Online Proceedings

SESSION 1C

HISTORIES OF POWER, SOCIAL DIFFERENCE, AND COMMUNITY FORMATION

Session Moderator: Ileana Rodriguez-Silva, History
228 MGH
1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Finding a Voice: The Korean Struggle against Japanese Imperialism and One American Journalist's Fight to Assist Them
Kathryn Perkins, Senior, History, Pacific Lutheran University
Mentor: Beth Kraig, history, Pacific Lutheran University
Mentor: Robert Ericksen, History, Pacific Lutheran University

During the colonial period in Korea the Japanese tried to squelch Korean identity, enfolding the Korean people within their expanding empire. As Japan's policies and actions on the peninsula became increasingly oppressive, the Western world naively accepted Japan's benign explanations. However, not everyone disregarded the warning signs in East Asia. Thomas F. Millard, an American journalist, was struck by the Korean plight and took up the Korean cause for independence in his writings. Millard was not only immersed in the affairs of East Asia, he was passionate about what he wrote. As Japanese historians and politicians worked to distort the Korean voice so that it reflected a supposed need for and acceptance of Japanese assistance, Millard attempted to expose their deception. In response to Japanese domination, Korean nationalism rose. Koreans formed a national identity centered on their shared heritage. Identity needs both internal and external recognition. Though the Korean people never identified as Japanese, during the colonial period the rest of the world saw them as Japanese citizens, not Koreans. In 1948 the United Nations agreed that nationality was a human right. Though the Universal Declaration of Human Rights was far from being conceived in the early 1900s some people already believed in the rights that it would solidify; Millard was one of those people. He saw Japan's actions as criminal, and he wrote about just that. As the Japanese tried to muffle Korea's voice, Millard became a conduit for that voice. In a present-day world that still wrestles with the vestiges of imperialism, Millard's work is a testament to the importance of listening to the multitude of voices that continue to sound around the globe.

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A Sight Distorted by the Glass Booth: Views of Adolf Eichmann and Ideas of Evil
Julia Walsh, Junior, History, Pacific Lutheran University
Mentor: Robert Ericksen, History, Pacific Lutheran University

The Holocaust is an example of an Encounter with the 'Other' in world history. It is plain to see that the Nazis viewed the Jews as "other", but the converse is also true, and to see the Nazis as the "other" is still common today. However, is Nazism an aberration, an "other", an outsider to the historical process? And even more than that, are individual Nazis, including Adolf Eichmann "other"? There are primary sources from the time regarding Eichmann's personality and actions. These primary sources include trial and interrogation transcripts as well as literature about Eichmann from the time. There are also secondary sources to see what scholars think about Eichmann. My paper is organized by the questions I ask about the Eichmann texts and the understandings I form through those documents. Some of these questions might be formed as: Is Nazism an aberration, an "other", an outsider to the historical process? And even more than that, are individual Nazis "other"? Specifically, who is Adolf Eichmann and what problem does he pose for humanity? What does Eichmann as an individual perpetrator mean for history? Is Eichmann the Other? Or, what do we have in common with "evil" and its banality? My primary hope for researching this topic was to understand, in some small way, human evil. To know about Adolf Eichmann and his evil is not to understand

him or excuse him. His personality and character (or lack thereof) remains befuddling to me. In terms of what this paper accomplishes, I I address "otherness" as a concept which alienates perpetrator from victim as well as victim from perpetrator, and (for this essay) the perpetrator as Other for the rest of society.

SESSION 1D

MEDICAL THERAPEUTICS AND ENDOCRINOLOGY

Session Moderator: Ian Sweet, Medicine
231 MGH
1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Nalfurafine as a Novel Treatment for Hot Flashes
Lee Wohlen (Lee) Organick, Junior, Biology (Molecular, Cellular & Developmental)
Mary Gates Scholar
Mentor: Robert Steiner, Obstetrics And Gynecology
Mentor: Amy Oakley, Physiology and Biophysics

Hot flashes affect 75% of menopausal women, leaving them with recurring flushing, sweating, skin blotching, and occasional anxiety, palpitations, and sleep disturbances. 20% of those affected describe the symptoms as "intolerable," and current treatment methods carry too many side effects or are insufficiently effective. We propose the drug nalfurafine to prevent these symptoms. Nalfurafine has the distinct clinical advantage of being taken orally and targeting κ-opiod receptors outside of the blood-brain barrier, leading to minimal side effects. κ-opiod receptors decrease the activity of Kiss1 neurons, and we believe kappa agonists such as nalfurafine inhibit the Kiss1 neuron activity we hold responsible for hot flashes. To test this hypothesis, we injected nalfurafine in mice and collected blood and brain samples, expecting reduced levels of specific hormones and proteins associated with Kiss1 neuronal activity. Analysis of data collected in this study is ongoing. If our hypothesis is incorrect, we will have a new understanding of how κ-opiod receptors regulate Kiss1 neuronal activity. However, if we find evidence that nalfurafine inhibits Kiss1 neuronal activity, it may alleviate hot flashes in women, thereby providing rationale for clinical studies and potentially leading to a therapy that would improve quality of life for millions of women.

SESSION 1L

QUANTIFYING THE EFFECTS OF HUMANS ON THE ENVIRONMENT

Session Moderator: Bonnie Becker, Academic Affairs (Tacoma)
271 MGH
1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Influences of Anthropogenic Antibiotics from Fish Farms and Aquaculture on Intertidal Ecosystem Health
Ryan D'jay, Senior, Oceanography
Mentor: Rick Keil, Oceanography
Mentor: Robert Morris, School of Oceanography

Marine ecosystems are vulnerable to anthropogenic influences due to increased stresses from climate change and habitat destruction. Fish farming, aquaculture, and the pollutants of antibiotics and organic matter produced by them are one influence that has been observed to affect local marine wildlife leading to increased resistance to bacterial pathogens and increased algae cover. Rocky Intertidal Zones of the Pacific Northwest are environments that are under intense thermal and desiccation stresses. The unique organisms that inhabit these areas have adapted to live under these high stress conditions. I researched the effects of fish farms and oyster farms on the health of rocky intertidal communities, by quantifying shifts in species richness and biodiversity, near the aquaculture sites. The research took place in Barkley Sound between January 26th and February 2nd in 2013 on rocky beaches near fish farms, oyster farms, and control sites away from aquaculture locations. Ecosystem health was determined by evaluating species richness, bio diversity, and presence of keystone predator, Pisaster ochraceus, using standard quadrant surveys. I collected water samples for Solid Phase Extraction and Liquid Chromatography Mass Spectrometry to determine concentrations of anthropogenic antibiotics released from fish farms. I hypothesized that the presence of antibiotics will decrease biodiversity and species richness in rocky intertidal communities. Determining what effect and how strong of an impact these influences have on the environment may help define future environmental policies and fish farming protocols.

SESSION 2I

AQUATIC MICROBIOLOGY

Session Moderator: Frieda B. Taub, Aquatic & Fishery Science
251 MGH
3:45 PM to 5:15 PM

* Note: Titles in order of presentation.

Culture Experiment: Elucidating the Roles of Sulfur Oxidizing Bacteria in Marine Nutrient Cycles
Yih En Lim, Senior, Biochemistry
Mary Gates Scholar
Mentor: Robert Morris, School of Oceanography

Bacteria play important roles in marine nutrient cycles. However, most marine bacteria are uncultured and little is known about their specific functions in marine nutrient cycles. Environmental members of the gamma proteobacterial sulfur oxidizer (GSO) clade have the genetic potential to use energy from sulfur oxidation to assimilate carbon, suggesting that they contribute to carbon and sulfur cycling in the oceans. Here we report the isolation and initial characterization of an open ocean representative from the GSO clade. Our isolate, GSO-NP4, was purified and its identity confirmed by 16S rRNA gene analyses. This isolate grows to relatively low cell densities (2 x E5 cells/ml) and has a doubling time of approximately 19 hours. Six 1L cultures were required to obtain 3.1g of DNA for genome sequencing. Six to twelve additional 1L cultures were established to obtain enough DNA to sequence the complete genome of GSO-NP4. Genomic information of this isolate is essential for future studies to determine the roles of GSOs in marine carbon and sulfur cycles.

POSTER SESSION 3

Commons East, Easel 58

2:30 PM to 4:00 PM

How Persistent Vortices along a Kelvin-Stuart Cat's Eye Separatrix Shaped Upper Half Affect Flight Characteristics of a Wing
Nicholas James (Nick) Harvey, Junior, Pre Engineering
Jacob Lloyd Hamilton, Sophomore, Pre Engineering
Mentor: Robert Breidenthal, Aeronautics & Astronautics

The lift-to-drag ratio (L/D) of a wing or propeller is the most important measure of its performance, as a higher ratio defines more efficient designs. The goal of my group's project is to show that sufficiently strong and persistent vortices along the top of a wing will positively benefit its aerodynamic efficiency. Previous results in the UW Fluid Dynamics Lab show that a wavy wall modeled after the Kelvin-Stuart Separatrix shape - which intends to more accurately outline the vortice's flow - further minimize boundary layer turbulence compared to previous wavy wall shapes. We believe that modeling the upper half of our wing along the Kevlin-Stuart Separatrix will keep the boundary layer attached even at very high angles of attack, with relatively low drag coefficients. Two model wings are being tested in the wind tunnel, a control wing with a familiar smooth top half and our experimental model outfitted with vortex generators and the top half shaped to match the Kelvin-Stuart separatrix. Further research may include attaching surface tufts to both models, which qualitatively aid in visualizing flow. The models are mounted to a force balance system, which returns the lift and drag. Our experiments test various angles of attack and vortex generator configurations to compare the wings in different situations, such as take-off and cruise. Achieving the desired L/D will have broad implications for both wing and wind turbine propeller design. More efficient wings could drastically lower fuel costs for airliners, and more effective wind turbines would return more energy at lower cost.

POSTER SESSION 3

MGH 241, Easel 132

2:30 PM to 4:00 PM

Detection of Homocysteine and Cysteine using Fluorescence Dialdehyde
Katherine Huynh, Junior, Micro-molecular Biology, Chemistry, Portland State University
McNair Scholar
Mentor: Robert Strongin, Chemistry, Portland State University

Cysteine and homocysteine are two important amino acid biomarkers related to human health. The presence of homocysteine at high concentrations in the bloodstream is correlated with various disorders such as cardiovascular and Alzheimer's diseases. Healthy cysteine levels are important in preventing lethargy, edema, and liver damage. Because of their critical roles in human health, we report the development of fluorescent and chromogenic indicators to monitor homocysteine and cysteine concentrations rapidly and inexpensively using absorption and fluorescence spectroscopy. Several aldehyde-modified probes have been developed for thiol detection, with their function based on spectral changes associated with their respective heterocyclic products formed upon reaction with cysteine and homocysteine. These reaction products exhibit specific excitation, emission, and absorbance wavelengths related to the concentration of target analytes. In the case of fluorescein dialdehyde, our previously reported results indicated a UV-vis absorbance change and fluorescence quenching in response to both analytes. We hypothesize that judicious selection of experimental conditions will allow improved sensitivity and selectivity for specific analytes. The current study focuses on optimizing experimental conditions by evaluating several pH values and excitation wavelengths. The data shows that the response of fluorescein dialdehyde to thiols is pH-, wavelength-, and time-dependent, with difference in the responses toward cysteine and homocysteine. Further investigation of these and related compounds will elucidate the mechanism responsible for the selectivity and allow for increased utility of this class of aldehyde-modified probes

POSTER SESSION 4

MGH 241, Easel 150

4:15 PM to 5:45 PM

Mapping *Kiss1* Gene Expression in the Mouse Brain

Paige Haas, Sophomore, Biology (Molecular, Cellular & Developmental)
Mentor: Robert Steiner, Obstetrics And Gynecology
Mentor: Don Clifton, Obstetrics And Gynecology
Mentor: Simina Popa, Molecular and Cellular Biology
Mentor: Caroline Cho, OB/GYN

The *Kiss1* gene encodes a neurotransmitter whose expression in the brain is essential for reproduction. Previous studies with *in situ* hybridization and immunocytochemistry have identified *Kiss1* expression in several hypothalamic nuclei, including the arcuate. To determine whether *Kiss1* expression is limited to the hypothalamus, we developed a transgenic mouse that expresses a marker gene (*tdTomato*) if and only if *Kiss1* expression is turned on. *tdTomato* encodes a red marker protein that is constitutively expressed, labeling the cell forever as having once expressed *Kiss1*. We looked for tdTomato labeling in brain sections to identify areas that reveal expression of *Kiss1* at some time during development. Surprisingly, we found tdTomato labeling outside of the hypothalamus. Possible causes include *Kiss1* expression early in development or low-level *Kiss1* expression in adulthood. Distinguishing between these possibilities has important implications for developing tools to genetically manipulate Kiss1 neurons in adult animals. We will test the hypothesis that *Kiss1* is widely expressed at low levels in the adult brain. *Kiss1* transcription will be mapped in two ways. First, brain sections will be examined for the presence of green fluorescent protein (GFP). GFP is expressed under the *Kiss1* promoter, but it may not mark low levels of *Kiss1* transcription. Therefore, *Kiss1* expression in adulthood will also be tested by *in situ* hybridization. *In situ* hybridization radioactively marks *Kiss1* mRNA, illuminating even low levels of transcription. Comparing *in situ* hybridization between wild-type and Kiss1 knockout mice may reveal low levels of *Kiss1* mRNA outside the adult hypothalamus— and open new possibilities for a physiological role of *Kiss1* signaling that extends beyond reproduction.

POSTER SESSION 4

Balcony, Easel 117

4:15 PM to 5:45 PM

Quantifying the Fate of Applied N Fertilizer Over a One-Year Period in Douglas-Fir Plantations using Stable Isotope Technology

Joanna Ciol (Joanna) Harrison, Freshman, Environmental Science & Resource Management
Mentor: Betsy Vance, School of Environmental and Forest Sciences
Mentor: Robert Harrison, Forest Resources

Nitrogen is a commonly limiting nutrient for Douglas-fir growth in commercial stands throughout the Pacific Northwest. Fertilizer nitrogen is applied to mitigate these deficiencies though some studies estimate that only about 30% of the nitrogen is actually taken up by the trees. Knowing where the rest of the nitrogen goes will help determine the best way to fertilize trees and reduce excess use of nitrogen fertilizers. This is beneficial both to stand managers looking to reduce costs associated with fertilization and to the environment as excessive fertilization can lead to increased nitrates in water. For this study, fertilizers labeled with 15N were used to track to the movement of nitrogen within a commercial Douglas-fir ecosystem. Nitrogen-15 is a stable isotope of nitrogen and is often used to trace nitrogen compounds in the environment. Three enhanced fertilizers designed to increase fertilizer N uptake by reducing volatile loss of N and one industry standard fertilizer were used on ten different commercial Douglas–fir stands throughout the Pacific Northwest. The fertilizers were applied at same rate over a period of one year. For the purpose of this study we will be looking specifically at two of the stands. Mineral soil (up to 60cm depth) and foliage samples were collected prior to fertilization to determine the background abundance levels of 15N. Following fertilization, mineral soil and foliage samples were collected at regular intervals to quantify the amount of N15 recovered over time and final sampling was conducted one year after fertilization. Mineral soil and foliage samples were prepared and analyzed for N15. To quantify the amount of N15 taken up by each component, background abundance of N15 was subtracted from the amount of N15 recovered in both the mineral soil fractions and the foliage. We anticipate that the enhanced fertilizers will increase N uptake.

POSTER SESSION 4

Balcony, Easel 100

4:15 PM to 5:45 PM

Measuring the Magnetic Field Perturbations in a Double-Gun Configuration of the High Power Helicon Thrusters

Joshua Justin (Joshua) Yip, Senior, Electrical Engineering
NASA Space Grant Scholar
Mentor: Robert Winglee, Earth And Space Sciences

Over the past few decades various electrical propulsion systems have been developed to facilitate space exploration.

Plasma propulsion is a form of electrical propulsion of particular interest, in that it is especially efficient for the purposes of long-duration interplanetary space travel. Specifically, the high power helicon (HPH) thruster is a plasma propulsion system that utilizes a helicon antenna to ionize a neutral gas and create high energy plasma. This project has focused on the production of a B-dot probe to measure magnetic field perturbations in the plume of the HPH double-gun configuration. The configuration will have two HPH thrusters mounted next to each other and fired simultaneously. It is known by Faraday's law of induction that time-varying magnetic flux through a closed circuit induces an electromotive force in the circuit. At the end of the B-dot probe are three coils of wire, whose circular loops are arranged into a sphere. Using the B-dot probe, the time derivative of the magnetic field component normal to each loop can be found, for each of the three vector components. The time derivative of the magnetic field can then be integrated over time to find the changes in the magnetic field. These changes in the magnetic field will be compared to those that result when only a single HPH thruster is fired. It is expected that the double-gun configuration will produce stronger magnetic field perturbations downstream than will a single HPH thruster. Measuring changes in the magnetic field with the use of a B-dot probe will provide a better understanding of the performance of the double-gun configuration and how it can be improved.

POSTER SESSION 4

Balcony, Easel 99

4:15 PM to 5:45 PM

Initial Investigation into Alternative Fuels for a Pulsed Plasma Thruster

Craig Franklin (Craig) Foulds, Senior, Physics: Applied Physics, Earth & Space Sciences (Physics)
Mentor: Robert Winglee, Earth And Space Sciences
Mentor: Ian Johnson, Aeronautics & Astronautics

Pulsed plasma thrusters are a modular electric propulsion technology with extensive flight heritage. Flight-ready PPTs are tailored to a specific mission based on the power and mass budget of a mission. The lower bound for both parameters is far less than competing electric propulsion (EP) technologies, such as Arcjets and Hall Thrusters, which makes them desirable as spacecraft size decreases. The variable components of PPTs are typically electrode geometry, capacitor size, spark plug geometry, and fuel feeding system, but rarely if ever does a space mission select an unusual fuel. Teflon is used almost exclusively, and PPT fuel research is effectively stagnant. This investigation has concluded that alternative fuels are indeed significant. The sulfur PPT (SPPT) is inspired by natural sulfur plasmas in the Jovian magnetosphere. Thrust stand tests over the course of six months have demonstrated clearly that the specific thrust (thrust per unit power) is three times higher than in a corresponding test using a Teflon PPT of the same electrode geometry. Both pure sulfur and a sulfur-epoxy binder have been considered, and show the same specific thrust within error of the experiment. Pure sulfur will outgas in space, and may not be suitable for long missions, but the sulfur-epoxy fuel could potentially solve this problem. Additionally, an insulated semi-conductive bismuth sulfide compound shows similar thrust characteristics to the Teflon fuel, albeit at a lower exhaust velocity. This investigation is ongoing, with a parallel application project performing the SPPT experiment on a high-altitude balloon airship. This mission will demonstrate systems control, test the SPPT in a non-laboratory environment, build flight heritage, and represent and important advancement in PPT applications.