EBS/CMOP Undergraduate Intern Mentoring Opportunity

Project Title:

Environmental Particleomics: A New Approach to Link Aquatic Biogeochemistry and Plankton Assemblage Structure

Project Description:

Most of the main determinants of water quality either consist of, or are controlled by, particles. Many of these are well characterized, such as the relationship between microbial pathogen size and their removal by coagulation and filtration-based water treatment technologies. However, all of this work has been done with the emphasis on particular particles (e.g., bacteria) in isolation or in binary combinations (e.g., bacteria attached to sediment). This intern will pursue a holistic approach to the characterization of the particle load in water, focusing on the aggregate properties of the 'particleome'.

The intern will use a combination of existing and new data collected from the Lower Columbia River and Estuary. The data sets will come from an imaging flow cytometer (FlowCAM) that provides >20 metrics that describe particle properties (for example, length, width, surface roughness). The main project goal is to link aquatic properties (including temperature, turbidity, and nitrate levels) and hydrography (i.e., river flow) with changes in planktonic assemblages and their characteristics in order to (1) identify key factors that link assemblages (i.e., particles) with environmental characteristics, and (2) test the hypothesis that aggregate particle properties can be used to predict biogeochemical characteristics of aquatic systems. The first goal will be accomplished using multivariate statistical tools (Principal Component Analysis, Canonical Correspondence Analysis). Achieving the second goal will involve additional statistical analyses such as K-means clustering and Discriminant Analysis.

Outcomes/Broader Impact:

The results will contribute to the scientific basis for assessment of water quality and water treatment, as well as provide insights into drivers of community structure within coastal margin environments. This approach is well suited to the distillation of observatory data; specifically, this approach can be used to analyze new data coming from high-resolution continuous measurements of particle-specific properties alongside measurements of water chemistry and in the context of model predictions and observations.

Timeline:

Week	*Activities*	*Deliverables*
1	Basic training on safety, lab protocols, analytical methods.	
2	Develop and validate analytical methods.	
3	Preliminary application of methods to aquatic biogeochemistry.	
4	Refine methods based on preliminary results.	

5	Synthesize and present interim results.	Presentation
6-9	Further application and refinement of the methodology.	
10	Synthesize and present final results.	Report