Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

Poster Session 1

Commons West, Easel 29

11:00 AM to 1:00 PM

A Practical and Efficient Synthesis of Bismuth N

Elena Christopher-Allison, Junior, Chemistry, Mathematics, Portland State University
McNair Scholar
Mentor: Andrea Goforth, Chemistry, Portland State University
Mentor: Hayden Winter, Portland State University

Bismuth nanoparticle (Bi NPs) have wide-ranging applications in both biomedical imaging and nanotechnology. These applications are hampered by the absence of a sized-controlled, uniform synthesis using conventional laboratory techniques. The current synthesis of such particles is arduous and requires specialized techniques and equipment, specifically air-free techniques, which are not readily available to all. By using air stable and cost effective reactants, we hope to develop and characterize a synthesis that is reliable, aerobic, free of lithium based organic bases, and potentially offers size control between 30 nm and 70 nm. This synthesis would produce high quality Bi NPs that are available to a wider range of researchers.

Session 1C

Sensory Integration, Learning, and Motor Control in Animal and Human Models

Session Moderator: Horacio de la Iglesia, Biology

MGH 231

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Fluid Intelligence Raised through Electrical Stimulation Tested on Ravens Matrices

Stephanie Ai Mizuno, Freshman, Pre-Sciences
Mentor: Andrea Stocco, Department of Psychology

Fluid intelligence is defined as the ability to solve reason and solve novel problems independent from previous knowledge. Fluid intelligence is typically tested with Raven's Progressive Matrices (RPM), a non-verbal test of logical and abstract reasoning. Previous studies have shown that fluid intelligence and performance on the RPM test rely on various brain regions, especially the left inferior parietal lobule (IPL) and the left middle frontal gyrus (MFG). In this study, we tested the hypothesis that artificially increasing the activity of these regions using Transcranial Alternating Current Stimulation (tACS) would improve RPM performance during stimulation. In the experiment, 16 naïve participants were tested with a within-subject design while they solved RPM problems of varying complexity. Each participant was tested under four conditions. In the two experimental conditions, tACS stimulation was applied to either the middle frontal gyrus or the inferior parietal lobule. Stimulation was administered using an HD-tACS system at 0.5 mA and 40 Hz, in a configuration with a central cathode and four surrounding anodes. In the remaining two control conditions, sham stimulation was applied to the same regions. Preliminary analysis suggests that stimulation resulted in a significant decrease in response times, especially for the most difficult problems. The results of this study could pave the way for future applications in cognitive rehabilitation, progression in the understanding of the neural signature of fluid intelligence, and improving cognitive performance.

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.

POSTER SESSION 3

Balcony, Easel 86

2:30 PM to 4:00 PM

The Effects of Ocean Tides on Suspended Surface Sediments in the Amazon River Using Satellite Imaging and Ground Truth Sampling

Caitlin Joy Fisher, Senior, Biology (Molecular, Cellular & Developmental), Oceanography
Mentor: Andrea Ogston, Oceanography
Mentor: Aaron Fricke, Oceanography

The Amazon tidal river consists of the lowermost 800 km of the Amazon River that is affected by tides. The effect of tides on surface suspended sediment concentration (SSC) in the Amazon has not yet been characterized, and may impact estimates of surface SSC as monitored through remote sensing. To assess potential tidal influence on surface SSC, water samples were collected and filtered in field; published remote sensing maps were also collected and compared to field measurements. Thus far, this project has identified discrepancies between *in situ* and remotely-sensed estimates of surface SSC, and constrained the influence of tides on the observed signals. *In situ* surface SSCs more accurately matched with remote sensing maps on sites located directly in the Amazon mainstem, while tributaries showed exaggerated differences in surface SSC. Field surface SSCs in the Amazon mainstem also did not vary significantly with tidal seasons, suggesting that ocean tides play a smaller role in surface sediment transport than originally hypothesized. Further conclusions will look into the roll that tides play on total bedload, especially at sites close to the river mouth where tidal influence is strongest. Explanations for surface SSC discrepancies will also be included in the paper's conclusions; since many of the discrepancies occur in freshwater tribuataries, the seasonality of phytoplankton blooms will be cross-linked to satellite SSCs. Finally, suggestions for future usage of remote sensing in strong tidal areas of the Amazon River will be given and the success rate/percentage of correlation of satellite surface SSC with field SSCs will be assessed. With a better understanding of the effects of tides on surface SSC and how well remote sensing captures variability, we can better monitor sediment discharge into the tropical Atlantic Ocean as well as sediment delivery to the floodplain of the Amazon River during seasonal floods.

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.