UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

Online Proceedings

Poster Session 1

Balcony, Easel 111

11:00 AM to 1:00 PM

Soil Microbial Abundance is Reduced by Fertilizer

Leana Lynn Axtell, Junior, Environmental Science & Resource Management
Mentor: Serita Frey
Mentor: Jessica Moore, Natural Resources and the Environment, University of New Hampshire
Mentor: Kevin Geyer, Natural Resources & the Environment, University of New Hampshire

Anthropogenic nitrogen (N) emissions have caused an increase in global N deposition, and the northeastern United States is a N deposition hotspot. Nitrogen deposition could impact soil microbial abundance because most soil biota evolved under low N conditions. Soil microbes are key to many ecosystem processes such as organic matter decomposition, which makes nutrients available for plant growth. Therefore, understanding the factors controlling microbial abundance is critical for being able to predict ecosystem processes. We hypothesized that fungal and bacterial abundance and the fungi:bacteria ratio in soil would decrease along a natural N deposition gradient in the northeastern US, and be further reduced by fertilizer application. To address our hypothesis, we collected soil from eight different sites, six of which had experimental plots where N fertilizer had been added. At each site, we collected soil from four ambient or control plots and, if available, four fertilized plots (48 total plots). We measured microbial abundance using phospholipid fatty acid analysis (PLFA). We compared microbial abundance in fertilized to control plots using t-tests, and we analyzed changes in microbial abundance along the natural N gradient using regression analysis. We found that ambient N reduced bacterial abundance ($p = 0.03$, $R^2 = 0.08$), but it did not affect fungal abundance ($p = 0.17$, $R^2 = 0.02$). Fertilizer had no overall effect on fungal ($p = 0.72$, $t = 0.36$) or bacterial abundance ($p = 0.91$, $t = -0.12$). However, fertilizer did reduce bacterial ($p = 0.02$, $F = 5.6$) and fungal ($p = 0.02$, $F = 5.8$) abundance at high levels of ambient N deposition. In conclusion, our study showed that soil microbial responses to fertilizer in the northeastern US depend on the background levels of atmospheric N deposition.

Session 1C

Blurred Realities, Ethical Questions and Media Critiques

Session Moderator: Barbara Miller, Art History, Western Washington University

MGH 171

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Organ Harvesting, and the Value of Brown and Black Bodies, and its Portrayal in Modern Media: Analyzing the Film, *Get Out*

Bryan Gregory Barnett, Senior, Interdisciplinary Arts & Sciences (Ethnic, Gender & Labor Studies), UW Tacoma
Mentor: Ellen Moore, School of Interdisciplinary Arts & Sciences

This research will better illustrate the paralells of melanocyte harvesting as it has been shown in modern media, through the 2017 blockbuster, *Get Out*. Essentialy, Melanocyte harvesting is the process in which melanocyte cells are stripped from their host and then distributed for their various benefits. Many benefits of melanocyte harvesting is not only their monetary value, but their medical value. This research is important for the reassurance of the value of the brown and black body in a society designed on dismantling the institutions marginalized peoples represent. The methods of the harvesting initially come post mortem, however, the methodology of why is to be shown through the research. Not only will this research draw paralells with this film, but this research will also address the conversation of value, in regards to brown and black bodies. Using a psychoanalytic approach while analyzing this film, these very connections and paralells will be evident.

Session 1O

Unexpected Rebellions: Reframing the Norm

Session Moderator: Michelle Liu, English

MGH 288

12:15 PM to 2:15 PM

* Note: Titles in order of presentation.

A Beast in the Pews: *The Autopsy of Jane Doe,* A Contextual Analysis

Jeffery (Jeff) Salazar, Recent Graduate, Interdisciplinary Arts & Sciences (Communication), UW Tacoma
Mentor: Ellen Moore, School of Interdisciplinary Arts & Sciences
Mentor: Alexandra Nutter Smith, Culture, Arts, and Communication

Steeped in ritual, *The Autopsy of Jane Doe* walks viewers through the (mediated) processes of a clinical autopsy with the subject being a young, recently-deceased woman in pristine condition. Psychoanalysis of this film reveals deep interconnections of Freud's structures of the mind and cultural portrayals of gender power dynamics. Dillman explores the concept of a "dead-beginning", where women play active roles in story development, yet experience a halting of "temporal progression", reinforcing the objectification and exploitation of women's bodies. What starts as a routine procedure, beginning with cataloguing of biometric data, quickly turns into chaotic mania as dead bodies are reanimated, flash floods trap the inhabitants and a dead woman seems to have taken control of the building. Using a psychoanalytic approach, this paper illuminates major connections between the id, ego and superego while also identifying the preconscious, conscious, and unconscious functions of the brain. As expressed through character interaction and symbolic relation, this paper posits that the continued shallow practices of female representation contribute widely to a culture built on systematic oppression and the exploitation of women as sexual objects. Furthermore, Jane Doe's retaliation over her circumstances echo traits of the #MeToo movement and the crucible of men in positions of power.

SESSION 1Q

CHEMISTRY AND BIOCHEMISTRY

Session Moderator: Michael Heinekey, Chemistry
JHN 022
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Effects of Peptide Microenvironments on the Electronic Properties of Tryptophan

Timothy (Tim) Welsh, Senior, Applied & Computational Mathematical Sciences (Biological & Life Sciences), Chemistry, Biochemistry
Mary Gates Scholar, UW Honors Program
Mentor: Stefan Stoll, Chemistry
Mentor: Ellen Hayes, Chemistry

Many biochemical processes rely on the conversion of electrical energy into chemical energy. Tryptophan is one aromatic amino acid that facilitates electron transport through proteins by means of reduction and oxidation reactions, allowing for the energy conversion to occur. The ability for a protein to tune the reduction potential of tryptophan is critical to its function in reactions within enzymes such as cryptochromes, which are involved in regulation of circadian rhythm, and photolyases, which are involved in DNA repair. This tuning of the reduction potential is achieved by modulation of the microenvironment surrounding tryptophan residues within a protein. In order to study the relationship between protein environment and tryptophan oxidation, we have designed and synthesized a series of model peptides to engineer specific environments which have the same geometry but differing charge states and levels of solvent exposure. The reduction potential of each peptide was determined via differential pulse voltammetry over a pH range from 1-7.5 in order to determine how the pH dependence of tryptophan's reduction potential responds to changes in its microenvironment. The results indicate that the reduction potential of tryptophan at the physiologically relevant pH=7.5 increases with increasing positive charge in the surrounding microenvironment. The results across the entire pH range indicate that the pKa of oxidized tryptophan increases with decreased solvent exposure. Finally, our entire series of peptides indicates that the tryptophan oxidation reaction does not directly follow the expected Nernstian behavior for pH dependence of a single proton-coupled electron transfer reaction and thus indicates that the oxidation process may have differing degrees of reversibility in difference environments.

POSTER SESSION 2

Commons East, Easel 59
1:00 PM to 2:30 PM

Students of Color in STEM: Representation, Inclusion and the Lack Thereof

Fadumo Asad Abdirahman, Senior, Interdisciplinary Arts & Sciences (Communication), UW Tacoma
Mentor: Ellen Moore, School of Interdisciplinary Arts & Sciences

This research explores the underrepresentation of students of color in the STEM fields, focusing on the University of Washington as a case study and examining retention, representation and inclusion. In recent years, there has been a push to graduate and increase the number of students joining the STEM work fields in the U.S. The completion rates of STEM students, especially students of color, has increased concern. A study found that only 37% of students studying a STEM major completed their degree. That percentage is much smaller when students of color are taken into account. When education prior to college comes into play, studies have noticed that many of these students may not have the chance to consider STEM because of the lack of resources and opportunities in their middle schools, high schools and even as

early as elementary school. This is a problem because pre-college achievement and participation in STEM go hand in hand. I have examined change over a 10 year period at the UW and compared my findings to the change on a national level. To understand the trend of underrepresentation of students of color at our school, I have collected quantitative and qualitative data in various forms including data from the UW president and offices. It's believed that students of color simply are not interested in STEM or college but this is not the case. My research explores the access of STEM for students of color, representation and exposure and specifically takes a look at retention, representation and inclusion within the UW system.

POSTER SESSION 3

MGH 241, Easel 127

2:30 PM to 4:00 PM

Functional Mobility Analysis and Classification of Turning Strategies in Older Adults

Molly U. Nguyen, Senior, Biology (Bothell Campus)
Mentor: Ellen McGough, Rehabilitation Medicine, Physical Therapy

Older adults are at high risk for fall-related injuries that contribute to decreased quality of life and higher health care costs. Risk for falling is especially high during everyday activities involving turns and transitional movements. However, little is known about movement strategies that older adults use when turning. Therefore, the purpose of this research is to identify turning strategies in older adults. In this study, we examined movement strategies used for 180 degree turns during a clinical test of functional mobility, the Timed Up and Go. The Timed Up and Go test measures the time it takes to stand up from a chair, walk, turn around, walk back to the chair, and sit down. Thirty-one older adults (means age 85.6 years) were studied using Qualisys Motion Capture laboratory-based quantitative motion analysis (eight-camera system) and APDM portable body-worn sensors (inertial sensor system). Five distinct turning patterns were identified through frame-by-frame observational analysis of the Qualisys output. Quantitative methods were then applied to characterize parameters of turning in older adults, including turn duration (seconds), turn angle (degrees), and peak turning velocity (meters/second). Finally, we explored relationships between turning patterns and predictive tests of functional mobility and falls in older adults. These measures will be vital in identifying early signs of fall risk in older adults. As a result of this research, we can classify and quantify turning strategies using innovative technology. The results of this research have clinical implications, for healthcare practitioners, to identify people who are at risk for falls and construct therapeutic activities to prevent fall-related injuries.

POSTER SESSION 3

Balcony, Easel 113

2:30 PM to 4:00 PM

Development of Perineuronal Net Fibers in the Auditory Centers of *Eptesicus fuscus*, The Big Brown Bat

Elyse Vera Janzen, Senior, Psychology
Mary Gates Scholar, UW Honors Program
Mentor: Ellen Covey, Psychology

Neural plasticity is a prominent feature of brain anatomy that is prevalent through various stages of development. However such plasticity is not maintained through the entirety of an organism's lifespan and diminishes at varying rates in different brain regions. As regions of the brain become less plastic, perineuronal net fibers increase, and can be taken as an indicator of the end of the critical period of plasticity. The presence of these fibers have been connected to numerous neurodegenative disorders and appear to be a prominent feature of the disorder group. I hypothesize that different neural regions follow different biological timelines and retain their neuroplastic properties for varying amounts of time. By measuring the growth and development of these fibers in the auditory centers of *Eptesicus fuscus,* I can establish a comprehensive timeline of their development. This allows me to develop a timeline of the pattern of plasticity within the different structures of the auditory system. This could provide helpful insight into the conditions under which neurodegernative disorders are more likely to occur.