SESSION 1J

UNDERSTANDING OUR WORLD: DATA-BASED APPROACHES

Session Moderator: Walter Andrews, Near Eastern Languages and Civilization

MGH 251

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Computational Propaganda in Action: How the Russian-Backed Internet Research Agency Interacted with the Black Lives Matter Community on Twitter

Elizabeth (Betz) Mayer, Senior, International Studies, Russian Language, Literature, & Culture

UW Honors Program

Mentor: Scott Radnitz, International Studies

Mentor: Jessica Beyer, Jackson School of International Studies

Following the events of the 2016 United States Presidential election, evidence emerged of a Russian-led effort to influence the American people via social media. Through a Kremlin-backed organization known as the Internet Research Agency (IRA), computational propaganda was conducted against the American people on a variety of social media platforms including Facebook, Instagram, YouTube, and Twitter. As part of the ongoing Mueller Investigation and in the name of political transparency, Twitter released a data archive of Tweets and user information for bot and troll accounts linked to the IRA. Prior research completed by data scientists at the University of Washington has revealed that IRA accounts infiltrated the Black Lives Matter discourse community on Twitter. Building off of this work and using the publicly available Twitter dataset, I have analyzed the messaging tactics used by the IRA over time in relation to the Black Lives Matter discourse community on Twitter. I will randomly sample Tweets relating to Black Lives Matter, police brutality, and other related topics beginning in 2009 and ending in 2018, which is when the dataset ends. I use RStudio, Tableau, and other data analytic systems to identify trends, patterns, and messaging themes used by the IRA while they were infiltrating this online discourse community. As an area studies scholar, I provide a more comprehensive understanding of Russian tactics in addition to the data analysis. By examining the methods used by foreign agents when impersonating Americans on social media, I expand the knowledge base about this online effort and highlight themes or trends that could be used by similar groups in the future.

POSTER SESSION 2

Balcony, Easel 110

1:00 PM to 2:30 PM

Genetically Manipulating U2OS Bone Cells to Target Inhibitor Drugs to the Kinetochore during Mitosis

Irvin Garcia, Senior, Biology (Molecular, Cellular & Developmental)

Louis Stokes Alliance for Minority Participation

Mentor: John Scott, Pharmacology

Mentor: Paula Bucko, Pharmacology

Mitosis is an essential cellular process in which a cell divides to produce two genetically identical daughter cells. When this process becomes dysregulated cells divide uncontrollably leading to diseases such as cancer. Polo-like kinase 1 (Plk1) is a key enzyme that is necessary for coordinating numerous events during mitosis. When Plk1 becomes dysregulated or mislocalized, mitotic spindle assembly, protein organization, and mitotic timing impairments may occur. One of the many subcellular locations where Plk1 carries out essential mitotic functions is the kinetochore. The kinetochore is the interface between the chromosomes and the mitotic spindle and is critical for ensuring proper DNA to microtubule attachments early on in mitosis. Historically, the small-molecule inhibitor drug BI2536 has been used to inhibit the activity of Plk1 in order to study its role in regulating various mitotic processes. However, traditional inhibitor drugs turn off entire protein kinase populations, inhibiting the activity of Plk1 all throughout the cell, not just at the kinetochore. This can lead to unwanted side effects and limits our understanding of Plk1's role at specific subcellular locations. To improve the specificity of BI2536 drug delivery, we utilized SNAP-tag, a tool in which a self-labeling enzyme can irreversibly react with substrates linked to a chloropyrimidine (CLP) functional group. By genetically manipulating human bone cancer (U2OS) cells, we expressed a kinetochore localizing SNAP. We also generated a BI2536 conjugated to a CLP group. By treating our genetically modified cells with CLP-BI2536, we can target Plk1 inhibiting drug to the kinetochore to study Plk1's role at this specific location. Using super-resolution structured illumina-

tion microscopy (SIM), we demonstrate that we can effectively target fluorescently labeled CLP substrates to kinetochores in our cell line. In future work, we will target our CLP-BI2536 drugs to the kinetochore and investigate how local Plk1 inhibition affects mitotic timing.

POSTER SESSION 2

Commons West, Easel 10

1:00 PM to 2:30 PM

Theiler's Murine Encephalomyelitis Virus Dependence on Intracellular Glutathione and the Implications in Progeny Production

Greyson Alexandre Hamilton, Senior, Microbiology
Mentor: John Scott Meschke, Environmental & Occupational Health Sciences
Mentor: Erika Keim, Environmental and Occupational Health Sciences

Theiler's murine encephalomyelitis virus (TMEV) is a positive-sense RNA Picornavirus used to model epilepsy, poliomyelitis and multiple sclerosis. Previous research has demonstrated a dependence of some Picornaviruses on host glutathione (GSH) in order to produce viable progeny. GSH depletion in host cells has resulted in unstable viral capsids, reducing viral fitness due to a lack of oxidative homeostasis. The objective of this study was to investigate the dependence of TMEV on GSH and determine the consequences of oxidative stress in the host cell due to the absence of GSH. Incubation of TMEV at denaturing temperatures with increasing doses of reduced GSH demonstrated that GSH stabilizes viral particles and 54% viral infectivity was retained with doses as low as 25mM GSH. Using L-Buthionine-sulfoximine (BSO) to deplete GSH in host cells, a 3-fold decrease in viral production was observed when compared with untreated cells. Interestingly, when GSH was restored in BSO treated cells using cell permeable GSH ethyl ester, TMEV viral production was partially restored and viral plaque formation was comparable in yield to an untreated viral infection. Virus production and viability were quantified using plaque assays on host cell monolayers. Next steps include monitoring viral genome production via RT-qPCR and quantifying GSH levels using fluorescence plate assays. RT-qPCR will be further utilized to examine other host stress pathways. This project will use TMEV to look at a host-virus relationship as it relates to an important host antioxidant system interacting with the capsid, assembly, and genome replication of the virus life cycle.

SESSION 2M

MCNAIR SESSION - FROM CHAOS TO ORIGAMI: ADVANCES IN MATH, PHYSICS, CHEMISTRY AND ENGINEERING

Session Moderator: Therese Mar, OMAD and Department of Environmental and Occupational Health Sciences

MGH 288

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Hydroxyl Radical Scavenging Rate Constants for Solid Phase Mineral Surfaces in Oxidative Treatment Systems

Constance Green, Senior, Molecular Biology, East Central Coll
McNair Scholar
Mentor: Klara Rusevova Crincoli, R.S. Kerr Environmental Research Center, National Research Council
Mentor: Scott Huling, R.S. Kerr Environmental Research Center, USEPA

Advanced oxidation treatment processes involve powerful and indiscriminate radical intermediates, including hydroxyl radicals (•OH) and sulfate radicals (SO4-•). Inefficiency in radical-driven treatment systems involves scavenging reactions where radicals react with non-target species in water and solids. Radical scavenging studies have been focused on soluble scavengers in the water and have not assessed radical scavenging by solids which are also present in oxidation treatment systems. The objective of this study was to quantify radical scavenging by solid surfaces. •OH were produced in iron (Fe)- and UV-activated hydrogen peroxide (Fe-AHP, UV-AHP) systems where the loss of rhodamine B (RhB) dye served as an indicator of •OH activity. The basis used to estimate the •OH surface scavenging rate constant (k≡S) were comparisons of treatment results between simple solids-free oxidation systems and more complex systems containing mineral solids. The solids-free system was based on Fe-AHP and UV-AHP reactions; the solids-amended systems were identical but contained different mineral species. Therefore, differences in the loss of RhB were attributed to •OH scavenging by the solid surfaces in the Fe-AHP and UV-AHP treatment systems. Alumina (Al_2O_3), silica (SiO_2), and montmorillonite ($Al_2H_2O_12Si_4$) (MMT) are solid minerals found in soil and aquifers. These minerals were used in this study to assess the solid surface scavenging rate constants. Preliminary results in the Fe-AHP system indicated that k≡S for silica (2.85×10^6 $1/m^2\times s$) was not statistically distinguishable from alumina (3.92×10^6 $1/m^2\times s$). k≡S values in the UV-AHP system for silica (4.50×10^6 $1/m2\times s$) and alumina (7.45×106 $1/m2\times s$) were greater than estimates

in the Fe-AHP system and may be due to pH. k≡S,MMT ($\leq 4.22\times10^5$ $1/m^2\times s$) was much less than k≡S for silica and alumina indicating k≡S is mineral-specific. A critical analysis suggests that radical scavenging by solid surfaces in aquifer systems is orders of magnitude greater than scavengers in the water.

SESSION 2Q

PUBLIC POLICY, INEQUALITY & POLITICAL EXCLUSION: CAUSES, CONSEQUENCES & REMEDIES

Session Moderator: Rebecca Thorpe, Political Science

JHN 026

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Pursuing Social Justice: How Would a Universal Basic Income or Federal Jobs Guarantee Undermine Women's Oppression?

Kathryn Mason Karcher, Senior, Political Science
Mentor: Scott Lemieux, Political Science
Mentor: Chelsea Moore, Political Science

Welfare policies in the United States perpetuate women's oppression. This is largely because these policies reinforce sexism, racism, and classism that plague American society. When discussing policy options, scholars and political players should not just consider their economic consequences. They should emphasize the social consequences of these policies, such as how effectively they may combat women's oppression. In this study I aim to demonstrate what an emphasis on vulnerable groups' needs may look like and to further the political debate surrounding a federal jobs guarantee (FJG) and a universal basic income (UBI). I use the framework established in Justice and the Politics of Difference by Iris Marion Young and her explanation of the five faces of oppression to evaluate how FJG and UBI may help or harm women. I also analyze recent public opinion polling to determine the likelihood of the U.S. implementing these policies. This paper answers the following questions: Which policy, FJG or UBI, would more effectively undermine women's oppression? Which is more likely to be implemented? Should those concerned with women's oppression favor UBI, FJG, or a combination of the two? My theoretical analysis shows that UBI would more effectively combat women's oppression. However, public opinion polling suggests that FJG is more likely to be implemented. This presents a dilemma for progressive advocates who wish to prioritize vulnerable groups' needs while focusing on realistic goals. The social justice framework that I adopt in this paper resolves this dilemma — due to its inability to further the cause of gender equity, FJG should not be implemented unless it accompanies a form of UBI. These conclusions both contribute to ongoing debates over these policies and demonstrate how researchers and advocates going forward can analyze policies within a social justice framework that prioritizes the needs of our most vulnerable populations.

POSTER SESSION 3

MGH 206, Easel 176

2:30 PM to 4:00 PM

Understanding UW Students' Experiences with and Perceptions of Capacity-Constrained Majors

Marlowe Lee Keller, Senior, Biology (Molecular, Cellular & Developmental)
UW Honors Program
Nathan Ji, Sophomore, Pre-Major (Arts & Sciences)
UW Honors Program
Vera Onyekachi Okolo, Senior, Anthropology: Medical Anth & Global Hlth, Biology (Molecular, Cellular & Developmental)
Undergraduate Research Conference Travel Awardee
Camila Valdebenito, Senior, Biology (General)
Sanchita (Sanch) Narayan, Junior, Pre-Sciences
Dianne Laboy, Senior, Biology (Molecular, Cellular & Developmental)
Howard Hughes Scholar, Levinson Emerging Scholar, Mary Gates Scholar
Mentor: Scott Freeman, Biology

Last year, our team conducted an exploratory study to characterize the prevalence and admittance factors of STEM degrees across the U.S. with Additional Requirements to Entry (ARE). By gathering data on universities with these programs and surveying their administrators, we gained a general understanding of the state of competitive majors across the nation. We found that GPA was the most frequent criteria of admittance for these programs, which were mostly in engineering and life sciences. Furthermore, we determined that the most common reason for the implementation of these programs was limitations on faculty, funding, and administrative support. These findings suggested that further study into these programs is warranted. Thus, our current aim is to characterize the impact of these programs on the student experience at the University of Washington, particularly those of students from minority and low income backgrounds. To this end, we conducted focus groups throughout winter and spring quarter of 2019 to evaluate student experiences with competitive majors and assess whether there are consistent themes across them. We will be supplementing these qualitative data with quantitative data from survey questions administered to a large number of UW undergraduates. Because GPA is often correlated with socioeconomic or minority status, we hypothesize that these programs may discourage stu-

dents or disproportionally exclude minority groups from entering high-earning STEM fields. The qualitative and quantitative data of this project will further add to our understanding of the effects and scope of competitive majors.

POSTER SESSION 4

MGH 258, Easel 189

4:00 PM to 6:00 PM

The Effect of Intramedullary Screw Fixation on Proximal Phalanx and Metacarpal Head Articular Contact Stress: A Cadaver and Finite Element Modeling Study

Homer Christian Johann Reiter, Senior, Biology (Physiology)
Mentor: Scott Telfer, Orthopaedics and Sports Medicine

Metacarpal and phalangeal fractures can be treated in a variety of surgical procedures ranging from k-wire fixation, plate/screw constructs, external fixation, or intramedullary fixation. All treatments must account for normal pressure loading, stability, and maintenance of normal tendon and ligament function. Intramedullary fixation has gathered interest as it has advantages in less surgical work, the cannulated screw being guided by a wire, shorter time of operation, no interference of soft tissue, and enough stability to immediately begin range of motion rehab. The crucial question is whether there is a change in pressures from joint contact and reaction forces of the proximal interphalangeal and metacarpophalangeal joint as a result of the articulating surface area due to this procedure. The methods of this study were comparing joint contact pressures in ten fresh-frozen cadaveric hands that I prepared before and after intramedullary fixation, and developing finite element models of the fingers. These have allowed more precise results of changes in joint contact pressures as well as testing of other conditions such as changes in joint pressure when the location of the hole in the joint is changed. Grasping forces were simulated by my attaching weights to flexor and extensor tendons while a pressure sensor inside the joint recorded forces. The anticipated result of this ongoing study is that placement of an intramedullary screw in the joint articular surface will increase contact pressures throughout regions of the joint that contact the articular defect. The significance of this study is that joint replacement research in cadavers has been shown to cause a change in contact pressures, however there is no literature detailing if this is true of the proximal interphalangeal and metacarpophalangeal joint. Once a CT-based finite element analysis model is validated by cadaver testing it will be usable for deeper research of finger surgery.