IEH Undergraduate Intern Mentoring Opportunity

Deadline: **February 22, 2013**
Selections Announced: **mid-March, 2013**

Name/Title/Institution(s) of senior mentor(s):

Joseph Needoba/Assistant Professor/Oregon Health & Science University

Tawnya Peterson/Assistant Professor/Oregon Health & Science University,

Name/Title/Institution(s) of frontline mentor(s):

Rachel Golda/PhD Student/Oregon Health & Science University

Project Title: Using chemostat systems to examine the influence of ocean acidification on algal toxin production

Context for Project:

Harmful algal blooms (HABs) are the rapid proliferation of phytoplankton that threaten human health or environmental quality. The impact of HABs on coastal communities can be severe, ranging from serious human and ecological health problems to the negative economic impacts of costly mitigation strategies and lost revenue. The negative impacts of HABs on coastal environments are compounded by the developing problem of ocean acidification (OA), the alteration of the marine carbon cycle due to increased anthropogenic input of CO_2 to the atmosphere. OA is known to have severe negative impacts on shellfish, corals, and certain species of algae.

Brief Description.

CMOP: Please address the scope of research and its relevance to the CMOP mission, particularly how it fits into the CMOP Integrated Research Plan which can be found at www.stccmop.org/files/CMOP_IntegratedResearchPlan.pdf.

EBS: Please describe the project as it relates to research goals of your laboratory group.

This summer project will explore the influence of the emerging problem of ocean acidification on the population dynamics and toxin production of the toxic marine algae *Alexandrium catenella* and *Protoceratium reticulatum*. *A catenella* is a causative agent of paralytic shellfish poisoning, while the effect of toxins produced by *P. reticulatum*, although showing acute toxicity in animal studies, are as yet unknown for humans.

This will be a laboratory based study. A chemostat culturing system will be used to keep the cultures at steady state in a chemically static environment so that specific variables (in this case, pH and

pCO_2) can be targeted and manipulated to determine their influence on the algae studied. The project will include training in algal culture maintenance, (both continuous cultures as well as batch cultures), media preparation and sterile techniques. The student will learn sampling techniques as well as sample processing, which will include fixing samples for pCO_2 work, microscopy and flow cytometry, as well as filtering for nutrients. Pulse amplitude modulated (PAM) fluorometry will be used to determine activity of Photosystem II, as well as reactive oxygen species (ROS) assays to determine the amount of oxidative stress experienced by the cell.

This research may enable coastal communities to act preventatively against the negative impacts of HAB events, as opposed to reacting after the damage has already been done. This dovetails with CMOP's mission to support research that is "anticipatory rather than reactive.

Proposed Outcomes/Broader Impact:

This work will illuminate relationships between OA and HAB dynamics, reducing health risks and minimizing monitoring costs by using existing infrastructure (i.e., *in situ* pCO_2 sensors) to predict future HAB events. Coastal communities will be able to use this information in regulating shellfish harvests to minimize exposure to saxitoxin.

Proposed timeline (within a 10 week span):

Week 1: Orientation, literature review and background reading, introduction to chemostat system, LabVIEW program. Lab meeting (Fri. 1:30pm).

Week 2: Training in media prep, chemostat maintenance, sterile sampling, batch culture identification and maintenance. Make media, organize experiment. Introduction to PAM fluorometry, ROS assays. Lab meeting (Fri. 1:30pm).

Week 3-7: Chemostat maintenance (maintaining a steady supply of sterile media to input carboys, emptying waste carboy), monitoring/sampling (fluorometry, microscopy,), sample processing (PAM fluorometry, ROS assays). Lab meeting (Fri. 1:30pm).

Week 8: Organize/interpret PAM, ROS data. Lab meeting (Fri. 1:30pm).

Week 9: Project report write up and presentation preparation. Lab meeting (Fri. 1:30pm).

Week 10: Final wrap-up, final presentation and paper.

Intern academic experience and skill set should include: Please list majors you would consider, preferred course background, any other needed skills. Please note if you are willing to work with a less experienced intern (freshmen or sophomore) or require a more experienced candidate (junior or senior).

Please keep in mind that funding restrictions may require parameters on candidate selection.

Preferred Majors: Biology, Microbiology, Ecology, Environmental Science or Engineering, Marine Science or related fields.

Course Background: More experienced candidate preferred (junior or senior); exceptional experience in sophomore also acceptable. One year of general biology, chemistry required. Coursework in microbiology preferred.