**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.

**Effects of a Turbid Plume on Phytoplankton Abundance at the Mouth of the Elwha River**

*Brendan Patrick Eickelberg, Senior, Oceanography  
Mary Gates Scholar*

*Mentor: Andrea Ogston, Oceanography  
Mentor: Ian Miller, Washington Sea Grant  
Mentor: Emily Eidam, School of Oceanography*

The Elwha River was dammed between 1911 and 2014 trapping millions of cubic meters of fine and coarse-grained sediment in the two reservoirs created by these dams. Upon dam removal, much of this sediment was re-suspended and transported into the Strait of Juan de Fuca, reducing light availability to photosynthetic organisms. Phytoplankton abundance has not previously been studied near the Elwha Delta, so it is unknown how the dam removal has affected these organisms. Phytoplankton net tows and chlorophyll samples were collected at several stations surrounding the mouth of the Elwha River to determine overall abundance and diversity in and out of the plume. Chlorophyll concentration and phytoplankton abundances were compared to turbidity levels and salinity to determine their location within the plume. Phytoplankton abundance and chlorophyll concentration was reduced in high turbidity, low salinity water, i.e., inside of the plume. The chlorophyll concentrations measured within the plume were less than half the Strait of Juan de Fuca fall and winter average chlorophyll concetrations as documented in Masonn and Peña (2009). The purpose of this study is to provide a foundation for the Elwha dam removals and future dam removals effect on the base of the marine food web.

**SESSION 1P**

**ASTRONOMY AND ATMOSPHERIC SCIENCES**

*Session Moderator: Suzanne Hawley, Astronomy*

JHN 022  
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

**A Spatially-Resolved Study of the GRB 020903 Host Complex**

*Mallory Douglas Thorp, Senior, Astronomy, Physics: Comprehensive Physics  
UW Honors Program*

*Mentor: Emily Levesque, Astronomy*

The host complex of GRB 020903 is one of only a few long-duration gamma ray burst (GRB) environments where spatially-resolved observations are possible. It may also be the only known GRB host consisting of multiple interacting components, as well as an active galactic nucleus. We were granted 4.5 hours of observing time on the Gemini Multi-Object Spectrograph (South) to obtain spatially resolved spectra of the GRB 020903 host complex. Using long-slit observations at two different position angles we were able to obtain optical spectra of the four main regions of the GRB host, with a spectral range of 3600 - 9000 Å. From this data we discern the redshift of each region, concluding that they do not comprise a single interacting system as previously assumed. Two regions, including the GRB host region, are at an approximate redshift of 0.251 as expected. The other two are at a redshift of 0.662. We also measure the metallicity, star formation rate, and young stellar population age of each region to create a spatially-resolved map of these parameters for the larger host complex. Based on the distribution of these characteristics we determine whether the localized GRB explosion site is representative of the host complex as a whole, or localized in a metal-poor or strongly star-forming region.
Spatially Resolved Metallicity and Star Formation Rates of the Supernovae-Rich Fireworks Galaxy

Locke Linden Patton, Senior, Physics: Comprehensive Physics, Astronomy
Mary Gates Scholar
Mentor: Emily Levesque, Astronomy

Supernovae (SNe) are the spectacularly violent deaths of evolved young massive stars, which expel a shock wave into the intergalactic medium that in turn can spark star formation and disperse heavy elements into the galaxy. While a SN event can be classified by its spectral signature definitively, determining the nature of a SN progenitor depends upon chance photometry taken prior to the event. We circumvent this challenge by turning to the study of SN host environments and their surrounding interstellar medium within the unique and rare population of galaxies that have hosted three or more SN events within the last century. This subpopulation offers the opportunity to study the locations and environmental properties of stellar populations prone to supernovae production. Using moderate-resolution slit spectra spanning 3500-7000 Angstroms taken with the Apache Point Observatory 3.5m telescope DIS spectrograph, our goal is to map the metallicity, ionization parameter, and star formation rates using emission line diagnostic ratios for all of the SN host sites across each SN-rich galaxy. Dubbed the “Fireworks Galaxy” at a distance of 6.9 ± 2.4 Mpc, NGC 6946 has uniquely produced nine core-collapse supernovae (CCSNe) within the last century, which specifically occur when massive stars develop an iron core under gravitational collapse. We present the spatially-resolved metallicity and star formation rates (SFRs) of NGC 6946, tracing nine spectrophotometric slits centered on each CCSN host site across the galaxy. Future work includes stellar population synthesis modelling to determine the host galaxies’ stellar populations, ages, and SFR histories for NGC 6946 and, eventually, the other nine SN-rich host galaxies in our sample.

The Role of Flow in Athletic Competition: An Investigation through Whitman College Athletes

Cherokee Washington, Senior, Psychology, Rhetoric, Whitman College
Mentor: Emily Bushnell, Psychology, Whitman College

In the 1970s, psychologist Mihaly Csikszentmihalyi established the concept of “flow,” a universal experience in which an individual enters a psychological state that allows for optimal performance. When in this state, individuals will experience several specific factors such as intrinsic motivation, task concentration, and perception of abilities that all work together to define “flow.” Today, many athletes strive to attain flow in order to achieve excellence in competition. My presentation explores flow within athletics as a promoter of good performance in competition. I examine whether or not flow is responsible for optimal performance or, conversely, if good performance stimulates flow. Through an experiment involving Whitman College athletes, several pre- and post-game surveys, and performance data from a targeted competition, I suggest the overall function of flow in athletics.

Comparing the Development of Chemoresistance in Genetically Engineered Mouse Models of Small Cell Lung Cancer

Sun Jung (Sunny) Park, Senior, Biochemistry
Undergraduate Research Conference Travel Awardee
Mentor: David MacPherson, Human Biology
Mentor: Emily Eastwood

Small cell lung tumor (SCLC) is a type of lung tumor that accounts for 10-15% of new lung cancer cases. It is an aggressive cancer that is often not detected before metastasis occurs. Even with chemotherapy and radiotherapy, SCLC has a very high mortality rate and patients tend to develop chemoresistance quickly. Unlike other types of lung cancers, SCLC has no available gene-targeted therapies. This project examines the development of chemoresistance in SCLC genetic mouse models. This approach deletes tumor suppres-
sor genes, such as Rb1 and Tp53, and/or activates oncogenes like lmyc, using a Cre-expressing virus in mouse lung tissue, which leads to the development of SCLC. My role included verifying tumor burden following magnetic resonance imaging (MRI) and quantification of tumor volume in the lungs using MRI data. Once MRI confirmed tumor burden, mice are treated with chemotherapy and tumor volume measured over three weeks of drug treatment. The tumor response to chemotherapy will be compared in different genetic mouse models. At the end of treatment, lung tumors are collected and I use immunohistochemistry to measure the response of the tumors collected from the genetic mouse models. I examine markers of cell proliferation and cell death to assess drug effectiveness. These results could be relevant clinically if certain genetic mutations are found to be associated with chemoresistance.

**Poster Session 4**
Commons East, Easel 58  
4:00 PM to 6:00 PM

**Aquaculture in Future Oceans: Effects of Food Changes on Mussel Health**

*Molly K. Payne, Senior, Aquatic & Fishery Sciences*
*Mary Gates Scholar, UW Honors Program*
*Mentor: Emily Carrington, Biology*
*Mentor: Alexander Lowe, Biology*

Mussels, Family Mytilidae, are vital to intertidal ecosystems and to a burgeoning aquaculture industry. They act as ecosystem engineers within their environment by controlling resource availability to other organisms and by shaping the structure of their habitat. Unfortunately, with the rise of anthropogenic climate change, mussel populations are seeing growing threats to their ability to survive and reproduce. This includes lower recruitment, increased susceptibility to disease, and weakening of the byssal thread that adheres mussels to their substrate. Understanding the life history of these organisms, in addition to what food sources and conditions are most suitable for their growth, is essential for preserving this economically and ecologically vital species group. Mytilus trossulus, a common species of saltwater mussel ubiquitous in the aquaculture industry was used in this study. The mussels were grown at two different depths on aquaculture lines for comparison of the environmental effects at those depths. The first layer at 1 meters depth consisted of a mixed surface layer rich in phytoplankton growth and represented a warmer, more variable ocean environment. The second layer was found below the surface mixed layer at 7 meters depth and represented a colder, more constant environmental regime. By analyzing the food sources of these mussels through fatty acid extraction, we will draw conclusions not only about what nutrients are most beneficial to mussel growth, but also what effects the environmental differences between the two depth strata has on the mussels. The purpose of this study is to both provide data for the care of mussels in aquaculture farms and to make inferences about what a changing climate will mean for these organisms.

**Poster Session 4**
Commons East, Easel 53  
4:00 PM to 6:00 PM

**Dam Removals and Implications to Organic Matter Transfer**

*Madeline Rose (Maddy) Savage, Senior, Oceanography*
*Mary Gates Scholar*
*Mentor: Andrea Ogston, Oceanography*
*Mentor: Ian Miller, Washington Sea Grant*
*Mentor: Emily Eidam, School of Oceanography*

Rivers are conduits for transporting sediments and organic material through the watershed and to the ocean. The Elwha River recently was involved in the largest dam removal in history within the USA. Studies of the dam removal impacts have never been done as extensively as they have for the Elwha River Restoration project. Now, the river is no longer blocked, and 21 million m$^3$ of sediments have been made available for erosion, and it is not fully known where the sediments are depositing and how they are affecting the ecosystem. In order to quantify where organics are being stored in the river system, sediment samples were collected along the river and shoreline, and grain size and loss on ignition (LOI) analysis performed on them. Most of the samples with more than 2% organic content were at sites in the reservoir and side channels, and organics less than 1% were retained on the beach and riverbank. Therefore, finding organic matter in the river and shoreline systems can inform us how the ecosystem is recovering, and whether overtime organics are fully transported to the ocean, or whether organics will be consumed, transformed, or altered along the way.