errors, and interact to promote cell separation. One class of machinery that functions in the abscission checkpoint is the Endosomal Sorting Complexes Required for Transport (ESCRT). ESCRT

proteins facilitate more than fifteen known cellular membrane remodeling processes, including cytokinetic abscission, and viral budding. ESCRT-I and -II complexes function to mark specific membranes, while ESCRT-III factors form filaments that act to mediate membrane fission. Our understanding of these processes is incomplete, therefore our primary goal is to characterize new ESCRT-III interacting proteins. Structurally, each of the twelve known human ESCRT-III proteins has a conserved N-terminal helical core, and a diverged C-terminal tail that contains MIT Interacting Motifs (MIMs), which bind to proteins that contain Microtubule Interacting and Trafficking (MIT) domains. These MIM-MIT interactions recruit MIT proteins to sites of ESCRT activity. For example, the MIT domain of VPS4 localizes the enzyme to remodel ESCRT-III filaments. Humans express 22 proteins that contain MIT domains. To date our lab has cloned, purified and tested the ESCRT-III binding activities of MIT domains from 18 of these proteins and the final four human MIT proteins (FIDGETIN (3) and KATANAL2) are being tested. The MIT constructs are expressed in *E. coli*, purified using Ni^{2+} chromatography, cleaved, and purified using size exclusion chromatography. Fluorescence polarization experiments measure the binding of each MIT domain to the C-terminal MIM elements from all twelve different fluor-labeled ESCRT-III C-terminal tails. Subsequent structural analyses of productive MIT-MIM interactions will then be used to obtain a full picture of MIT-MIM motif with the goal of identifying novel biological activities.

Poster 20

Presenter: Alec Hegg (Knox College)
Mentor: Janis Louie (Chemistry)

Investigation into the Ligand Effects on Iron-Catalyzed [2+2+2] Cycloadditions to provide Regioselective Pyridines

N-heterocycle structures are found in 51% of the small molecule drugs approved by the FDA in the past decade. Out of these 92 drugs, 25% contain a pyridine ring. Interestingly, although the molecules are often found in bioactive compounds, there are broad substitution patterns, and it is critical to be able to access them all readily. To provide a single step method of pyridine formation, we have examined a metal catalyzed [2+2+2]-cycloaddition. A number of transition metals are commonly used, primarily precious metals, but we have used iron as our metal catalyst because it has been shown to be a competent catalyst which provides a less-expensive replacement for precious metal catalysts. Through investigations into the mechanisms of two separate Fe-cycloaddition catalysts, we discovered that iron can perform both homo-oxidative and hetero-oxidative coupling and can form the 2,3,6- or 2,4,6- products selectively. The differences in the cycloadditions performed with iron have been found to depend on the ligand utilized. While it is understood that these relationships between the metal and ligand exist and that they affect the coupling, it is not well understood what causes this difference. In the PDAI system, we suspect that the partial dissociation of the ligand from the metal is critical to allow the cycloaddition to occur. Previous work done has shown that while PDAI ligands are fully capable of dissociating, the related PDI system has very limited ability to dissociate. This is evident in trials, where the PDAI ligands successfully perform cycloadditions, while the PDI ligands failed to show any conversion. We therefore decided to synthesize a mixed PDI/PDAI ligand and test its ability to perform cycloadditions and determine the regioselectivity of any products. This will give us insight into the function of the ligand dissociation in cycloadditions and show us how the ligand controls the regioselectivity of the cycloaddition product.

Poster 22

Presenter: Andrea Ibarra Suarez (Salt Lake Community College)
Mentor: Jillian Jafek (Biology)

An Emerging Role for OCA-B

OCA-B is a cofactor of OCT1 and it is found in B-cells as a transcription factor. The expression of OCA-B in Acute Myeloid Leukemia was identified in only 48% of the cases[1]. However, it is shown that OCT2 and OCA-B expression is correlated to an increased risk of relapse in patients with AML[2]. The Tantin laboratory showed that in an MLL-AF9 driven murine leukemia model the mice with an OCA-B knockout were protected against AML. To further study the role of OCA-B in AML and how leukemic cells react to OCA-B deletion, we are going to monitor OCA-B $^{-/-}$ and OCA-B $^{fl/fl}$; MX1Cre cells expressing MLL-AF9+GPF respectively. Additionally, it could be possible to impede OCA-B activity through competitive inhibition utilizing a peptide in the same murine model and human leukemia cell lines. However, it was found that the peptide is potentially toxic at high concentrations in human cells. We are going to treat NB4, MV4-11, and EOL-1 human cell lines with a concentration curve of the peptide to test its efficiency and toxicity. This method could potentially provide an improved approach to AML.

Poster 24

Presenter: Leonard Almero (University of California San Diego)
Mentor: Dipayan Chaudhuri (Biochemistry)

Does inhibiting the assembly of one mitochondrial electron transport chain complex affect the activity of the other three?

In cardiomyopathies of various causes, the heart muscle has reduced capacity to pump blood, leading to excess mortality. In these cardiomyopathies, prior research has shown poor functioning of the mitochondrial electron transport chain. Three of the four electron transport chain complexes make up a super complex and little is known about whether inhibiting the assembly of one complex, as seen in cardiomyopathies, can affect the function of the others. To better understand this rewiring of cardiac metabolism, we will examine how inhibition of each complex affects overall electron transport chain performance. To investigate whether or not inhibiting the assembly of one of the complexes can have an effect on the others, we will grow cultured human cells treated with the known complex assembly inhibitors like rotenone (Complex I), 3-nitropropionate (Complex II), antimycin (Complex III), and sodium azide (Complex IV). We will then isolate mitochondria from the treated cells and use imaging assays to measure the activity of each of the four complexes. From this we will be able to calculate the degree of specific inhibition for each complex by comparing it to our untreated control cells. These results will show whether particular complex have privileged positions in respiratory super complex function, and may help explain why mitochondrial function becomes rapidly impaired following cardiac injury.

Poster 26

Presenter: Olivia Cooper (Smith College)
Mentor: Anil Seth (Physics & Astronomy)
Chemodynamics of Complex Stellar Populations in M31

Just as petroglyphs on a rock face preserve details about the history of ancient peoples, the chemical properties and kinematics of stars provide a fossil record of the history and formation of galaxies. However, the fundamental question of how galaxies form and evolve over time is challenging to answer. In the Milky Way, the ideal laboratory for studying individual stars, we see a correlation between stellar chemistry and kinematics, but as we quickly lose the ability to resolve individual stars outside of our galaxy, we have been unable to discern this relation in most other galaxies. By studying our closest neighbor, the Andromeda Galaxy, or M31, we gain the advantage of both having a complete, external view, and the ability to resolve some of its stars, allowing us to analyze its chemodynamics. By fitting stellar spectra to high resolution (R~22,500) infrared spectroscopy from SDSS IV's APOGEE-2 project, we measure radial velocity and velocity dispersion throughout the galaxy's inner region. Our data analysis confirms the expected rotation of the galaxy, as well as reveals a slight negative velocity dispersion gradient from ~160 km/s radially outward. Beyond these findings, we also compare the kinematics for chemically differentiated stars throughout M31, in order to gain insight as to the structure, composition, and history of the galaxy.

Poster 28

Presenter: Alexis Torres (New Mexico State University)
Mentor: Trafton Drew (Psychology)
Neural processing of repeated search targets depends upon stimuli: Real world stimuli engage semantic processing and recognition memory

As part of our daily routines, we spend a vast amount of time searching for objects in our environment. In an everyday context, we may search for car keys in the morning. In a more specialized context, a radiologist searches for a fracture in a medical image. To search for and locate a novel object, we must form and hold a mental representation of it in visual working memory until we locate the object. There are two neural correlates of mental activity that inform us about whether an item is being held in visual working memory (VWM) or long-term memory (LTM), the CDA and n2pc. CDA is an indicator of working memory load and n2pc is an indicator of attention allocation to an object or an object's target features. When we get ready to search for a novel object, the representation of that item is housed in VWM-producing a larger CDA and a smaller n2pc (Kappenman & Luck, 2012). When an object is repeatedly presented, the representation is transferred into LTM-producing a smaller CDA (Carlisle, et al., 2011). In contrast to simple laboratory stimuli, repeated real-world objects result in a larger n2pc, suggesting real-world objects are more readily transferred into LTM (Jones, et al., 2018). For this project, we will investigate whether real-world objects presented repeatedly, then reintroduced after an extended period, are treated as new (represented in WM) or old (represented in LTM). Specifically, we are interested in whether the CDA is smaller and the n2pc larger for repeated real-world objects that are reintroduced after long periods of time. We expect that individuals will be faster and more accurate at locating real-world objects that have been shown repeatedly as compared to items that have only been shown once or are brand new.

Poster 30

Presenter: Celine Slam (University of Utah)
Mentor: Vikram Deshpande (Physics & Astronomy)
Thermoelectric Measurements of a Metal-Organic Framework

Power plants extract only 30 to 40% of usable energy from fuel and lose the rest of energy in the form of unusable heat [1]. Recovering this wasted heat will dramatically change the consumption of limited energy sources, such as petroleum and coal, leading to a sustainable society. Thermoelectric materials, which reliably and renewably convert heat into electricity,

are promising for recovering wasted heat, as they do not produce carbon emissions and do not require complicated mechanical systems. Electricity is generated at the interface of a thermoelectric material applying a temperature gradient across the substrate. For a thermoelectric to be efficient it must have a high figure of merit (ZT), expressed as $ZT = \frac{S^2\sigma T}{\kappa}$, where S is the Seebeck coefficient, σ the electrical conductivity, and κ the thermal conductivity. To optimize ZT, the Seebeck coefficient and electrically conductivity must be increased, while the thermal conductivity lowered. Commercially available thermoelectric materials exhibit a high ZT of around 1.5, [2], however they are toxic and costly. Metal-organic frameworks (MOFs), a new candidate for thermoelectrics, are inexpensive and non-toxic. MOFs are a favorable material because of their intrinsic porosity, which lowers their thermal conductivity. In general, MOFs have poor ZT values because of their low electrical conductivity. However, copper-benzenehexathiol (Cu-BHT) exhibits an unusually high electrical conductivity for MOFs. As such, we have measured electrical and thermal conductivity of Cu-BHT. We have found Cu-BHT's periodic, one nanometer pore size, effectively scatters phonons, contributing to its intrinsic low thermal conductivity, while conducting electrons. In future work we will focus on optimizing the ZT of Cu-BHT, by chemical doping. [1] Annual Electric Utility Data – EIA-906/920/923 Data File. (2018). Retrieved July 3, 2018, from https://www.eia.gov/electricity/data/eia923/ [2] Yamashita, O., Tomiyoshi, S., & Makita, K. (2003). Bismuth telluride compounds with high thermoelectric figures of merit. *Journal of Applied Physics*, *93*(1), 368–374. https://doi.org/10.1063/1.1525400

Poster 32

Presenter: Jose Cátala Torres (University of Puerto Rico, Rio Piedras Campus)
Mentor: Vahe Bandarian (Chemistry)
Investigating the function of two SPASM domain containing radical SAM enzymes in E. coli

Two genes encoding for a hypothetical radical *S*-adenosyl-l-methionine (SAM) maturase, each containing a **S**ubtilosin, **P**QQ, **A**naerobic **S**ulfatase, and **M**ycofactocin (SPASM) domain, were identified in *E. coli*. Each gene encoding a maturase is co-localized with a gene that encodes for a small peptide; which is hypothesized to be its substrate. To determine the function of these proteins, a putative substrate peptide and its corresponding radical SAM maturase was cloned into *E. coli* expression vectors and recombinantly expressed in *E. coli* BL21-DE3. The two peptides were co-expressed as a polyhistidine fusion in the presence and absence of the putative radical SAM maturases. The peptide was purified using affinity chromatography and analyzed via high pressure liquid chromatography mass spectrometry (HPLC-MS) to probe for the presence of any peptide modifications. This poster will summarize these results and discuss our findings.

Poster 34

Presenter: Daniel Tinoco (University of Utah)
Mentor: Mei Koh (Biochemistry)
The Role of Iron in Kidney Cancer

Intracellular iron sensing and regulation is essential to maintain normal cell proliferation. Cancer cells lack proliferative control and, therefore, may have altered iron requirements. Investigating the effects of iron deprivation on cancer cells may yield biologically and clinically important findings. This study examines the impact of iron on cancer cell proliferation and the levels of iron-related proteins in renal cell carcinoma (RCC). RCC holds particular interest for iron studies, because iron levels are often altered in RCC and the kidney influences systemic iron and oxygen homeostasis. Our hypothesis is that decreased iron availability will decrease proliferation rate in RCC cell lines and activate intracellular iron response pathways. Furthermore, we hypothesize that exposure to low oxygen (hypoxia), a common occurrence within solid tumors, will exacerbate these effects. We observed that established RCC cell lines cultured under iron-free or low iron conditions showed decreased rates of proliferation and altered protein expression. Iron concentration was controlled by defined holo-transferrin supplementation. As expected, levels of the iron storage protein Ferritin, decreased with lower iron levels and increased with iron excess. By contrast, iron excess decreased levels of transferrin receptor (TfR) and IRP2. Surprisingly, TfR showed lower expression at very low levels of iron, with levels increasing in iron-free media and the highest TfR expression at physiologic iron levels. Hypoxia further decreased proliferation and altered cell behavior. These studies highlight that the cellular response of RCC to iron deprivation may alter cell and tumor growth, which becomes more pronounced under hypoxic conditions. Further investigation into the relationship between hypoxia typically found in solid tumors and the iron deposition seen in RCC may better define the mechanisms controlling these related pathways and yield clinically relevant results to better understand and treat the disease.

Poster 36

Presenter: Matt Lassey (University of New Mexico)
Mentor: Anne Blascke (Pediatrics)
Allelic variation in fibronectin binding protein B (fnbB) of Staphylococcus aureus causing osteomyelitis

Background: *Staphylococcus aureus* causes serious infections in children and adults and is one of the leading causes of human bacterial infection. A major manifestation of *S. aureus* disease is osteoarticular infection. We analyzed genetic differences in fibronectin binding protein B (fnbB), a gene that may be involved in the tropism of *S. aureus* for bone. **Methods:** Invasive *S. aureus* isolates were identified from children 0-18 years treated at Primary Children's Hospital in Salt Lake City, Utah from 2009 to 2012. Medical records were reviewed for disease presentation. FnbB sequences from clinical isolates were aligned to a reference genome. PCR assays were developed from these alignments; one targeted the 5′ region of fnbB and a second targeted the junction between fnbB and the upstream galU gene. Gel electrophoresis was performed to confirm product size and Sanger sequencing was performed to confirm the correct target sequence. **Results:** Analysis of sequence data through the fnbB region suggested several patterns of gene presence/absence or partial coverage amongst clinical *S. aureus* isolates. PCR analysis confirmed the presence of the 5' region of fnbB next to galU in all isolates tested. Sequencing confirmed the identity of our product. **Conclusions:** PCR confirmed preliminary sequence alignment data regarding the 5' region of fnbB located next to galU. Further studies will analyze the variable region in the 3' end of fnbB. Comparing genetic data with clinical presentation will help our understanding of the relationship between fnbB polymorphisms and their association with the tropism of *S. aureus* to bone.

Poster 38

Presenter: Seo Young Ahn (University of Utah)
Mentor: Orest Symko (Physics & Astronomy)
Synchronization of Thermoacoustic Engines

Thermoacoustic engines (where heat produces sound) combined with piezoelectric devices were used to generate electricity. In order to increase the power output, arrays of 2, 3, 5, and 6, engines were studied, as needed in industry. They operate at 2.51 kHz. Since they are self-sustained oscillators, in-phase synchronization is necessary for maximum power output. Indeed, with sufficient coupling between the engines higher output power densities were achieved due to synchronization. In-phase synchronization was confirmed from measurements of Fast Fourier transforms, absence of beats between the engines, and a proportional, relative increase in output signal. Coupling between the engines is attributed to the mutual impedance of the acoustic field. In order to cope with the changes in engine resonant frequencies, caused by injected heat, the piezoelectric devices were made broadband by attaching to them selected Helmholtz resonators. This ensured constant power output for long periods of time in the presence of changes in engine resonant frequencies. With such approach, the achieved large increase in output power density, demonstrated here, supports the concept of using arrays for power applications of the devices studied here and opens the field for large scale applications.

Poster 40

Presenter: Asmita Dulal (University of Utah)
Mentor: Sujee Jeyapalina (Bioengineering)
Osteoblast Cells Behavior on Fluoridated Hydroxyapatite

Hydroxyapatite (HA; Ca5(PO4)3(OH)) coating is known to modulate the surrounding tissues' biological environment and improve the biocompatibility of orthopaedic implants. However, particulate debris from the HA coating reported to lead to an adverse tissue reactions. Biological apatites are not strictly stoichiometrically pure HA; they in fact contain carbonates, fluoride, chloride etc. Fluorohydroxyapatite (FHA) and Fluorapatite (FA) are a form of HA, in which, one or both hydroxyl ions have been replaced with fluoride ions, respectively. As FHA and FA are known to resist acid degradation much better than HA, it is predicted to have limited degradation in vivo. However, their potential as bone substitutes is less well studied and documented. Previous data generated from our group indicated improved cellular adhesions and differentiations of osteoblasts when they were sintered. This study is, therefore, aimed at investigating the in vitro osteogenic properties of sintered apatites for orthopedic application using qualitative polymerase chain reactions (qPCRs). For this study, apatite powders were compressed into 10 mm thin disks and sintered at 1050, 1150 and 1250◦C for 2 hours. After which, sterilized apatite disks and titanium controls were seeded with a known number of $5.5x10^{4}$ osteoblast cells and allowed to adhere and proliferate. At 48 and 72 hours post-seeding, cells that were attached to the disks were rinsed, and lysed with lysate buffer RLT for RNA extraction using the standard techniques, extracted RNAs were converted to cDNA. The validated primers for mineralization markers (alkaline phosphatase (Alp), secreted phosphoprotein 1 (SPP1), Runt-related transcription factor 2 (Runx), and osteopontin (OPN)) were then used to perform qPCR analyses in triplicates. Overall, when compared to the Ti surfaces, the result indicated overexpression levels of Runx, OPN, and SPP1 markers in osteoblasts that were seeded on apatite surfaces. However, protein assays need to be undertaken to confirm whether or not respective proteins were synthesized. Early results do support the potential of using FA sintered at 1250◦C for orthopedic applications.

Poster 42

Presenter: Sage Yeager (University of Utah)
Mentor: Udara Abeysekara (Physics & Astronomy)
Using a Machine Learning Based Algorithm to Improve the Sensitivity of the HAWC Gamma-Ray Observatory

The High Altitude Water Cherenkov (HAWC) observatory is a detector sensitive to gamma-rays (photons) with energies between 100 GeV and 100 TeV. Both gamma and cosmic-rays stream through the universe from their origins outside our solar system, and eventually enter the Earth's atmosphere where they interact with air molecules. The result is a precipitation of charged particles known as an Extensive Air Shower (EAS). Sitting at an altitude of 4.1 km, HAWC detects thousands of EAS footprints per second. HAWC then uses characteristics of each footprint to reconstruct the properties of the original ray; these include species (gamma or cosmic), energy, angle of incidence, e.t.c. The primary purpose of HAWC is to detect gamma-rays. Therefore, EAS generated by hadronic cosmic-rays are significant sources of background. Currently, HAWC analysis packages use subtle differences between computer simulated gamma and cosmic-ray shower footprints to identify gamma-rays in the real data. The particles constituent to a gamma-ray shower are a subset of those present in a cosmic-ray shower; in most cases it is challenging to determine the original species responsible for each shower. An efficient algorithm with the ability to separate gamma-ray generated showers from cosmic-ray generated showers could drastically improve the sensitivity of HAWC. My research has explored the potential of using Python in conjunction with SciKit Learn's AdaBoostClassifier and DecisionTreeClassifier to develop a more efficient tool to select gamma-rays. In this symposium, I will present the new machine learning based algorithm and its performances compared with those of the algorithm currently in use by HAWC.

Poster 44

Presenter: Mica Sloan (University of Utah)
Mentor: Danny Chou (Biochemistry)
Treating Type I Diabetes Through Novel, Hepatocyte Targeting, Insulin Analogs

Diabetes has become a global epidemic and the current standard of care for Type 1 Diabetes consists of 1-4 subcutaneous injections of insulin per day. The treatment works but it has some key limitations. One of which is that insulin does not reach the liver in the concentrations seen in a healthy individual; this leads to the liver continuing to release sugar into the bloodstream and adipocytes and muscle cells receiving too much insulin, which leads to long term insulin resistance. We propose to solve these problems using a multivalent ligand for hepatocyte targeting via the asialoglycoprotein receptor (ASGPR, a liver-specific receptor) to bring our insulin to the liver. Our initial proof of concept experiment began with mice which were intravenously injected with fluorophore tagged human and experimental insulin then imaged using fluorescence molecular tomography (FMT) to visualize the biodistribution of the insulin every 20-30 minutes. Preliminary data suggests that the ligand-bound insulin does demonstrate a selectivity toward liver while smaller concentrations can be found in other body systems as compared to native insulin. Using the time intervals identified through an insulin tolerance testing in mice, we will begin sacrificing our subjects and analyzing the effects of insulin in the organs through Western Blot Analysis (WBA). We expect the WBA to show liver selectivity. This concrete proof of concept is a key step as we continue our efforts to develop a more effective insulin therapy to improve patient overall health and long-term outcomes.

Poster 46

Presenter: Ilse Meiler (Smith College)
Mentor: Jennifer Shumaker-Parry (Chemistry)
Towards enantioselective chemical detection via chiral plasmonics

Localized surface plasmon resonance (LSPR) is a phenomenon where light interacts with metal nanostructures to induce the oscillation of electrons and ultimately produces amplified electric fields. This occurs when the frequency of light matches the frequency of electrons oscillating on the surface of a conductive metal. These responses can cause enhanced optical near-field effects that can be tuned through nanostructure design and structural details, leading to tailorable antenna-like optical effects. These 3-D topographical details have been examined through Atomic Force Microscopy (AFM) to better understand differences in between samples and their correlations with changes in LSPR responses. Similarly, strong chiroptical effects can be observed through interaction with circularly polarized light (e.g circular dichroism). We observe that these chiroptical properties can be controlled by altering the orientation of the sample with respect to incident light. Here, we discuss gold nanostructure features using AFM and LSPR responses using linearly and circularly polarized light as well as their responses to chiral molecules. When chiral compounds are adsorbed to the surface of these nanostructures, enhancement of the chiral compounds' inherent chiroptical properties has been observed by monitoring LSPR and circular dichroism (CD) responses and continues to be investigated.

Poster 48

Presenter: Tayla Chiang (University of Utah)
Mentor: Alicia Lai (Oncological Sciences)
Immune Regulation of RON Kinase in Breast Cancer Metastasis

Metastasis, the result of cancer cells spreading beyond the original tissue to distant organs, is the leading cause of death of nearly all types of cancer, including breast cancer. Immunotherapy has emerged recently as a new strategy for cancer

therapy. However, it is evident that cancer cells can actively subvert the anti-tumor immune response to favor tumor growth in a variety of ways. Our lab discovered that the oncoprotein, RON kinase, not only promotes tumor progression by becoming activated on tumor cells, but also by functioning on macrophages to inhibit cytotoxic T cells, the main immune cells that attack tumors. My goal in this summer research project was to compare the immune cell infiltration of metastatic breast tumors growing in the lung of mice lacking RON (RON knock-out) or with RON. Importantly, we seek to determine which type of immune cells are enriched in tumors. In order to do this, I performed immunohistochemistry staining on paraffin-embedded lung tissue to detect different cell markers (F4/80, CD11b, CD3e, B220) that denote certain types of immune cells. The goal was to examine if knocking out RON facilitates immune cell infiltration into tumors. Our data indicate that all four types of immune cells are observed in the tumor bed, and there is a potential reduction of CD11b monocytes in the tumors from mice lacking RON.

Poster 50

Presenter: Aspen Johnson (The University of New Mexico)
Mentor: Anandh Velayutham (Nutrition and Integrative Physiology)
Dietary strawberry ameliorates vascular inflammation in diabetic db/db mice possibly through a nuclear factor-κB mediated mechanism

Diabetes greatly increases the risk of cardiovascular disease such as atherosclerosis. High glucose induced vascular inflammation play a pivotal role in the development of atherosclerosis in diabetes. Recently we showed that dietary supplementation of strawberry reduces vascular inflammation in diabetic mice. However, the molecular mechanisms involved are unknown. Nuclear factor-κB (NFκB) is one of the major targets of NADPH oxidases (NOXs) which induces vascular inflammation. In diabetes, NOX derived reactive oxygen species activate IKKβ leading to the degradation of inhibitor IκBα, nuclear translocation of NFκB-p50/p65 and activation of NFκB signaling. We investigated whether the vascular effects of strawberry are mediated through NFκB. Seven-week old diabetic *db/db* mice consumed standard chow (*db/db*) or supplemented chow containing 2.35% freeze-dried strawberries (*db/db*+SB) for 10 weeks were compared to non-diabetic control mice (*db/+*). The gene expression of NOX1, NOX2, NOX4, IκKβ and IκBα in the aortic vessels from experimental animals were assessed via qPCR. In our study, diabetic *db/db* mice exhibited an increased mRNA expression of NOX2, NOX4 and IκKβ in the aortic vessels. This indicates NOX mediated NFκB activation may play a key role in the development of vascular complications in diabetic vasculature. However strawberry supplementation significantly reduced the mRNA expression of NOX2 and IκKβ in the aortic vessels of *db/db*+SB mice compared to *db/db* mice. This indicates that the vascular beneficial effects of strawberry may be possibly mediated through the suppression of NFκB mediated mechanism. Strawberry might complement conventional therapies to improve vascular complications in diabetics.

Poster 52

Presenter: Ricardo Gonzalez Montalvo (University of Puerto Rico - Mayaguez Campus)
Mentor: John Matthews (Physics & Astronomy)
Fluka Simulation of sFLASH Experiment

The Telescope Array (TA) is the largest cosmic ray detector in the Northern Hemisphere. It consists of a surface detector of plastic scintillation counters overlooked by 3 fluorescence detector sites. They are used to measure cosmic rays from 1 PeV to 100 EeV and higher by observing extensive air showers in the atmosphere. To determine the shower energy, it is important to understand the fluorescence yield (FY), which is a conversion factor from the energy deposition in air to the fluorescence light. (s)uper (F)luorescence (A)ir (SH)ower (sFLASH) is an auxiliary experiment of TA, carried out at SLAC, that measures FY in air produced by high energy electrons in a volume called the active region. In this work, we report the results of a FLUKA simulation of sFLASH in order to gauge our understanding of the energy deposition in the experiment. FLUKA energy deposition density plots and Geant4, an alternative simulation software, energy deposition deposition plots of the active region were compared to verify if accuracy of energy deposition in sFLASH is within 3%. Preliminary results show that when comparing both simulations' plots the energy deposition density measurements are similar enough to be within the 3% accuracy. Further comparisons are being made to arrive at a more concrete answer. The sFLASH FY systematic uncertainty will be reduced using the energy deposition data of sFLASH FLUKA simulations. This will improve energy estimations of high energy cosmic rays in experiments such as TA and Auger.

Poster 54

Presenter: Hayli Spence (American University)
Mentor: Dimitri Trankner (Human Genetics)
Exploring Computational Networks Across an Entire Brain at Single Cell Resolution

Currently, large scale monitoring of neuronal activity in mouse models depends on either live imaging techniques or activity snapshots based on immediate early gene expression. Both methods pose challenges: live imaging techniques utilize expensive and training-intensive multi-photon technology, whereas activity snapshots use poorly definable test

intervals and generate high background levels. To overcome these limitations, we generated a mouse line for the expression of the neuronal activity reporter CaMPARI. One of the newer tools out there, CaMPARI is a green fluorescent protein that irreversibly photoconverts to red fluorescence in the presence of high intracellular calcium levels and photoconversion (PC) light. High intracellular calcium is found naturally in active neurons, while PC light can be delivered deep into the brain through single or multiple light guides by the experimenter when and where a snapshot of neuronal activity is required.

Poster 56

Presenter: Eleni Spanolios (New College of Florida)
Mentor: Caroline Saouma (Chemistry)

Understanding the Mechanism for (^{tBu}PNP)$CoCl_2$ Catalalyzed N-formylation of Amines

The use of carbon dioxide as a feedstock for industrially relevant chemicals provides a production method for sustainably sourcing valuable fuels while simultaneously decreasing atmospheric levels of CO_2. This has been successfully achieved through the catalytic N-formylation of amines, whereby CO_2 and H_2 react with an amine at high temperatures and pressures to generate a formamide. While early reports of N-formylation have typically used more costly metals, such as Ru, Milstein et. al. recently reported N-formylation with a series of earth abundant Co based pincer catalysts. While a catalyst binding mechanism has been proposed, there has been limited direct evidence to support it. Thus, the proposed binding mechanism for one of the reported catalysts, (^{tBu}PNP)$CoCl_2$ has been investigated. Each of the proposed intermediates, (^{tBu}PNP)CoCl, (^{tBu}PNP)CoH, (^{tBu}PNP)CoCOOH, and (^{tBu}PNP)CoN_2 (all previously reported) have been synthesized independently and characterized by ^{31}P NMR and ^{1}H NMR spectroscopy. These synthesized intermediates were used in place of the main catalyst in hydrogenation reactions. Each reaction was held under high temperatures and pressures for 36 hours, in either THF or toluene, and in the presence and absence of a base, producing easily comparable results. The products of these reactions were analyzed by ^{31}P NMR, ^{1}H NMR, GC-MS (GC-FID), IC-TCD, and IR. From these results, the probability of the proposed catalytic mechanism was assessed. The results and conclusions of these experiments will be reported. The increased understanding of the catalytic system gained by these experiments is pivotal to the creation of more stable and robust catalysts for CO_2 transformation.

Poster 58

Presenter: Anisa Madey (University of Utah)
Mentor: Mahesh Chandrasekharan (Pediatrics)

Investigating the Molecular Mechanisms Regulating the Activities of CDC34 Ubiquitin-Conjugating Enzyme and UBC9 Sumo-Conjugating Enzyme

Ubiquitination is the process in which a 7.6 kDa ubiquitin protein is added to a substrate protein to mark it for degradation, change its location in the cell, or affect its activity. There are two main types of ubiquitination: monoubiquitination in which a single ubiquitin molecule is conjugated typically onto lysine-residue in the substrate protein and is generally regulatory in function, and polyubiquitination in which different types of ubiquitin chains are added which is often associated with protein degradation. Targets for polyubiquitination include cell cycle regulatory proteins whose timely destruction is important for controlling cell division. The goal of this project is to determine the mechanisms that regulate E2s function in monoubiquitination versus polyubiquitination. There two non-mutually exclusive possible hypotheses: one, the association of E2s with different E3 ligases may regulate its ability to perform mono versus polyubiquitination, and two, there may be a mechanism intrinsic to an E2 enzyme such as a molecular switch that could be related to phosphorylation and dephosphorylation that might regulate its catalytic functions. The second hypothesis is being tested in this project using the budding yeast (*Saccharomyces cerevisiae*) model. Previously, we found that E2 ubiquitin-conjugating enzyme Rad6 is phosphorylated at a serine residue in its catalytic cleft. We found that mutating this residue alters mono versus polyubiquitination functions. Sequence alignments further showed that this serine residue is conserved in other E2 enzymes. In this project we are testing the function for the conserved serine residues in regulating the functions of CDC34 and UBC9 E2 conjugating enzymes. We have created yeast deletion strains for expressing either wild-type or serine-residue mutants of CDC34 or UBC9. We have evaluated their effects on cell growth and viability, on CDC34 or UBC9's ubiquitin or SUMO conjugating activities, respectively. We will present our findings from these experiments and discuss their implications.

Poster 60

Presenter: Tristin Bullshoe (University of Montana-Western)
Mentor: Kalani Raphael (Internal Medicine)

Effect of sodium bicarbonate (NaHCO3) on kidney injury markers in diabetic kidney disease (DKD)

Hypothesis: Metabolic acidosis (MA) in DKD is defined as a serum bicarbonate <22 meq/L. Oral NaHCO3 is commonly used to treat MA in DKD to preserve kidney health. We tested the hypothesis that NaHCO3 will also preserve kidney health in persons with DKD and normal serum bicarbonate concentration. Methods: We performed a randomized, double-blinded, placebo-controlled study in 74 veterans with DKD to determine the effect of NaHCO3 on kidney injury markers over 6-months. We measured urinary levels of transforming growth factor-b1 (TGF-b1), kidney injury molecule-1 (KIM-1), and fibronectin at baseline, three, and six months and compared the mean change from baseline between the groups. Results: Mean baseline values were age 71 years, estimated glomerular filtration rate (eGFR) 51 ml/min/1.73m2, systolic blood pressure 127 mm Hg, urine albumin/creatinine 121 mg/g, and serum bicarbonate 24 meq/L. Characteristics were similar between the groups. NaHCO3 had no effect on urine TGF-b1, KIM-1, and fibronectin levels. However, eGFR was higher in those who received NaHCO3 as compared with placebo. Conclusion: Treatment with sodium bicarbonate did not lower urinary levels of TGF-b1, KIM-1, and fibronectin in persons with DKD and normal serum bicarbonate over 6-months. However, kidney function was improved. A large-scale, multicenter trial to determine the long-term effects of NaHCO3 on eGFR in DKD should be considered.

Poster 62

Presenter: Aaila Ali (DePaul University and Illinois Institute of Technology)
Mentor: Christoph Boehme (Physics & Astronomy)
Identification of Spin-Dependent Electronic Processes in Semiconductor Materials with Low Spin-Orbit Coupling

In organic and inorganic semiconductor materials with low spin orbit coupling, the recombination of charge carrier pairs is governed by spin-selection rules. The spin states of bipolar charge carrier pairs at the interface of p-n junctions of semiconductor diodes will randomly form either singlet (anti-parallel) or triplet (parallel) configurations. Due to spin-selection rules, recombination is more likely to occur for singlet pairs than triplet pairs. When recombination occurs, the number of free charge carriers changes, affecting the device current under constant voltage bias. In order to study these processes, one can therefore manipulate the charge carrier pair spin states with magnetic resonance under radio frequency irradiation, causing mixing between singlet and triplet pairs and changing the rate of spin recombination. This is proposed to manifest itself as an Electrically Detected Magnetic Resonance (EDMR) signal in the current of the commercially available diode 1N4007, and OLEDs poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) and Super Yellow polyphenylene vinylene (SY-PPV), which is monitored as a function of the external magnetic field under spin resonance excitation at radio frequencies of 100MHz, 400MHz, and 1GHz. The purpose of this research is to study whether the device current of a commercial diode under magnetic resonance excitation can be used as a readout mechanism for spin quantum states since spin states are proposed to be used as qubits in hypothetical quantum computer applications.

Poster 64

Presenter: Samantha Nelson (McPherson College)
Mentor: Anandh Babu Pon Velayutham (Nutrition and Integrative Physiology)
Dietary supplemation of blueberry modifies NFκB signaling in the aortic vessels of diabetic mice

Background: Cardiovascular disease is the leading cause of death in diabetic patients. Individuals with diabetes are more susceptible to cardiovascular disease such as atherosclerosis. In our recent study, blueberry supplementation reduced vascular inflammation in diabetic mice and blueberry metabolites attenuated endothelial dysfunction in human aortic endothelial cells. Nuclear factor-κB (NFκB) plays a major role in vascular inflammation by up-regulating chemokines and adhesion molecules. Inhibitor κB kinase (IκKβ) activates the nuclear translocation of NFκB-p50/p65 by degrading the inhibitor IκBα. In the nucleus, p50/p65 binds to the promoters of NFκB-dependent inflammatory genes and mediate vascular inflammation. In the present study, we studied the effect of blueberry supplementation on vascular IKKβ and IκBα in diabetic mice. ***Methods:*** Wild type *db*/+ and diabetic *db*/*db* mice (7-wk) consumed standard diet or diet supplemented with 3.8% freeze-dried blueberries for 10 wk. Gene expression analysis of IκKβ and IκBα in the aortic vessels was determined by qPCR. Briefly, RNeasy plus mini kit was used to isolate RNA from aortic vessel, Reverse Transcription kit was used to synthesize cDNA, and SYBR green was used to complete qPCR analysis. The gene expression levels were calculated by normalizing to the level of GAPDH. ***Results:*** Diabetes increased the expression of IκKβ in the aortic vessels of diabetic mice but did not change IκBα. Blueberry supplementation suppressed IκKβ in diabetic mice indicating the vascular effects of blueberry may be mediated through regulation of NFκB signaling. ***Conclusion:*** Blueberry consumption may be an adjunct therapy to reduce vascular complications in diabetes.

Poster 66

Presenter: Ashley Allen (University of Utah)
Mentor: Elisabeth Conradt (Psychology)
Maternal Borderline Personality Disorder and Stress Responses During Pregnancy as Predictors of Newborn Neurobehavior

Borderline personality disorder (BPD) is characterized by difficulty with emotion regulation, impulsivity, and unpredictable relationships (American Psychiatric Association, 2013). Women with BPD tend to have difficulties regulating their stress responses and impacts of stress while *in utero* affects infants neurobehavioral functioning at birth and throughout their lifespan (Kuo & Linehan, 2009). The maternal brain undergoes psychophysiological changes during pregnancy in preparation for motherhood (Rosenblatt et al., 1994). These complex processes make BPD symptoms during pregnancy problematic for both maternal and child health outcomes. Although existing literature examines risks for offspring of women with BPD, the literature on physiological mechanisms impacting infant neurobehavioral outcomes are largely lacking. Examining maternal physiologic reactivity is important because research supporting Marsha Linehan's (2009) biosocial developmental theory suggests maternal BPD and their associated physiological stress responding during pregnancy may shape infant neurobehavior while *in utero*, creating risk for neonatal impairments in attention, self-regulation, stress/abstinence, and arousal/ excitability (Crowell et al., 2009; Crandell, Patrick, & Hobson, 2003; White et al., 2011). Building on this research, the present study aims to extend previous findings in research examining infant neurobehavioral outcomes for women with BPD by examining the associations between BPD and physiological responses during baseline and to the trier social stress test (TSST) in pregnant women and by examining the associations between BPD and newborn neurobehavior. I hypothesized that higher maternal BPD symptomatology would be associated with heightened heart rate (HR) and reduced respiratory sinus arrhythmia (RSA) during baseline. I also hypothesized RSA to increase somewhat but not significantly during the recovery phases to reflect difficulty with emotion regulation. Lastly, I hypothesized higher maternal BPD symptomatology would be associated with impairments in newborn neurobehavior.

Poster 68

Presenter: Taylor Cly (University of Utah)
Mentor: Swapna Gudipaty (Biology)

Piezosome formation in crowded epithelia can be monitored using a Sphingomyelin binding biosensor

Epithelia made of one or two layers of cells form tight barriers for the organs they encase to prevent inflammation, inappropriate growth factor signaling, and invasion by pathogens. Yet they undergo rapid turnover by death and division, which could disrupt barrier function. To protect the barrier, cells fated to die are seamlessly extruded out of the monolayer by concerted actomyosin contraction of the cell and its neighboring cells, which is orchestrated by cell autonomous production of the lipid Sphingosine 1-Phosphate (S1P). Under homeostatic conditions, to maintain constant cell densities, epithelia activate live cells to extrude in crowded regions and these cells later die. We previously found that Piezo1, a stretch-activated channel, activates live-cell extrusion in response to crowding forces. However, it is unclear how Piezo1 activation triggers S1P-controlled extrusion. As crowding causes reduction in cell volume leading to plasma membrane and macromolecular crowding, Piezo1 can be driven to localize into large lamellar body-like structures we called Piezosome that may act as extrusion signaling centers. Since lamellar bodies are rich in sphingolipids such as sphingomyelin (SM), one way to observe Piezosome formation is to monitor incorporation of SM in crowded cells. Here we aim to utilize the SM-binding biosensors equnatoxin-II-GFP (Eqt-SM) that bind specifically to the plasma membranes. If Piezosomes are formed from the plasma membrane, exposing cells to purified Eqt-SM-GFP will allow us to visualize endocytosis of the biosensor and incorporation of SM in these bodies. The overall goal is to understand how Piezo1 associates with membranes to form Piezosomes which will be key to uncovering signaling mechanisms involved in extrusion.

Poster 70

Presenter: Benjamin Ringham (University of Wisconsin-La Crosse)
Mentor: Lisa Joss-Moore (Pediatrics)

Postnatal Growth Restriction Causes Sex-Divergent Changes in Elastic Fiber Deposition in the Rat Lung

Abstract: Postnatal growth restriction (PGR) increases the risk of the chronic lung disease, bronchopulmonary dysplasia (BPD), in preterm infants, with males having worse outcomes than females. BPD is characterized by impaired elastic fiber deposition. A critical component of elastic fiber deposition is the transcriptional regulator, PPARγ. We previously showed that, in a rat model, PGR decreased lung PPARγ signaling in male, but not female rats. We hypothesize that PGR causes sex-dependent changes in elastic fiber density in the rat lung. **Methods**: Growth restriction was induced in Sprague Dawley rat pups using variation in litter size. Newborn rat pups were randomized to the PGR group (litter size of 16), or the control group (litter size of 8). At day 21, pups were euthanized, lungs were collected, sectioned and stained with Hart's stain. We measured total elastin deposition in the lungs. PGR was compared to sex-matched control using a Mann Whitney test. **Results**: Results are PGR as % sex-matched control±SD (*=$p<0.05$). Rat pups in the PGR group weighed significantly less than control by day 5 and continued to weigh less through day 21. PGR increased elastic fiber density in male rats (143±41%*), but not in female rats (115±52%). **Conclusion**: PGR causes sex-dependent changes in elastic fiber density in the rat lung. We speculate that altered PPARγ signaling increases elastin fiber density in male rats. Ongoing studies are evaluating the effects of PPARg activation on elastic fiber deposition in the rat.

Poster 72

Presenter: Adityajit Kang (Bennington College)
Mentor: David Kieda (Physics & Astronomy)
Secondary analysis of Stellar Intensity Interferometry measurements from StarBase observatory, Grantsville, UT

Stellar Intensity Interferometry (SII) is an observational technique that uses the second-order coherence of light (how intrinsic intensity fluctuations correlate between simultaneous measurements in separated telescopes) to perform high spatial resolution measurements of hot stars. The first SII observations were taken in the 1960's at Narrabri Observatory by Hanbury Brown et al. to calculate the apparent angular diameters of 32 stars. Due to advancement of photon-counting detectors and development of faster electronics, there has been a resurgence of interest in the field. Here, a secondary analysis of on-sky SII measurements taken at the StarBase observatory located in Grantsville, UT is presented. The secondary analysis was performed in order to validate the initial independent analysis. We correct for the geometrical optical path delay between the two telescopes which is changing as the star moves across the sky. The effects of spurious noise correlations are removed through calibration measurements. Future work involves taking SII observations using 12-meter optical reflectors at VERITAS, AZ. SII can help us generate high resolution images of stars - potentially resolving surface features such as sunspots, or structures in the circumstellar disks and winds of fast rotating stars.

Poster 74

Presenter: Rebecca Higham, Sullivan Howard (University of Utah)
Mentor: Akiko Kamimura (Sociology)
Stress Management Classes for Uninsured Free Clinic Patients in the United States

Stress has become a growing public health concern in the United States (US). Uninsured, low-income or minority patients utilizing a free clinic are exposed to stress disproportionately across various areas of life. Health promotion programs regarding stress management have the potential to benefit vulnerable, low income populations by reducing stress related health issues. The purpose of this study was to describe and evaluate the "stress-management" education class taught at a free clinic that provides healthcare to uninsured patients. Data for this study were collected by a pre-stress management class survey, field notes during the stress management class, and post-class survey at a free clinic for low-income, uninsured patients. The surveys and class took place in June 2018. Direct observations were based off the Theory of Planned Behavior (TPB). 55 stress management classes were offered with a total of 83 participants. Among the class participants, 71 filled out the survey. Free clinic patients experience cumulative negative situations. One strategy to cope with stress is to organize participant responsibilities. Main stressors among the participants included finances, family, emotions, work, health, social relationships, and a sense of not belonging. Providing resources regarding these stressors would be a feasible solution for patients at free clinics. Future projects should work to develop stress management class which responds to the results of this study.

Poster 76

Presenter: Siddharth Iyer (University of Utah)
Mentor: Tony Pomiciter (Oncological Sciences)
Autophagy realted causes to AML Cell death post SIRT5 KO

Acute Myelocytic Leukemia (AML) is a blood cancer with an overall 5-year survival rate of less than 30%. Common treatments for AML include various forms of chemotherapy, a treatment that puts a considerable stress on the patient's body and provides varying degree's of success. Recent literature suggests that the knockdown of the mammalian sirtuin, SIRT5, significantly hinders the proliferation of certain unique AML cell lines. The pathway involved in this process is as of yet unknown, and further analysis is required. An understanding of this pathway could pave the road to a novel medical alternative to chemotherapy. The purpose of my study was to examine and measure the physiological process known as autophagy in various AML cell lines and to determine its level of influence on the SIRT5 KO pathway. Autophagy is the process by which the cell creates an organelle within the cytoplasm known as an autophagosome, which then engulfs other organelles to be recycled into raw materials for cell proliferation. The effect of autophagy was measured using various analytical methods including: flow cytometry, fluorescence microscopy, western blot analysis, and MTS assays.

Poster 78

Presenter: Edwardo Hurtado (University of Utah)
Mentor: Luisa Whittaker-Brooks (Chemistry)
A Study on the Intercalation of poly(3,4-ethylenedioxythiophene) onto Titanium Disulfide

The thermoelectric figure of merit affects the electronic efficiency of a given material, this is dependent on both the thermal and electrical resistivities, the absolute temperature, and the Seebeck coefficient. Generally speaking, an organic material has lower thermal and electrical conductivity, while an inorganic material has higher thermal and electrical

conductivity, each of these possessing a desired quality. By making a composite, which intercalates PEDOT into the lattice structure of TiS2, we hope to improve this figure of merit. These materials were chosen due to their low cost, being well researched, and commonality among other potential sources. The study was realized by electrochemically poymerizing PEDOT onto the surface of TiS2 and characterizing using SEM, XRD, TEM, etc. Special focus was placed on ensuring that the PEDOT was in fact between the individual nanostructures of the TiS2 and not simply forming two unique layers, which would defeat the purposes of this study. The electrical and thermal conductivities were then studied and compared to literature values of each of the individual components. An improved figure of merit would open a branch of research in modern day electronics.

Poster 80

Presenter: Liz Lara (University of Utah)
Mentor: Jared Bergman (Oncological Sciences)
Ezrin phosphorylation significance in ERK pathway

ERK pathway functions regulate the cell's, growth and division, death, fate, and motility. Due to the significance of this pathway, its dysregulation/amplification often results in disease, such as cancer. Specifically, in a cancer context, aberrations in this pathway result in: mutation, excessive proliferation, angiogenesis, inflammation, and inactivation of tumor suppressors amongst cells. Studies have suggested that ERK signals to many different proteins in the cell, one of them being LOK. LOK's importance includes linking up the actin cytoskeleton of the cell, which is the structure and protection of the cell. ERK phosphorylates LOK at the amino acid, T952, which activates the LOK. Studies have shown that LOK phosphorylates Ezrin at T567. Assays being carried out include knocking out the LOK protein from the ERK pathway by using CRISPR technology which allows for a clear view into what the LOK protein does for the phosphorylation of Ezrin; This could be done by cutting out the LOK protein out of the ERK pathway completely and recording the effects. LOK's effect on Ezrin could lead to discovery of a way to stifle hyperactivation of Ezrin which is seen in many cancers. Ezrin has many tasks in the ERK pathway and in the cells functions. This cytoskeletal organizer is a part of the of ezrin-radixin-moesin family which are key regulators in interactions and signaling. Ezrin plays important roles in not only cell motility, cell adhesion, and apoptosis, but also in various cell signaling pathways. Increased ezrin T567-P levels were correlated with the late stage and poor differentiation of non-small cell lung cancer. Ezrins importance signifies that the phosphorylation of Ezrin might be of some importance in order to fully understand onco nature of cells. CRISPR could also be used to create a new cell line in which assays may be performed to evaluate abilities and overall functionality of said protein.

Poster 82

Presenter: Tahno Warren (University of Utah)
Mentor: Trevor Tippetts (Biochemistry)
A Role for Ceramides in Vascular Function

Cardiovascular complications are the leading causes of morbidity and mortality in individuals with obesity, type 2 diabetes mellitus (T2DM), and insulin resistance. Complications include pathologies specific to large (atherosclerosis, cardiomyopathy) and small (retinopathy, nephropathy, neuropathy) blood vessels. Common among all of these diseases is an altered vascular endothelial cell phenotype (i.e., endothelial cell dysfunction) that is characterized by reduced nitric oxide (NO) bioavailability. Understanding the mechanisms linking obesity and dyslipidemia to the impairment in endothelial function is essential for developing new therapeutic strategies to combat these debilitating disorders. The persistent exposure of blood vessels to elevated fatty acids and lipoproteins leads to the aberrant production of ceramides, a class of sphingolipids that inhibit NO production. Previous work has shown that pharmacological approaches that inhibit enzymes required for ceramide synthesis systemically prevent endothelial dysfunction, ameliorate hypertension, and lessen the development of atherosclerosis in rodents. These data strongly suggest that ceramides are important drivers of the endothelial dysfunction that underlies cardiovascular disease. To test the relevance of ceramides in endothelial function in vivo, we studied mice lacking Sptlc2, the rate-limiting enzyme in de novo ceramide synthesis, selectively within the endothelial cell using a tamoxifen-inducible knockout mouse model. Animals were maintained on a normalchow diet for 8 weeks. In line with the aforementioned studies, animals lacking Sptlc2 displayed improved vascular flow mediated dilation (FMD) and sodium nitroprusside (SNP) induced dilation with no change in body mass or glucose tolerance. These data suggest ceramides affect vessel function in a cell-autonomous manner and reveal new therapeutic strategies for combating hypertension.

Poster 84

Presenter: Emily Swafford (University of Miami)
Mentor: Michael Vershinin (Physics & Astronomy)
Mechanical Properties of Microtubules at Extreme Temperatures

Microtubules consist of hollow, fibrous shafts that function to support eukaryotic cell shape. These filamentous intracellular structures are also responsible for various kinds of movement in eukaryotic cells, including nucleic and cell division, organization of intracellular structure, and intracellular transport, as well as ciliary and flagellar motility. Due their critical roles in cell vitality, microtubules must be able to maintain shape under force, corresponding to high flexural rigidity. Past research studied these properties of microtubule functionality up to 50 °C. We questioned the mechanical properties at even higher temperatures. Creating both flow and non-flow cells, we imaged the microtubules after we had exposed them to varying temperatures. Then, utilizing the Easyworm software tool, we studied the flexural rigidity and persistence length of taxol-stabilized microtubules from 25 °C up to 80 °C. Our preliminary values match known literature up to 50 °C and then exponentially drop until microtubules completely degrade after 70 °C. These results suggest that the degradation process involves a secondary structure conformation change rather than complete protein degradation as previously expected. Future work has the potential to prevent this alteration, enabling microtubule-based transport in engineered devices to function at much higher temperatures than they do currently.

Poster 86

Presenter: Levi Neely (Utah Valley University)
Mentor: Owen Chan (Human Genetics)
Carvedilol Improves Hypoglycemia Awareness in Rats

Patients with diabetes often encounter hypoglycemia resulting from insulin treatment, which decreases the adrenergic response. This contributes to hypoglycemia unawareness and increases morbidity. We used Sprague-Dawley rats to assess whether the adrenergic blocker, carvedilol, can improve hypoglycemia awareness (HA). The rats were treated with repeated 2-deoxyglucose (2DG; 200mg/kg, SQ) injections to make them "hypoglycemia unaware" before being treated with carvedilol. In humans, hypoglycemia unawareness is evaluated using a questionnaire that rates the intensity of hypoglycemic symptoms experienced. However, a questionnaire is not feasible for rodents, thus hypoglycemia unawareness must be measured using hunger or food-seeking behavior. We measured food intake in response to insulin-induced hypoglycemia as a surrogate marker for HA. Compared to Controls, 2DG reduced food intake in response to hypoglycemia and treatment with carvedilol increased food intake in 2DG rats ($P<0.01$). We conclude that carvedilol may be a useful therapeutic strategy to improve HA in RH rats.

Poster 88

Presenter: Daniela Vidal (The University of Texas Rio Grande Valley)
Mentor: Russell Richardson (Internal Medicine)
The role of enzyme and substrate dependence in NO-mediated vascular dysfunction with aging

The process of aging affects the vasculature, resulting in remodeling and dysfunction in both the macro- and microvascular systems. A marker of vascular health is the production and, ultimately, the bioavailability of nitric oxide (NO), which is recognized to be anti-atherogenic. NO synthesis predominantly depends upon the extracellular levels of L-arginine and the efficacy of endothelial nitric oxide synthase (eNOS), while reactive oxygen species can negatively impact both eNOS activity and NO directly leading to a decrease in NO bioavailability and vascular endothelial dysfunction. Tetrahydrobiopterin (Bh4), a cofactor which recouples eNOS, and chronic L-Citrulline (L-Cit), which increases plasma L-arginine, both by independent mechanisms, may increase NO bioavailability. Therefore, this study sought to evaluate the role of eNOS activity and/or L-arginine concentration in the NO-mediated vascular dysfunction associated with advancing age. Eight old subjects (73 ± 6 yr; ht: 168 ± 12 cm; wt: 84 ± 33 kg) received Bh4 acutely and underwent a 1 week supplementation of L-Citrulline (8 g per day). Vascular function was assessed by brachial artery flow mediated dilation (FMD: %) and passive leg movement (PLM: blood flow ΔPeak and AUC) with or without Bh4, both before and after L-Citrulline supplementation (Ctrl; Bh4; L-Cit; L-Cit + Bh4). PLM ΔPeak increased ≈35% and ≈27% in the Bh4 and L-Cit + Bh4 conditions, respectively ($p< 0.05$). PLM AUC increased ≈114% ($p< 0.05$) in the L-Cit + Bh4 condition. There were no significant intervention-induced changes in FMD. With advancing age, vascular function, as assessed by PLM, which may be more NO mediated than FMD, appears to be more limited by eNOS function than NO substrate. However, these findings also suggest that the combination of increased eNOS coupling and eNOS substrate most consistently enhances vascular function in the elderly, as assessed by the total (AUC) PLM response.

Poster 90

Presenter: Daniela Melchor (CSU Chico)
Mentor: Andrew Roberts (Chemistry)
Reaction development for the chemoselective modification of tyrosine containing peptides

The design of chemoselective reactions enables residue-selective modification of unprotected peptides. The application of such chemistry can provide access to functionalized peptide-based structures with improved therapeutic properties. Our goal is to develop a peptide-compatible chemical sequence for conversion of the phenolic moiety at tyrosine (Y) into a reactive benzyne intermediate through net loss of water. We anticipate the generated intermediate will engage

nucleophilic side-chain residues in bond-forming events to provide novel macrocyclic peptide structures. Reaction development utilized p-cresol as an early model system. Our efforts toward understanding benzyne generation from phenolic derivatives will be presented.

Poster 92

Presenter: River Gunville (Creighton Universtiy)
Mentor: Marcus Pezzolesi (Human Genetics)
Using Targeted Next Generation Sequencing to Understand the Genetic Bases of Chronic Kidney Disease

CKD is also called chronic kidney failure and is described as the gradual loss of kidney function. Chronic Kidney Disease affects 14% of Americans and associated with increased risk of mortality and morbidity. Understanding the primary case of a patient's kidney disease is essential for adequate classification, prognosis, and management. Next generation sequencing is a tool that can be used to uncover genetic diagnosis for a variety of human diseases with genetic underpinnings. The goal of this project is to perform targeted next-generation sequencing of CKD patients enrolled in the Utah Kidney Study (UKS) using the Utah Kidney Gene Panel. We anticipate that data generated as part of this project will identify the genetic cause of CKD in these patients and, thereby, demonstrate the effectiveness and utility of targeted next-generation sequencing in facilitating clinical diagnoses in CKD.

Poster 94

Presenter: Youn Lee (University of Utah)
Mentor: Frank Sachse (Bioengineering)
Functional and Structural Remodeling in Heart Failure: A Potential Predictor of Cardiac Recovery in Patients with Left Ventricular Assist Devices

Left ventricular assist devices (LVADs) are often implanted in heart failure (HF) patients as a bridge to heart transplantation. Some patients respond to LVAD implantation with sustained cardiac recovery and these patients will not need a heart transplant. The aim of our study was to investigate functional and structural remodeling in HF at the cellular level and predict cardiac recovery after LVAD unloading. Left ventricular tissues from donors (n=7) and HF patients (n=8) were sectioned, labelled, and imaged via a Leica SP8 TCS confocal microscope. We labelled the cardiac tissue sections with wheat germ agglutinin (WGA), DAPI, RyR2 antibody, and JPH2 antibody for extracellular matrix, cell nuclei, ryanodine receptors, and junctophilins, respectively. After imaging, 3D image stacks were deconvolved using measured point spread functions, and we corrected the depth-dependent signal attenuation using MatLab R2018a (Mathworks, Inc). We found major remodeling in some, but not all HF patients. The t-system in those patients exhibited sheet-like remodeling. Protein distributions were altered in tissues from some HF patients versus donor tissues. In particular, we observed that JPH2 clusters were re-localized from t-tubules to outer cell membrane (sarcolemma). Also, RyR2 clusters were redistributed with increasing distance from sarcolemma. Our results showed that cell microstructure is remodeled in many HF patients undergoing LVAD unloading. Assuming that proper localization of JPH2 and RyR2 to the t-system is crucial for normal cardiomyocyte function, we suggest that only patients without remodeling can recover cardiac function. Thus, the remodeling can serve as a predictor of cardiac recovery. We also suggest that a better understanding of functional and structural remodeling will contribute to developing innovative therapies for HF.

Poster 96

Presenter: Oriana Lopez (Arizona State University)
Mentor: Martin McMahan (Health, Kinesiology, and Recreation)
The Role of Integrin β3 and α6 in Metastatic Melanoma

Metastatic melanoma is a result of uncontrolled proliferation of melanocytes and spreading to other organs which kills approximately 90% of patients within 5 years of diagnosis. BRAFV600E is the most common mutation in cutaneous melanoma. This constitutively activating mutation induces sustained signaling of the Mitogen-Activated Protein Kinase (MAPK) pathway through MEKERK. This pathway targets several cellular processes including cell motility. Important components of motility are integrins, heterodimeric transmembrane proteins that also regulate cellular adhesion and invasion, both major elements in metastasis. ITGβ3 and ITGα6, genes encoding integrins β3 and α6, respectively, are profoundly abundant in melanoma, as seen in human and mouse cell lines. The McMahon lab published evidence that expression of ITGβ3 and ITGα6 are regulated by sustained ERK signaling. Since the increased expression of these genes are correlated with metastatic phenotypes in several human cancers and are up regulated in BRAF mutant melanoma, we hypothesize that genetic ablation of ITGβ3 and ITGα6 by using CRISPR/Cas9, will reduce metastatic potential in melanoma cell lines. To determine if these targets can be for therapeutic use, we use a panel of mouse melanoma cell lines with the BRAFV600E mutation and loss of tumor suppressors to test metastatic properties including growth, motility, migration and invasion. Results accumulated from our study will lead to further findings that in turn will improve the health of melanoma patients, including expanding the average life span after diagnosis.

Poster 98

Presenter: Kelly Walker (University of Utah)
Mentor: Marouf Hasian (Communication)
Media Mayhem & The 21st Century Celebrity: the Future of Jury Sequestration and Selection in Celebrity Trials

With the rise of outlets for media dissemination rapidly evolving everyday, an open conversation on fairness in trials covered by the media has expanded. With so much access to potentially biasing information how can current measures to downplay the role of the media in a verdict be improved even further? This paper looks to explore a current method utilized by courts, known as jury sequestration, and its effectiveness in limiting bias of juries in trials of celebrities. We examine jury sequestration and arguments for its usage through the lens of confirmation bias and cognitive dissonance theory to analyze their effectiveness. Ultimately, we recognize the impossibility of jury sequestration in a celebrity trial and look to changes in jury selection, rather than sequestration, as the answer to the problem of bias in celebrity trials. Utilizing the same framework, an analysis of jury selection improvement methods is also conducted. This paper not only serves to declare sequestration impossible, but creates a introduces a new dialogue surrounding a method that shows strong potential for the future of the American judicial system.

Poster 100

Presenter: Soe Meh (University of Utah)
Mentor: Akiko Kamimura (Sociology)
Perceptions of higher education among youths who migrated from a refugee camp in the Thailand-Myanmar border to Salt Lake City

Objective: The purpose of this study is to examine the perspectives of higher education and of academic support from family, teachers and a school. Methods: A self-administered survey was collected from high school students with a refugee background from the Thailand- Myanmar border at community events. Results: There were 114 participants as of July 20, 2018. More than 80% of their parents expect they will complete high school. More than 70% of their parents expect they will go to college. Less than 60% of the participants believe their family is able to afford their school supplies. Approximately half of their parents participate in PTA. Approximately one-quarter of the participants reported their family helped their homework in the past year. Only one-third of the participants believe they speak English very well. Less than 10% of the participants rated their academic performance as top 20% compared to their class mates in the past year. Approximately 70% of the participants plan to go to college. Discussion: Educational expectation is high among high school students and their parents. However, some of them may need financial support, more English education, and support for self-efficacy.

Poster 102

Presenter: Seth Drury (Utah Valley University)
Mentor: Rodrigo Noriega (Chemistry)
Optimization of Polydimethylsiloxane Lenses for Surface Plasmon Resonance Coupling

A Kretschmann configuration integrating a tunable polydimethylsiloxane (PDMS) plano-convex lens to couple surface plasmon resonance (SPR) was developed to investigate future charge transfer dynamic studies. PDMS lenses are a relatively inexpensive and easily fabricated lens option for optics. They allow for the adjustment of refractive index by cure temperature variation and addition of refractive index editing compounds. Optimization of the lenses also considered curing conditions, and texture of lenses. Lenses that were made in a silicon-glass mold hybrid at temperatures of 100°C proved to show SPR coupling that is comparable to that of a traditional glass prism Kretschmann configuration. Maximum SPR coupling was achieved while using an incident beam of 635 nm passing through a PDMS lens that excites a 50 nm Au layer sputtered on a coupling glass slide. This 635 nm spectroscopic setup represented an optimal SPR coupling response by affecting a steeper SPR response curve and delivering predictable coupling angles.

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