



# Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

## Online Proceedings

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### POSTER SESSION 1

**Commons East, Easel 56**

*11:00 AM to 1:00 PM*

#### **Parasitism in Nearshore and Offshore Herring in the Puget Sound**

*Emily C Oven, Senior, Aquatic & Fishery Sciences*

*Mentor: Chelsea Wood, Aquatic and Fishery Sciences*

*Mentor: Emily Oven*

Forage fish such as Pacific herring, *Clupea pallasii*, are a valuable economic and ecological resource in marine food webs. Forage fish are integral species as they can drive both top-down and bottom-up effects in pelagic marine communities. Understanding population dynamics of herring and other forage fish species is essential to management. Although poorly studied, parasites of forage fish are of particular interest due to their potential effects on population dynamics and ability to predict the presence of anthropogenic contaminants in the environment. The goal of this study is to determine if parasite communities differ in composition and diversity between year-zero herring collected in offshore and nearshore (marina) environments in the Puget Sound. I am performing necropsies on 180 herring collected from 6 Puget Sound sites. I expect to find a greater abundance of parasites that use direct transmission in nearshore herring due to decreased stock mixing, as well as a greater prevalence of certain parasites due to closer proximity to anthropogenic contaminants. Parasites remain understudied in important forage fish like herring; and, this research can be used to understand population dynamics of herring in local marine environments as well as aid in fisheries management.

### POSTER SESSION 2

**Commons East, Easel 69**

*1:00 PM to 2:30 PM*

#### **Locating Red Supergiants in the Galaxy IC 10**

*Tzvetelina Anguelova Dimitrova, Sophomore, Astronomy*

*Mentor: Kathryn Neugent, Astronomy*

*Mentor: Emily Levesque, Astronomy*

IC 10 is an irregular galaxy located in the constellation Cassiopeia. Despite its relative proximity to our own galaxy, it is difficult to study because it lies near the plane of the Milky

Way, where interstellar matter obscures visibility. Most notable is the fact that IC 10 is the only known starburst galaxy in the Local Group of galaxies, meaning it is undergoing an exceptionally high rate of star formation in comparison to the average long-term rate. Within these formed stars, our research project aims to find red supergiant stars. Using stellar evolutionary theory, estimates can be made about how many RSGs are expected, based upon analysis of known facts such as size, age, and metal content. The research conducted will allow for a comparison between observational data to theoretical expectations. RSG's are massive stars with a supergiant luminosity class; they are the coolest of the supergiant's and have spectral types of K and M; hence temperatures below 4,100 K. Typically, they can be up to a thousand times the radius of the sun, and are therefore highly luminous. We begin our search by collecting the Two Micron All-Sky Survey data of point sources for IC 10 through the VizieR Astronomical catalogue database, and downloading important values such as color band magnitudes and distances, into a table. To determine the temperatures and luminosities within the galaxy, the All-Sky Survey colors are transformed to the Bessell & Brett photometric system, and then de-reddened by taking into account the value for IC 10's reddening. Temperature of the point sources is then determined, and applied to find the bolometric correction and magnitude, from which luminosity can be identified. Furthermore, to visualize this data we will plot the luminosity and temperature to construct an HR Diagram which will allow us to identify the RSGs.

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## SESSION 2G

### LEARNING AND GROWTH IN AND OUT OF THE CLASSROOM

*Session Moderator: Emily Kroshus, Pediatrics/Health Services*

**MGH 248**

*3:30 PM to 5:15 PM*

\* Note: Titles in order of presentation.

#### **Exploring Barriers to Physical Education and Sport Participation by Muslim Girls: A Mixed Methods Study**

*Yomna H Anan, Senior, Public Health-Global Health, Communication*

*Mentor: Emily Kroshus, Pediatrics/Health Services*

The goal of the present study is to explore barriers young Muslim girls face that prevent them from participating in sports and physical education, and to generate strategies to address these barriers. This has been accomplished using a mixed methods approach. First, we conducted a narrative review of extant literature about barriers to school sports and physical education by Muslim girls (grades K-12). Through this process we identified barriers at different levels of the social ecological framework—including those at the interpersonal, organizational, community and societal levels. Next, we conducted qualitative interviews and a focus group with members of this population (Muslim girls grades K-12), in which we sought to explore and discuss these findings. The goals of this qualitative component of the study are twofold. First, we seek to gain the perspective of experts (e.g., members of the population of interest) on the barriers identified through the narrative review. Second, we will generate potential strategies to address these barriers, from the perspective of members of this population. Thus far, emergent themes from the narrative review include: policies and rules ranging from inflexible dress codes, gender organization, public swimming and dancing, and the observance of the holy month of Ramadan. The broader goal of this research is to begin the process of including the voice of Muslim girls in research about their physical activity and sport participation, and to partner with them to suggest potential avenues for change to meet their perceived needs related to physical activity and sport.

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## SESSION 2K

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### OUR COMPLEX UNIVERSE: PLANETS, STARS, BLACK HOLES, AND GALAXIES

*Session Moderator: Jessica Werk, Astronomy*  
**MGH 284**

3:30 PM to 5:15 PM

\* Note: Titles in order of presentation.

#### Atomic Absorption Line Diagnostics for the Physical Properties of Red Supergiants

*Brooke Paula Dizenzo, Sophomore, Pre-Sciences*  
*Mentor: Emily Levesque, Astronomy*

Red supergiants (RSGs) are evolved massive stars that represent extremes, in both their physical sizes and their cool temperatures, of the massive star population. Effective temperature  $T_{eff}$  is the most critical physical property needed to place a RSG on the Hertzsprung-Russell Diagram, due to the stars' cool temperatures and resulting large bolometric corrections. Several recent papers have examined the potential utility of atomic line equivalent widths in cool supergiant

spectra for determining  $T_{eff}$  and other physical properties and found strong correlations between Ti I and Fe I spectral features and  $T_{eff}$  in earlier-type cool supergiants (G and early K) but poor correlations in M-type stars, a spectral subtype that makes up a significant fraction of RSGs. We have extended this work by measuring the equivalent widths of Ti, Fe, and Ca lines in late K- and M-type RSGs in the Milky Way, Large Magellanic Cloud, and Small Magellanic Cloud, and compared these results to the predictions of the MARCS stellar atmosphere models. Our analyses show a poor correlation between  $T_{eff}$  and the Fe I and Ti I lines in our observations (at odds with strong correlations predicted by stellar atmosphere models), but do find statistically significant correlations between  $T_{eff}$  and the Ca II triplet (CaT) features of Milky Way RSGs, suggesting that this could be a potential diagnostic tool for determining  $T_{eff}$  in M type supergiants. We also examine correlations between these spectral features and other physical properties of RSGs (including metallicity, surface gravity, and bolometric magnitude), and consider the underlying physics driving the evolution of atomic line spectra in RSGs.

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## SESSION 2K

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### OUR COMPLEX UNIVERSE: PLANETS, STARS, BLACK HOLES, AND GALAXIES

*Session Moderator: Jessica Werk, Astronomy*  
**MGH 284**

3:30 PM to 5:15 PM

\* Note: Titles in order of presentation.

#### The Mass Transfer Geometry of V367 Cyg

*Aislynn Wallach, Senior, Physics: Comprehensive Physics, Astronomy*

*NASA Space Grant Scholar, UW Honors Program*

*Mentor: Jamie Lomax, Physics, United States Naval Academy*

*Mentor: Emily Levesque, Astronomy*

Companion-affected mass loss complicates our understanding of evolved stars; for example, theoretical models predict up to 70% of all main-sequence O stars interact with companions at some point during their lifetimes, but the details of mass loss and transfer in binary systems are poorly understood. V367 Cyg is an eclipsing, low-mass binary system with a complex geometry that offers a unique opportunity to better understand mass transfer processes; the primary star has overflowed its Roche lobe, resulting in an accretion disk that surrounds the secondary star. Using new spectropolarimetric data of V367 Cyg taken with the University of Wisconsin's Half-Wave Polarimeter (HPOL) at the Pine Bluff Obser-

vatory, I have resolved the behavior of the accretion disk by determining the position angle and intensity of the polarized light from the system as a function of orbital phase. Here, I will present an analysis of this data and discuss their implications for the mass-loss geometry of the system. By constraining the properties of this interacting binary, we can more precisely study the details of stellar mass transfer.

## POSTER SESSION 3

MGH 258, Easel 185

2:30 PM to 4:00 PM

### **Sports Parenting Interventions: A Narrative Review**

*Natalie Fuller, Senior, Environmental Health, Biochemistry*

*UW Honors Program*

*Mentor: Emily Kroshus, Pediatrics/Health Services*

Youth sports participation can have many benefits, including positive psychosocial development and lifelong healthy activity levels. However, such benefits are often not realized due to attrition from sport. Parents play a key role in shaping youth sport experiences. High pressure sports parenting and disruptive sideline behavior contribute to attrition. Interventions aimed at reducing such parent behaviors exist; however, little is known about their effectiveness. The purpose of this narrative review was to synthesize the extant research on sports parenting interventions. A narrative literature review was conducted between December 2018 and February 2019. Studies were selected if they contained a critically evaluated sports parenting intervention (inclusive, but not limited to education and policies) for parents of children 18 or younger participating in organized sports. Additional articles were obtained via pearling of reference lists. Study quality was appraised using the Downs & Black checklist. Our preliminary search found 13 articles, which included 8 educational interventions and 6 policies. The majority of educational interventions were related to sportsmanship; few included any elements of sports psychology. Many educational interventions were implemented using online videos and non-interactive online modules. Evaluations were of poor methodological quality, consisting primarily of limited-scope qualitative evaluations. No randomized controlled trials have as-yet been published on this topic. High quality research into the effectiveness of sports parenting education and sideline behavior policies is needed to better understand whether existing approaches are effectively changing this important parenting behavior. Future research should seek to use randomized designs and measure behavioral outcomes. Further, studies should move beyond efficacy measures and collect implementation data to understand how policies and educational programs are being used in a range of youth sport settings.

## POSTER SESSION 3

Commons West, Easel 34

2:30 PM to 4:00 PM

### **Formalizing Care for the Caregiver in Hospice**

*Sandra Renae (Sandy) Kolberg, Fifth Year, Nursing*

*Mary Gates Scholar*

*Mentor: Tatiana Sadak, PCH*

*Mentor: Emily Ishado, Biobehavioral Nursing and Health Informatics*

Everyone dying at home requires help from a care partner (CP). For most people, these CPs are family members and friends who help their loved ones with daily tasks, medications, and comfort measures. Those who engage hospice services also benefit from the support of experienced medical/social service teams. By definition, the focus of hospice care is on a family unit, although currently there are no broadly disseminated systematic methods for assessing the needs of CPs or offering preventative interventions. My mentors, Dr. Sadak's team, conducted a pragmatic trial of assessing CP needs in hospice by adapting "Managing Your Loved One's Health" (MYLOH), a 29-item self-report measure of CP activation: readiness, knowledge, skills for meeting their care recipient's healthcare needs and maintain personal wellness for use in hospice. I reviewed and thematically coded: 1. Video interviews with RN case managers and administrators, 2. Researcher's field notes, and 3. All other documented communication between the research and the hospice teams; created a timeline and documented the rationale for adaptations that were made in MYLOH. Methods: A Sample of N=50 CP of people receiving hospice care; N=14 RN Case Managers; N=6 Hospice Administrators. MYLOH and several other brief CP assessment measures were administered by RN case managers to CPs on baseline, week 4, and week 12. Measures were used as a guide for conducting CP/Patient needs assessment, and to plan and assess effectiveness of interventions. Case managers took process notes and offered feedback via video-recorded interviews with the research team. Adaptations to MYLOH were made based on this iterative feedback. MYLOH-Hospice is a 12-item measure that is a useful tool for guiding assessment and interventions for CPs in hospice, it has strong face validity and acceptability, but is found to be too long for iterative routine use.

## POSTER SESSION 4

Commons West, Easel 7

4:00 PM to 6:00 PM

### **Linking Childhood Headache Experiences with Family History of Headache and Other Chronic Pain Conditions**

*Anthea Helen Bartlett, Senior, Human Centered Design & Engineering, Psychology*

*Innovations in Pain Research Scholar, Undergraduate Research Conference Travel Awardee*

*Mentor: Emily Law, Anesthesiology and Pain Medicine, University of Washington School of Medicine*

Headache is common in childhood and can be associated with disability and distress. Family history of chronic pain may increase risk for pain and disability in childhood, although prior research has primarily focused on non-headache pain populations. We aimed to characterize the prevalence of headache, abdominal pain, and musculoskeletal pain in first- and second-degree relatives of youth with headache and determine whether family and parental pain history is associated with children's headache experiences. We hypothesized that a positive family pain history would be common, and that greater extent of family and parental pain history would be associated with greater headache frequency, intensity, and disability. We enrolled 239 youth (Mage = 14.7, 66.5% female) with headache and their parents. Parents reported whether they and 16 of their first- and second-degree relatives had a history of migraine, tension-type headache, abdominal pain, or musculoskeletal pain. Youth completed a 28-day headache diary to assess headache frequency and pain intensity and completed the PedMIDAS, a measure that assesses headache-related disability. As expected, a family pain history was common: 65.7% of youth had a relative with migraine, 39.3% had a relative with tension-type headache, 44.8% had a relative with abdominal pain, and 66.9% had a relative with musculoskeletal pain. Children's headache frequency was positively associated with the number of first- and second-degree relatives with a history of tension-type headache ( $r=.14$ ,  $p=.04$ ) and musculoskeletal pain ( $r=.14$ ,  $p=.04$ ), but not migraine or abdominal pain. We found that youth had greater disability when both parents had a history of headache compared to only one parent with a positive history,  $F(2,222)=3.27$ ,  $p=.04$ . No associations were detected between family history and youth's pain intensity. Our findings indicate children's adaptation to headache may be influenced by their family. Further research is needed to understand potential mechanisms of intergenerational transmission of headache.

## **POSTER SESSION 4**

**Commons East, Easel 61**

*4:00 PM to 6:00 PM*

### **13 Years of Spectropolarimetry of P Cygni**

*Keyan R. (Keyan) Gootkin, Junior, Astronomy*

*Mentor: Emily Levesque, Astronomy*

*Mentor: Trevor Dorn-Wallenstein, Astronomy*

We present a study on 13 years of HPOL optical linear spectropolarimetry of the famous star P Cygni. P Cygni is a Luminous Blue Variable, an important transitional phase in the lives of the universe's most massive stars. We revisit previous findings on the nature and variability of P Cygni's observed linear polarization and report on discrete features in P Cygni's observed polarization spectrum. Using this dataset we also test the assumption that line blanketing effects suppress all intrinsic polarization from strong emission lines. This assumption is vital in determining the wavelength dependence of P Cygni's intrinsic polarization. Our results allow us to constrain the geometry of the polarizing region to better understand the circumstellar material around P Cygni.

## **POSTER SESSION 4**

**MGH 206, Easel 178**

*4:00 PM to 6:00 PM*

### **Do Marine Microplastic Publications Influence Popular Awareness? A Comparison of Publication Metrics, News Media Coverage, and Social Media Impact**

*Anthony Krishtan Abruzzini, Senior, Neurobiology*

*Mentor: Lyda Harris, Biology*

*Mentor: Emily Carrington, Biology*

Publication metrics have often played a major role in understanding the interaction between research, popular opinion, and public policy. The field of scientometrics has been especially successful in bridging this gap for hot-button environmental issues, such as global climate change. Here, we used publication metrics to look at another burgeoning environmental topic: marine microplastic pollution. Research into marine microplastics has risen explosively in recent years, and some governments have already introduced anti-plastics policies in response. Here, we looked into the influence of microplastics research in news outlets and public opinion. First, we searched *ISI's Web of Science* for articles containing the search terms "MARINE" and "MICROPLASTIC," and recorded the number of publications over time. Second, we used a web scraper to gather similar publication counts for popular news outlets. Finally, we gathered data on social media interest in microplastic pollution by looking at the frequency of Twitter posts containing relevant keywords over time. Differences in article and tweet lexicons were analyzed using *WordSmith Tools*. We hypothesized that increased published research on microplastics correlates with stronger media coverage and more social media presence. Overall, the project found a unique interplay between microplastics research and popular sources, and we discuss how this interaction might impact public policy changes.

## POSTER SESSION 4

MGH 206, Easel 170

4:00 PM to 6:00 PM

### **Determining the Distribution of Microplastics in the Salish Sea**

*Louise Miranda Sutters, Senior, Biology (General)*

*Mentor: Emily Carrington, Biology*

*Mentor: Lyda Harris, Biology*

Microplastics are fragments of plastic smaller than five millimeters in length, often created by the breakdown of larger plastic materials. The ubiquitous presence of this form of debris in marine environments has led to detrimental effects when ingested by marine organisms including false sense of fullness, impaired reproduction, and stunted growth. Microplastics are heterogeneously distributed in water, animals, and sediment, making it necessary to compare and contrast conditions when considering any biological effects. Due to the variability of microplastics across space and time, different locations may have varying types and sizes of microplastics. This study examines the relationship between anthropogenic activity and microplastics in areas ranging from low to high population density in the Salish Sea. In July and August of 2018, samples of mussels, water, and sediment were collected from ten sites around the Salish Sea. The samples were chemically digested with hydrogen peroxide over a five-micrometer filter. Debris collected by the filters was photographed through a microscope and subsequently characterized. The images were processed using ImageJ for length, width, shape (fiber, fragment, film, or sphere), and color. We hypothesized sites have different microplastic compositions and there is a correlation between anthropogenic activity and microplastic abundance. The results of this study could aid in efforts to locate point sources of specific types of microplastics in the Salish Sea and determine priority locations for marine debris management.