Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

Poster Session 1

Commons West, Easel 6

11:00 AM to 1:00 PM

Inspiration Porn and Down Syndrome – Promoting Inclusion or Reinforcing Stereotypes?

Lauren Marie (Lauren) Halle, Senior, Sociology
UW Honors Program
Mentor: Heather D. Evans, Sociology

My research focuses on how inspiration porn articles perpetuate the Medical Model of Disability, and specifically, on how those articles objectify and devalue people with Down syndrome. Inspiration porn refers to the representation of disability as a form of disadvantage that can be overcome; it often celebrates disabled people simply for living with a disability. This "overcoming" narrative stems from the Medical Model of Disability, which defines disability as an individual defect and personal tragedy. While many Americans have not heard the specific term "inspiration porn," most have been exposed to inspiration porn articles. I conducted a qualitative content analysis to explore my research aim; this methodology allows for the investigation of the underlying, context-dependent meanings of a text. My unit of analysis was individual articles. I identified these articles through use of the search engine Access World News. These articles have been published in the USA between the dates of 1/1/16 and 12/31/16, and have the words "Down syndrome," "Down's syndrome," "Downs' Syndrome," or "Downs Syndrome" in the headline. After I created my coding frame, I analyzed every 10th article, and then interpreted the findings to ascertain the prevalence of inspiration porn, and how inspiration porn perpetuates the Medical Model of Disability. I initially anticipated the results of my content analysis would indicate that inspiration porn articles, in perpetuating the Medical Model, reinforce limiting and unrealistic stereotypes of people with Down syndrome. This result would show how the growing popularity of inspiration porn is troubling. This new phenomenon does not promote inclusion and diversity – rather it encourages interactions between those with disabilities and those without, in a superficial, condescending manner. My research is important because it draws attention to disability as a sociological topic, and further expands upon media studies by examining the role of mainstream media in perpetuating stereotypes.

Session 1D

Ecology and Evolution

Session Moderator: Bonnie Becker, Interdisciplinary Arts & Sciences (Tacoma Campus)

MGH 234

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Recent North Atlantic Right Whale Acoustic Presence along the Western North Atlantic Coast

Alyssa Ashley Ann Scott, Senior, Oceanography
Mentor: Genevieve Davis
Mentor: Danielle Cholewiak
Mentor: Sofie VanParijs

The North Atlantic right whale (*Eubalaena glacialis*, NARW) is among the most depleted species of whale existing today, with a current estimated population of only 450. Ship strikes and entanglement issues remain the predominant cause of mortality for this critically endangered species. Thus, understanding NARW distributions, and their overlap with human activities, are a top priority for management and conservation efforts. This study analyzed passive acoustic data collected within the migratory corridor from Cape Hatteras, NC to Brunswick, GA from Oct 2015 - June 2016 as part of a comprehensive seasonal distribution look at NARWs along the Western North Atlantic coast. Four lines of 5-8 Marine Autonomous Recording Units were deployed, stretching across the shelf, in the first deployment of a three year, continuous acoustic monitoring effort. These units were processed using the Low Frequency Detection and Classification System (LFDCS), and detections were screened for daily NARW presence. The results of this study show seasonal movements to and from their calving grounds while passing through Georgia, South Carolina, and North Carolina. Off the coast of Georgia and North Carolina, NARWs are detected primarily on inshore recorders from November to March, suggesting the species take paths closer to shore while migrating. However, in late April, the groups travelling north take a path further away from the Cape Hatteras, NC shore. NARWs were picked up predominantly on inshore recorders throughout all four lines of MARUs, further supporting that critical habitats exist close to the coast in southern US waters. This information provides a better understanding as to

where NARWs are spatially and temporally located, which is essential in minimizing human impacts on the species.

SESSION 1J

MCNAIR SESSION - THE STATE WE'RE IN: BODIES, WORDS, PROPHESIES AND POWER

Session Moderator: Sonnet Retman, American Ethnic Studies

MGH 258

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Indigenismo, Education, and Indigenous Women in Post-Revolutionary Mexico

Daisy Alexandra (Daisy) Jaime, Senior, Anthropology: Archaeological Sciences, History: Empire and Colonialism
McNair Scholar
Mentor: Vanessa Freije, International Studies

Indigenismo, a central ideology in Mexico's post-revolutionary nation-building projects, both celebrated and sought to assimilate Mexico's substantial indigenous population. The ideology was shaped by several disciplines, including biology and anthropology, and was adopted by the Mexican government to promote cultural nationalism in the 1920's and 1930's. There was a common agreement that education reform would be key to spread multiculturalism which, in theory, would create a more holistic and established "Mexican" identity. While the architects of indigenismo were predominantly privileged mestizo men, the subjects of their efforts were primarily women, who bore the burden of reproduction and family education. Nonetheless, the scholarship on indigenismo in Mexico has yet to explore gender roles and eugenics. My project adopts a gendered lens to explore if and how these cross-culture teachings reshaped the societal expectations of womanhood among indigenous women. Using archival research, teaching pamphlets and publications by these policy makers along with secondary scholarship, I hypothesize that reformers used education to control the indigenous female body.

SESSION 1R

COMPUTER SCIENCE: DISTRIBUTED SYSTEMS, VERIFICATION, SECURITY AND HCI

Session Moderator: Kurtis Heimerl, Computer Science and Engineering

JHN 111

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Relating Dice to Voting Systems

Arthur Vartanyan, Senior, Mathematics
Satvik Agarwal, Sophomore, Computer Science (Data Science)
Jueyi Liu, Senior, Applied & Computational Mathematical Sciences (Scientific Computing & Numerical Algorithms)
Dorothy Truong, Junior, Applied & Computational Mathematical Sciences (Discrete Mathematics & Algorithms)
Mentor: Jonah Ostroff, Mathematics
Mentor: Lucas Van Meter, Mathematics

For our research, we are focusing on dice and how we can relate them to voting systems. We want to see if we can create dice systems that mimic voting systems (with >2 candidates) and the traits that the systems possess. Two ideal traits of these voting systems are Pareto, which means that if everyone likes candidate A more than B, candidate B should lose; and IIA, which is if candidate A wins, then everyone mixes their ballot but keeps A's rank relative to B the same, then A should still win. However there is Arrow's Theorem, a central focus of our research, which states that if your system is Pareto and IIA, you must live in a dictatorship. One major topic of our research is trying to show whether or not this holds for our die systems. In order to accomplish this, we set out to define what these traits would be in terms of dice and how to translate dice outcomes to voter results, which we have successfully done for Pareto and IIA thus far. Our methods for this included testing certain systems that would reflect moving candidates/voters around, and testing these systems using some code we wrote for this purpose. Some other topics for our research are translating specific voting systems, such as popular vote, pairwise competitions, and point systems to dice, and showing whether or not these ideal traits hold for these translations, which we have successfully done for some. With this, we hope to gain a better understanding of these systems and how using something truly random, such as dice, has any reflection on the systems we have in place.

POSTER SESSION 2

Balcony, Easel 110

1:00 PM to 2:30 PM

Nontransitive Dice and Social Choice

Jacob Adam (Jacob) Watkins, Senior, Mathematics, Physics: Comprehensive Physics
Robert Murray (Robert) Gunn, Senior, Physics: Comprehensive Physics, Mathematics
Jase Grills, Senior, Applied & Computational Mathematical Sciences (Discrete Mathematics & Algorithms)
Mentor: Jonah Ostroff, Mathematics
Mentor: Lucas Van Meter, Mathematics

The purpose of this research is to better understand the connections between dice and elections in voting theory. We explored the phenomenon of nontransitivity in dice and elections. In a set of 3 dice, labeled A, B, C, it is straightforward to designate sides such that, on average, A beats B, B beats C, and C beats A. Similarly, in an election of more than two candidates, where voters create a preference list for the set of candidates, it is simple to make nontransitive relationships in voter preference. Motivated by these situations, we aimed to find a correspondence between these two mathematical objects. Additionally, we defined the concept of an overall winner for a set of dice and an election, and explored the effects of nontransitivity in determining it. We used tournaments (from graph theory) as a tool to visualize the relationship structure among dice and elections. As a result of this work, we have shown that, from any dice set, an election can be constructed such that the dice possess the same winning-losing relationships. The converse is also true: given an election, a set of dice can be constructed with identical winning structure to the election. We defined the notion of a contest, which serves as a classification for both objects. Finally, we developed a triangular inequality for contests, and proved that dice and elections both satisfy this inequality.

POSTER SESSION 4

MGH 241, Easel 162

4:00 PM to 6:00 PM

Visualizing CD8 T-Cell and Regulatory T-Cell Interactions during Memory Differentiation

Adithya Krishna Sonal (Adithya) Vegaraju, Senior, Chemistry, Biochemistry
UW Honors Program
Mentor: Vandana Kalia, Pediatrics
Mentor: Surojit Sarkar, Pediatrics and Pathology
Mentor: Yevgeniy Yuzefpolskiy

Fundamental understanding of how effector T-cells are transformed into quiescent memory T-cells is vital for developing immunotherapeutic treatments for autoimmune diseases and cancer, and for the development of vaccines against diseases such as AIDS, tuberculosis and malaria. Previous research on conversion of memory precursor effector cells (MPECs) into memory T cells has found evidence of Treg cell involvement in the process. Treg cells are regulatory helper T cells which selectively inhibit effector T cells to prevent and suppress overly strong immune responses and autoimmune responses. Research has also shown that MPECs produce their own IL-2, a cytokine involved in immune tolerance and activation. Based on these data, we hypothesize that direct interaction between MPECs and Treg cells, possibly via MPEC-produced IL-2, is required for conversion of MPECs into memory T-cells. We also addressed colocalization of Treg cells with short-lived effector cells (SLECs). SLECs are IL-2 non-producing effector cell counterparts of MPECs and do not form memory. Potential MPEC or SLEC interaction with Treg cells was visualized through immunofluorescence microscopy of the secondary lymphoid organs (spleen and lymph nodes) of experimental mice injected with lymphocytic choriomeningitis virus (LCMV). To bypass the low precursor physiological frequencies of MPECs we employed the P14 LCMV GP33-specific TCR transgenic mouse system, which is a well-regarded model system for studying memory differentiation. To test the role of IL-2 in cell-cell interactions, we used IL-2 agonist and antagonist antibodies. A detailed understanding of how Treg cells are involved in the process of MPEC to memory T cell conversion is key to developing novel immunotherapeutic treatments.

POSTER SESSION 4

MGH 241, Easel 141

4:00 PM to 6:00 PM

Understanding Joubert Syndrome by Creating a PI(4,5)P_2-RFP Biosensor and Ciliary Marker to Identify PI Localization in Primary Cilia

Joey Smith, Junior, Biology (Molecular, Cellular & Developmental)
Mentor: Dan Doherty, Pediatrics
Mentor: Julie Van De Weghe, Pediatrics Genetic Medicine

Joubert syndrome (JS) is a genetic neurodevelopmental disorder with medical features including a distinctive hindbrain malformation and developmental delay. All 35 JS-associated genes to date encode gene products localizing to the primary cilium but the mechanism behind JS is still unknown. The primary cilium serves as a cellular antenna for signaling, and when dysfunctional, can lead to the above features and more. One JS-associated gene, INPP5E, is an enzyme that controls phosphatidylinositol (PI) subtype distribution in the ciliary membrane. We hypothesize that abnormal distribution of PI subtypes PI(4,5)$P_2$and PI(4)P in primary cilia is central to the JS mechanism, and therefore should be present across genetic

causes. To test this hypothesis, I used fluorescently-tagged PI biosensors, domains from naturally occurring proteins that bind to different PI subtypes, and a domain from serotonin receptor (5-HT_6) that marks cilia. The PI biosensors were already tagged with GFP (green fluorescent protein) so I replaced GFP for RFP (red fluorescent protein) on the PI(4,5)P_2 biosensor, and inserted BFP (blue fluorescent protein) on the 5-HT_6 domain, allowing me to distinguish all three molecules in the same primary cilium. To do this, I removed the GFP sequence from our PI(4,5)P_2plasmid using restriction enzymes that cut DNA then inserted RFP (amplified from a template plasmid carrying RFP) using DNA ligase. I confirmed the RFP insert by restriction enzyme digests specific for RFP and by direct DNA sequencing. PI(4,5)P_2-RFP plasmids were transformed into cells with PI(4)P-GFP and our BFP ciliary marker, then live-imaged. These tools will make it possible to determine if abnormal PI subtype distribution in primary cilia is a unifying cellular defect in JS patient cell lines. If so, we can then explore the effects of altered PI distribution and determine whether modulating PI distribution has the potential for mitigating the effects of Joubert syndrome.

POSTER SESSION 4

MGH 241, Easel 140

4:00 PM to 6:00 PM

Uncovering the Role of C2CD3 in the Mechanisms Underlying Joubert Syndrome

Emma Rose Earl, Sophomore, Pre-Sciences
Mentor: Dan Doherty, Pediatrics
Mentor: Julie Van De Weghe, Pediatrics Genetic Medicine

Joubert syndrome (JS) is an autosomal recessive neurodevelopmental disorder, characterized by the "molar tooth sign" on axial brain MRI. JS is caused by mutations in 35 known genes, all of which encode proteins that localize to the primary cilium, a microtubule-based organelle that projects from the surface of most cells. Our current understanding of the underlying molecular mechanism causing JS involves lack of ciliary localization of ARL13B and INPP5E, two JS-associated proteins. ARL13B is required for the ciliary localization of INPP5E. Normal INPP5E localization maintains a phosphatidylinositol subtype distribution in the ciliary membrane. My research investigates ciliary phenotypes in cell lines harboring causal mutations in C2CD3, which encodes a protein that localizes to the primary cilium's basal body, using existing images of patient cell lines. Loss of C2CD3 function in mouse models has presented lower ciliation rates and shorter cilia lengths. Previous research in our lab on two other JS-associated basal body proteins, OFD1 and KIAA0586, identified normal ciliary ARL13B-INPP5E levels. To determine ARL13B and INPP5E localization, cells from two control and two different C2CD3 patient cell lines were grown and serum-starved, inducing ciliation. Cells were stained with antibodies to acetylated tubulin (marking cilia), and INPP5E or ARL13B (marking protein of interest). Using Fiji, an image analysis software, I "painted" each cilium by outlining the signal in the acetylated tubulin reference channel to define a mask. Using that mask, I quantified ciliary ARL13B and INPP5E. I measured ciliation rates using the number of masks divided by the number of nuclei, and cilium lengths using the "skeleton length" function. Based on data from mouse models, we predict that C2CD3 patient lines will have fewer and shorter cilia, but normal ARL13B-INPP5E localization. These expected data would exclude the hypothesis that INPP5E mislocalization is an obligate part of the biological mechanism underlying JS.