The job market for PhDs in aquatic science is changing. See Inside.
MEETING HIGHLIGHTS

COMMUNITY COLLEGE FACULTY AT ASLO AND OCEAN SCIENCES: BUILDING THE OCEAN SCIENCE 2YC COMMUNITY

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The approximately 1200 community colleges in the United States play a crucial role in STEM education. Forty-three percent of U.S. undergraduates attend a community college (American Association of Community Colleges, 2011), and almost one half of Americans who receive bachelor's degrees in science and engineering, and one-third of recipients of science or engineering master's degrees, attended a community college at some point during their education (Tsapogas, 2004). Community colleges are also important in teacher preparation; about 40 percent of the nation’s teachers, including those in STEM fields, completed some of their mathematics or science courses at community colleges. Community college (2YC) faculty thus play an important role in geoscience education, and oceanography or some type of ocean science is part of the curriculum at many community colleges. These courses are taught by a diversity of faculty some of whom have graduate degrees in the ocean sciences, others are teaching these courses outside of their primary discipline. One common feature of these faculty is that few of them have access to professional development opportunities to learn of new developments and discoveries in the ocean science field.

To address this issue, and to continue our efforts to build an ocean science 2YC community, we received funding from the National Science Foundation (NSF) to facilitate the attendance of twenty-two 2YC faculty at the 2013 ASLO meeting in New Orleans. We offered a Sunday workshop that focused on best practices for preparing workforce and transfer students in two-year colleges for ocean science careers. The workshop goals and program details can be seen at: http://serc.carleton.edu/sage2yc/workforce/workforce2013ASLO/program.html

In addition we sponsored a paper and poster session on opportunities and challenges of teaching introductory oceanography to undergraduates, thus providing an opportunity for the 2YC attendees, (along with others) to present their work that focuses on their teaching experiences. Participants valued the opportunity to network with others who teach oceanography, to learn about current research in ocean sciences, make new contacts and discover resources to utilize in their teaching.

Building on the success of the 2013 meeting NSF has again provided us with resources to bring 2YC faculty to the 2014 Ocean Sciences meeting as part of our efforts to build the Ocean Science 2YC community. In addition to the regular Ocean Science meeting opportunities 2YC faculty (both those sponsored by NSF and others who plan to attend the meeting) will be offered a Sunday workshop focusing on oceanography teaching resources and practices in the two-year colleges.

workshop will explore successful models for teaching oceanography topics to non-majors and will focus on tested models and strategies for effective teaching. Topics for inclusion are using on-line data, interactive activities, active learning, and research opportunities for 2YC students. We have also sponsored a paper and poster session on undergraduate ocean science education in the 21st century: an exploration of successful practices that has provided the 2YC faculty and others opportunities to showcase their expertise. Those interested in learning more about the developing Ocean 2YC community are invited to contact Jan Hodder - jhodder@uoregon.edu and Allison Beauregard - beaurega@nwfsc.edu

xFOCE: LONG-TERM IMPACTS OF OCEAN ACIDIFICATION IN SITU

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Laboratory studies have considerably advanced the understanding of the tolerance or response of individual species to ocean acidification in the past 15 years. This approach, however, provided little information concerning the response of natural assemblages of interacting species, in which the direct impacts of ocean acidification as well as their cascading indirect consequences (e.g. changes in the intensity of interaction strengths among predators or competitors) may be evident. Free Ocean CO₂ Enrichment experiments (FOCE; Kirkwood et al., 2011) are a key tool to investigate the long-term (several months to
more than one year) response of natural communities to ocean acidification. This technology provides precise control of pH within \textit{in situ}, partially open, experimental enclosures (e.g., Kline et al., 2012).

With support from the BNP Paribas Foundation and the French Embassy in Washington D.C., a group of present and future FOCE users and engineers met in Villefranche-sur-mer (France) in November 2013. FOCE systems and the results obtained so far were reviewed: dpFOCE deployed in deep waters offshore California (Jim Barry), cpFOCE deployed on the Great Barrier Reef (David Kline), eFOCE in operation in the NW Mediterranean Sea (Erin Cox and Paul Mahacek), swFOCE to be deployed in Californian coastal waters (Bill Kirkwood), and antFOCE to be deployed in the Australian sector of Antarctica (Donna Roberts and Jonathan Reeve).

There is little doubt that, although challenging from engineering and logistical point of views, current FOCE experiments will provide crucial data for understanding the response of communities to ocean acidification. However, ocean acidification is not the only change affecting the global ocean. Changes in temperature and oxygen concentration are also key parameters controlling marine ecosystems. It is anticipated that the next generation of FOCE systems will include options for oxygen and temperature control. Meeting participants have identified key engineering and scientific issues and discussed preliminary plans for manipulating several of these variables \textit{in situ}, including nutrients.

This informal group, called xFOCE, has organized to publish a paper providing guidelines and best practices information for future users and to prepare a Wikipedia entry on “Free Ocean CO\textsubscript{2} Enrichment,” now online. The xFOCE group is open and welcomes any scientist planning to develop a FOCE system. MBARI will release an open source package to transfer FOCE technology to interested researchers. This package will comprise all engineering information required to develop cost effective FOCE systems.

The xFOCE web site provides additional information on the current FOCE systems, meetings and expected products (http://xfoce.org).

REFERENCES


Fig A: The deep FOCE (dpFOCE) instrument, deployed for 17 months at 900 m depth offshore California, used a flume concept for maintaining greater control over the experiment volume while still permitting the introduction of natural seafloor sediments, organic material, and nutrients.

Fig B: The coral proto FOCE (cpFOCE), deployed at Heron Island (Great Barrier Reef), used replicate experimental flumes to enclose sections of the reef and dose them with CO\textsubscript{2}-enriched seawater using peristaltic pumps with computer controlled feedback dosing.

Fig C: The European FOCE (eFOCE) system, currently deployed in the bay of Villefranche-sur-mer (France) at about 12 m depth and 300 m offshore to investigate the effects of acidification on \textit{Posidonia} seagrass beds, comprises two open-top enclosures as well as a surface buoy housing the electronics as well as the production of CO\textsubscript{2}-enriched water.