Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

Poster Session 1

Commons East, Easel 45

11:00 AM to 1:00 PM

Well-Known Euphoniumists and Their Contributions

Cassidy Trott, Senior, Music Performance, Instrumental, Bemidji State University
McNair Scholar
Mentor: Curtis Olson, Bemidji State University

A euphonium is a valved brass instrument that is the tenor voice of the tuba family and it is most commonly seen in military and brass bands. The musicians who play this instrument are called euphoniumists. During the past few hundred years the euphonium has been transformed by euphoniumists. My research focuses on nine euphoniumists from the past to the present and examines how they have shaped the euphonium world. From dictionaries, biographies, and blogs, I gathered the history and success of each of the 9 musicians and discussed the progression of the euphonium world. My research reveals that the euphonium world would not have evolved into a more prominent solo instrument if it weren't for all euphoniumists and their passion.

Poster Session 2

Balcony, Easel 89

1:00 PM to 2:30 PM

The Mental Health of Socially Transitioned Transgender Youth

Gabriella Ji, Senior, Psychology
Mary Gates Scholar, UW Honors Program
Mentor: Kristina Olson, Psychology
Mentor: Lily Durwood, Developmental Psychology

Despite our society's growing awareness that transgender people exist, transgender children remain an understudied group that falls victim to huge amount of misunderstanding in both the scientific community and the public sphere. While academic literature is decidedly mixed on how to best support children who express a cross-sex gender identity, a growing number of parents have begun to support their children in social transitioning, a process that allows the child to live as their identified gender in all social contexts. The objective of this study was to understand the impact of social transition on children's mental health using structured interviews with the parents of socially transitioned transgender children. We focused on parent's report of how transgender children's mental health (child's mood, anxiety symptoms, and externalizing behaviors) changes over time. We recruited 60 parents of transgender children whose child socially transitioned between the age of 3 and 12. To maximize representation and generalizability, we then stratified them into subgroups by age at social transition (3-5; 6-8; 9-12); gender (girls; boys); and race (white; non-white). The interview was structured around three moments in the child's life: the first sign of gender nonconforming behaviors from the parent's perspective, the parent's first realization that the behaviors might signify something more deeply about the child's stable identity, and the age at which the child socially transitioned. The interviewer asked the same set of questions regarding the child's mental health condition at the first sign, at first realization, during the year before transitioning, and during the year after (if applicable). Two coders then coded the wellbeing of each child in each of the mental health domains at each time point. Findings of the study will have implications for the developments of research and clinical work as how to best support transgender children regarding their social transition.

Poster Session 4

Commons East, Easel 60

4:00 PM to 6:00 PM

Spectroscopic Analysis of Carbonyl Modes in Deuterated Electrolytes for Energy Storage Applications

Po Ki (PoKi) Tse, Senior, Chemistry
Mary Gates Scholar, UW Honors Program
Mentor: Cody Schlenker, Chemistry
Mentor: Jarred Olson, Chemistry

The goal of this project is to analyze and compare the carbonyl (C=O) stretch of ethylene carbonate before and after deuteration. This molecule is commonly used as a primary component of electrolytes in batteries, and exhibits a strong C=O stretching mode. The C=O mode is a sensitive reporter to an electric field through a process known as the Stark effect. A shift in peak position is associated with a quadratic Stark effect, while a widening of the lineshape is representative of a linear Stark effect. Many times, a combination of the linear and quadratic Stark effect manifest in analysis of the lineshape. Unfortunately, the absorption peak of

C=O stretching is split into a doublet due to the presence of a fermi resonant mode, causing a significant misrepresentation of the C=O lineshape. This would result in a poor estimate of an electric field associated with a linear and/or quadratic Stark effect. Substituting the hydrogen atoms on ethylene carbonate for deuterium results in a reduction of the previously mentioned fermi resonant effect, enabling a better interpretation of C=O lineshape for the analysis of Stark effects. Recently, we have observed a shift in the C=O peak position of carbonate-based electrolytes at the interface silicon nanoparticle-based electrodes. It is our hypothesis that this change in vibrational peak position is due to the previously mentioned Stark effect, a measurable electric field at the nanoparticle interface. This is significant because one could correlate the magnitude of this hypothetical interfacial electric field with the performance of a battery containing Si nanoparticles. To better estimate the linear and quadratic Stark effect contributing to the magnitude of this interfacial electric field in future studies, we have characterized the lineshape of deuterated vs. non-deuterated ethylene carbonate, as well as attempted to synthesize the material in both forms using inorganic catalysts.

POSTER SESSION 4

Balcony, Easel 102

4:00 PM to 6:00 PM

The SABRE Platform: A Novel, Unbiased, Nature-Driven Technology for Cancer Drug Discovery

Savanna S (Savanna) Carmack, Junior, Biochemistry
Mentor: Jim Olson, Pediatrics
Mentor: Shelli Morris, Clinical Research Division

Targeted therapies designed to inhibit hyperactive oncogenic signaling have demonstrated some encouraging clinical responses. However, many of these responses are not durable as tumors may develop new mutations to "work around" pathway inhibition leading to drug resistance. Technologies that enable more efficient discovery of "suites" of drugs that inhibit multiple pathway nodes are needed. The SABRE (Splice Acceptor Brilliant Reporter) platform was developed to provide an unbiased method to screen large compound libraries and dramatically improve the speed and efficiency for which novel targeted therapeutics can be identified. SABRE is built on the premise that oncogenic changes in gene transcription can be harnessed as powerful reporters of pathway activation status. SABRE utilizes gene trap technology coupled with a drug selection process to isolate cells that generate a robust "off to on" luciferase signal in response to pathway inhibition. Via massively parallel comparative analysis, multiple traps let nature provide the best reporter for further analysis and drug discovery. We employed the SABRE technology to identify insertion sites specific to the MAPK (mitogen-activated protein kinase) pathway, an oncogenic pathway that is implicated in a plethora of cancers. Experiments were performed using the human melanoma cell line A375, containing BRAFV600E mutation. SABRE lentiviral transduced A375 cells were treated with trametinib, an inhibitor of MAPK pathway, and clones were isolated that emitted a positive luciferase signal upon drug treatment. To determine if these reporters were MAPK pathway specific, the platform was used to screen a 6000+ compound library. Results from the screen found that 70% (28/40) of the top drug hits were known to directly modulate the MAPK pathway revealing the power of the SABRE gene trap technology to generate a panel of reporters specific to an unlimited number of cancer signaling pathways. SABRE holds the promise for discovering untapped drug therapies for cancer.

POSTER SESSION 4

MGH 206, Easel 178

4:00 PM to 6:00 PM

Tests for Coevoltuion in a Microbial Mutualism

Navriti Sharma, Senior, Biology (Bothell Campus)
Norhan T. Algetany, Senior, Biology (Bothell Campus)
Doibu Marip, Senior, Chemistry: Biochemistry (Bothell), Biology (Bothell Campus)
Jagroop Singh Mutti, Senior, Biology (Bothell Campus)
Mentor: Kristina Hillesland, Biological sciences, School of STEM
Mentor: Colin Feng, STEM

Bees and flowers trade nectar for reproduction. Rhinos provide food to birds in exchange for removal of parasites. Mutually beneficial interactions like these pervade the natural world, but their impact on the process of evolution is not well understood. Here, we test whether each species in a microbial mutualism repeatedly adapts to the changes in their partners, or coevolves. In our model system 22 communities of the *Methanococcus maripaludis* (archaea) and *Desulfovibrio vulgaris* (sulfate reducing bacteria) evolved for over 3000 generations in the laboratory. To test whether coevolution occurred, we separated the *D. vulgaris* and the *M. maripuludis* in the mutualistic community at 1000 generations. We then paired these 1000 generation *D. vulgaris* populations with *M. maripaludis* at different evolutionary time points and measured the growth rate and yield of each population. If *M. maripuludis* coevolved with *D. vulgaris* then we would expect the 1000 generation *D. vulgaris* to perform better with future partners (0-1000 generations) than past partners (1000-2000 generations) because mutualists are expected to have positive effects on each other's fitness. A preliminary experiment with 6 communities indicated the opposite, that *D. vulgaris* grew faster with past generations compared to future generations. The yield of communities was similar across pairings. These results could indicate *D. vulgaris* has coevolved with *M. maripaludis*, and that there is an underlying antagonism between

these species that has not been recognized. We present the results of a more extensive experiment, testing more mutualistic communities at more time points, and looking for patterns of coevolution in both species.