Online Proceedings

POSTER SESSION 2

Commons East, Easel 85

1:00 PM to 2:30 PM

Race and Emerging Adulthood: Looking at Mental Health and Racial Identity within a College Context

Stephanie Van Ha, Senior, Sociology
UW Honors Program
Mentor: Jerald Herting, Sociology

Emerging adulthood is a significant developmental period where individuals aged 18-25 years do not feel that they are adults, but on the path to becoming so. Individuals may describe their experiences within this life stage differently based on their racial identity. This research project asks: “How do young people of color in college describe their experiences of emerging adulthood compared to their white peers, and is this related to their mental health in different ways?” Within this study, I compare how students of color and white students view, experience, and navigate emerging adulthood and how this affects their mental health. Through interviews with young college students across racial groups at University of Washington (UW), I examine how they make sense of the stressors in their lives. Interview questions discuss significant areas of emerging adulthood, various social forces that could affect mental health, racial issues and socialization, and access to social support. I test the hypothesis that students of color describe their sources of stress as being more impacted by structural and institutional reasons, such as racism and xenophobia, while white students focus more on social and interpersonal reasons, such as families, relationships, and work. Emerging adulthood is a relatively new field of research and it is critical to understand how people of color experience this life stage. This research will contribute to current understandings and research of racial health disparities. It will also highlight areas for additional work addressing the significance and complexity of intersectionality within the emerging adulthood developmental period.

POSTER SESSION 2

Commons East, Easel 68

1:00 PM to 2:30 PM

Modeling Monsoon Flood Erosion in the Eastern Himalaya: Using GeoClaw to Simulate Velocity and Depth for High Discharge Annual Flows

Max Philip (Max) Vanarnam, Junior, Earth & Space Sciences (Physics)
Mentor: Susannah Morey, Earth and Space Sciences
Mentor: Katharine Huntington, Earth And Space Sciences

When seeking to better understand specific bedrock river erosional processes due to flooding, numerical modeling can help answer many questions, specifically the extent to which floods contribute to setting the landscape. The eastern Himalaya experiences multiple flooding events of different magnitude: annual monsoon floods ($10^3 m^3/s$) and centennial outburst floods ($10^5 m^3/s$). This region also experienced at least two ancient megafloods during the Holocene ($10^6 m^3/s$). Previous studies of flooding in the region have assessed the potential geomorphic role of the outburst floods and megafloods; however, the relative geomorphic impact of annual monsoon flooding remains unknown. To fully understand the relative erosive power of these eastern Himalayan floods, it is necessary to compare the hydraulics of outburst dam-break floods to the hydraulics of seasonal monsoon flow. To do this, we use the program GeoClaw to numerically simulate monsoon flood flow in this region. GeoClaw, which uses the 2D shallow water equations, has accurately been used to model outburst flooding events, including the centennial outburst floods and the ancient megafloods. By modifying the program to simulate constant monsoon discharge, we can analyze patterns of flow velocity and depth (GeoClaw outputs) to understand the spatial pattern of shear stress during monsoon floods. We expect to find that monsoon flow will yield lower magnitudes of shear stress and more homogeneous patterns of potential erosion compared to those observed for the outburst floods and megafloods. Understanding these erosional spatial patterns will help us better recognize the relative contributions of various magnitude floods and the extent to which each can set the landscape.

POSTER SESSION 2

Commons East, Easel 71

1:00 PM to 2:30 PM

Determining the Month of Soil Carbonate Formation for Paleoclimate Reconstruction

Nicole Sarieddine, Senior, Earth and Space Sciences: Geology
Mentor: Katharine Huntington, Earth And Space Sciences
Mentor: Julia Kelson, Earth and Space Sciences

Carbon dioxide concentrations have been on the rise since preindustrial times due to anthropogenic emissions. Understanding how past climates have responded to changes in the atmosphere is important to understand how our current climate will react to changes in our present-day atmosphere. Soil carbonates record the temperature at the time of their formation in their stable isotopic composition (called clumped isotope geochemistry). Ancient soil carbonates can record the temperature and allow us to better understand paleoclimates. Understanding what time of year soil carbonates form allows us to better interpret the temperature being recorded. The timing of changes in soil moisture is likely one of the most important environmental factors to consider. We test whether soil carbonates form during soil drying events using soil moisture and temperature data measured remotely by a satellite called Soil Moisture Active Passive (SMAP). This satellite has been gathering near-surface soil moisture data globally since 2015 at 35-65 km resolution. We compare the air temperature of the month with the greatest net negative soil moisture content month (determined from the satellite data) to the measured growth temperature of soil carbonates (estimated through geochemistry). We first compare the month of drying of three locales in North America, then extend the analysis globally to all locations for which soil carbonate clumped isotope data exist. Preliminary results suggest that the temperature of the month with the most drying agrees with formation temperature we estimated from clumped isotope geochemistry within one degree for a site in Nebraska and within seven degrees for a site in Wyoming. These results suggest that soil drying promotes soil carbonate formation in some environments. By using soil carbonates to explain past climates, we will improve temperature change estimates, which will help improve climate models for the future.

Poster Session 2

Commons East, Easel 70

1:00 PM to 2:30 PM

Paleo Basemap to Investigate Flooding Patterns and Geomorphic Change from the Bridge of the Gods Flood 550 Years Ago

Maxim Thomas (Max) Podhaisky, Senior, Earth and Space Sciences: Geology, Art
Mentor: Katharine Huntington, Earth And Space Sciences
Mentor: Susannah Morey, Earth and Space Sciences

The Bonneville Landslide dam, also known as the Bridge of the Gods, blocked the Columbia River about 550 years ago at the site of the modern Bonneville Dam, on the Washington-Oregon border. According to Klickitat lore, the Bridge of the Gods was created by the chief of all gods to join the lands north and south of the river. The dam's failure, thought to be a result of the violent dispute between the chief's sons, led to an outburst flood that drowned a forest and carved the Cascade Rapids. Sedimentary deposits from this dam break flood have been observed downstream, but the flood behavior and inundation pattern remains unknown. In this study, we created a paleo-digital elevation model (DEM) of the Columbia Valley Gorge landscape before the flood, which will serve as the basemap for numerical models of the flood. The paleo-DEM combines three data sets: 1) topographic data derived from the 1868 and 1901 U.S. Coast and Geodetic Survey historic topographic survey maps and bathymetric depth values from hydrographic sheets; 2) bathymetry of the Lower Columbia River with removed modern structures in Portland, validated by tide records from 1853 to 1876; and 3) bathymetry upstream from the Bonneville Dam, merged with adjacent topography and derived from NOAA data. In ArcGIS, we filled in data holes and modern channels and subtracted modern structures in an attempt to accurately represent the paleo-environment. Because the Columbia estuary is heavily influenced by tides, we used historic tide observations to create a low and high tide paleo-DEM to make preliminary analyses of how the tide might have influenced this flood. Once we know the paleo-topography of the Columbia Gorge, Portland basin, and Columbia Estuary, we can begin to numerically model this flood and explore its geomorphic impact.

Poster Session 3

MGH 206, Easel 170

2:30 PM to 4:00 PM

A Bacterial ADP-Ribosyltransferase Toxin Promotes Interbacterial Antagonism by Inhibiting Cell Division

Shuo Huang, Senior, Biology (Molecular, Cellular & Developmental)
Mentor: Joseph Mougous, Microbiology
Mentor: See-Yeun Ting, Microbiology

Modification of biomolecules is responsible for the regulation of cellular activities in all organisms. A type of enzyme, named ADP-ribosyltransferase (ART), plays a crucial role in such modifications by transferring one or multiple ADP-ribose moieties onto its target molecules. Some bacterial ART proteins are toxins that serve as virulence factors that enable pathogens to disrupt host cell functions during persistent infection. However, it was unclear if ARTs play roles in interbacterial interactions. Here, I report the discovery of the first interbacterial ART toxin encoded by a *Serratia proteamaculans* strain, a commensal bacterium isolated from plant root. Growth competition assays showed that the toxin is capable of conferring a higher fitness for *S. proteamaculans*. Subsequent analysis by microscope revealed that target bacterial cells became elongated, leading up to cell lysis. Together, my results offered new insights into the complex question of how bacteria compete against each other. The finding expanded our knowledge of the diverse roles of ART proteins and their cellular activities.

POSTER SESSION 3

MGH 206, Easel 171

2:30 PM to 4:00 PM

Understanding the Role of Widespread Polymorphic Toxins in Bacterial Infection by Temperate Phages

Elizabeth Daiyun Su, Junior, Biochemistry
Mentor: Joseph Mougous, Microbiology
Mentor: See-Yeun Ting, Microbiology

Microbial toxins are a molecular weapon involved in pathogenesis, immune evasion, and bacterial competition. A prime example of such microbial toolkits are polymorphic toxin systems, which consist of multi-domain proteins and are widespread in all major bacterial lineages. A polymorphic toxin system called MuF has been newly identified and is the first to be discovered in temperate phages and their bacterial hosts. Though it is highly abundant in the human gut microbiome, its biological role has not been defined. To better understand the toxin system, our team is studying a model species *Enterococcus faecalis*, a commensal bacterium encoding a two-domain MuF toxin protein on one of its phages, consisting of an N-terminal MuF domain and a C-terminal toxin domain. The toxin domain is predicted to be an ADP-ribosyltransferase (ART), which post-translationally attaches ADP-ribose moieties to its target molecules and can profoundly impair cell processes, leading up to cell death. Using genetic approaches to generate phages with malfunctional ART activity, I have found that the mutations change phage infectivity and the morphology of the plaques formed (clear zones in a cell layer formed due to lysis by phage). Moreover, heterologous expression of the toxin domain in *E. faecalis* results in cell aggregation. From this, I hypothesize that the MuF toxin is delivered by phages to help infection and ensure phage DNA incorporation into host genomes. To further dissect the mechanism by which the MuF toxin system operates, our team is currently developing a fluorescent protein reporter system to investigate and track the detailed process of phage infection. In addition, by applying X-ray crystallography and electron microscopy, I aim to uncover structural information on the toxin, which may lend insight into the mechanism of MuF toxicity and its larger role in the human microbiome.