Five Years of the Scholars Program

In Fall 2008, ten students embarked on a new learning experience – an academic-year training program in which they would be mentored by faculty researchers at UH Mānoa while engaging in hands-on scientific research. These students formed the first C-MORE Scholars cohort, and now, five years later, the Program continues to train a selected group of promising young researchers in scientific disciplines ranging from meteorology to molecular biology. This year, 16 students represent four institutions on O‘ahu and Hawaiʻi Islands.

How did the C-MORE Scholars Program begin?

The Center for Microbial Oceanography: Research and Education (C-MORE) is a National Science Foundation Science and Technology Center that was founded in 2006. Part of C-MORE’s mandate is to train the next generation of scientists, a process that necessarily occurs at multiple levels of education, including undergraduate. Recognizing that post-college success relies on more than just academic achievement, the Scholars Program takes a holistic approach to student development by equipping students with practical skills in research design, lab and field methods, data management, and professional development.

What have Scholars done with their C-MORE experiences?

Alumni of the Scholars Program have co-authored articles on their C-MORE-supported research in peer-reviewed journals, and several are currently enrolled in graduate programs in Hawai‘i and on the mainland U.S. Collectively, C-MORE Scholars have participated in over twenty different Research Experiences for Undergraduates (REU) programs. What will you do with your C-MORE Scholars experience?

Interested? Download the C-MORE Scholars application: http://cmore.soest.hawaii.edu/education/undergraduates/index.htm
Scholars Orientation

On September 7, 2013, the 2013–2014 cohort of C-MORE Scholars trekked out to the scenic Hanauma Bay Nature Preserve for the annual program orientation. All 16 Scholars came together to get to know one another, learn about the structure and expectations of the program, and explore the Bay.

Graduating seniors Paul Bump, Edna Díaz-Negrón, and William Truong led the orientation activity. Students divided into three groups and were provided with various pieces of equipment to sample the near-shore environment. Before heading into the water, each group developed a research question and discussed how they would use available resources to answer their question.

After collecting data with a YSI probe, quadrats, tape measures, fish ID guides, and snorkeling gear, the students returned to the conference room to pool, map, and interpret their data. The activity gave students a hands-on experience with the scientific process, as well as an opportunity to reflect on how best to approach research questions with finite resources (including time!).

C-MORE Scholars work together to devise research questions and determine how best to use the sampling equipment to answer those questions.

C-MORE Scholar Eli (Rez) Wong takes temperature and conductivity readings with a YSI probe.
Interview: Notes from the Field, Part 1
A new column on marine science careers and the people who have them.

JEANETTE CLARK: OCEANOGRAPHY INSTRUMENTATION & RESEARCH SPECIALIST, UNIVERSITY OF HAWAI’I

Jeanette graduated from the University of Hawai’i at Mānoa with an MSc degree in Physical Oceanography in May 2013.

What have you been doing since you graduated?
I started a position with Dr. Margaret McManus, a biophysical oceanographer who was one of the faculty members on my thesis committee. My official title is “Oceanography Instrumentation and Research Specialist,” but basically I am a technician who also gets to do analysis and writing.

What does your work entail?
I use a variety of instruments to measure water velocity, pressure, quality, turbidity, and fluorescence. We look at the way ocean physics affects patterns that we see in the biology. For example, we can use circulation data to understand connectivity between coral heads or fish populations in Kane’ohe Bay. On Lana’i, we are doing a water quality study to understand how to mitigate sedimentation.

How did graduate school prepare you for this work?
In grad school, I learned a ton of hard skills, such as how to program instruments, develop a numerical model, use GPS, and drive boats, in addition to the extensive traditional academic knowledge I received in my classes. I use all of these things in my job, which has been like an extension of grad school. There is also a lot of training that isn’t necessarily built into the curriculum but that you can pick up along the way, like scientific writing, public speaking, and people skills, in general.

How does your work reflect your larger interests?
I have always been interested in interdisciplinary work and enjoy the feeling that my work can be used in a broader context. I am also interested in conservation and looking at problems with invasive algae or runoff, for example. I want to study and better understand how marine systems work and to influence policy.

What has been your most challenging experience as an oceanographer?
I applied for a grant for student ship time and ended up serving as co-chief scientist for a 12-day research cruise. Being in charge of science operations was exciting and challenging because conditions changed all the time. I had to coordinate with the other chief scientist, make sure that we were maximizing the work done on the ship, work with the ship’s crew, and do a lot of trouble-shooting whenever the instruments didn’t operate properly. Plus, being on a ship adds its own layers of complexity. I had never been on a large research vessel before, and yet suddenly I was overseeing a group of six people and all of their research!
For this issue of the Scholars Newsletter, we collected impressions about the program from several current Scholars: Paul Bump, Kirena Clah, Edna Diaz-Negrón, Louise Economy, Kalani Quiocio, and Kanoe Steward.

What are some of the projects that Scholars work on?

Paul: My research focuses on the interface between bacteria and the larvae of the marine polychaete, *Hydroides elegans*. My specific goal is to better characterize the potential role that the genetic components of the innate immune system of *H. elegans* play in metamorphosis. This is an intriguing avenue as it has been well established that *H. elegans* larvae settle and metamorphose in response to a specific bacterial cue.

Kanoe: My C-MORE project this semester primarily involves DNA extraction, polymerase chain reaction (PCR), DNA purification, and DNA sequencing. At the beginning of the semester, I intended to sequence samples of *Cassiopea* spp., more commonly known as upside-down jellies, from different parts of Hawai‘i Island. Although I was only able to locate the *Cassiopea andromeda* species in a pond in Waiʻōpae, Kapoho, I was still able to process polyp samples that were collected from the same pond as the jellies. I was interested in seeing if these were *Cassiopea* spp. polyps to determine if these species were being established there and if they had any harmful effects on the other aquatic organisms, such as the ʻōpae huna, or feeble shrimp.

Edna: Submarine groundwater discharge (SGD) is any flow of fresh or recirculated saline groundwater from land to the coastal ocean. SGD may contain nutrients, heavy metals, organic compounds and contaminants that can strongly influence coastal water geochemical budgets and water quality, causing biological responses and driving ecosystem changes. The main objectives of my study were to measure and compare potential microzooplankton community grazing rates on phytoplankton and phytoplankton growth rates as a function of SGD at Kiholo Bay, and to determine if SGD has any significant effects on these rates.

How do you benefit from the program?

Paul: I believe the C-MORE Scholars Program has been one of the most impactful experiences of my undergraduate education. As an undergraduate student it can be challenging to find a meaningful research experience that allows a student to do more than washing glassware or autoclaving media. From the initial question of “Why is this important?”, to performing field and laboratory work, to the final presentation of results, participating in the C-MORE Scholars Program has been an invaluable opportunity to expand my capacities as a researcher.

Kanoe Steward pipettes samples of *Cassiopea* spp. DNA for gel electrophoresis.

Kirena Clah collects water samples from the Ala Wai Canal.

Kanalani: I have learned to accept that things may not go as planned and that it takes an incredible amount of patience and persistence to collaborate with many groups and individuals to achieve one objective. I have gained more experience working with people and have learned how to communicate more clearly and effectively. Learning to prioritize my responsibilities and my commitment to a team has not been an easy lesson. Nonetheless, I am extremely grateful that I was able to be a part of this process. It may be one of my most valuable experiences in my academic career to come.

Louise: Through participation in the C-MORE Scholars Program, I have been challenged to balance coursework, research, and a commitment to education and outreach. This opportunity has given me a better understanding of the demands of a scientific career. As a future scientist, I will be required to handle the logistical aspects of the field such as grant writing, maintaining a budget and following a timeline, which was mirrored in my coursework this semester.
Scholars Roundtable, continued from previous page.

Kirena: My overall experience participating in the C-MORE Scholars Program has been extremely rewarding. Although at times it was hard, working in a laboratory allowed me to push myself intellectually and mentally. I learned so much, not only about marine microbial oceanography but also about myself and what I want to do in the future.

**What are your goals for the future?**

Kalani: My initial objectives focused on collaborating with fishpond managers to address the need for effective, culturally-based management and conservation strategies. This internship has given me the skills to facilitate collaboration among university, government, and community members to integrate scientific research, formal and informal education, and traditional cultural practices to assist the needs and desires of the Keaukaha community. I plan to continue to foster these relationships and work towards conducting meaningful research that encompasses local and Hawaiian community involvement and participation to elevate our cultural heritage and sense of place.

Edna: In the future I would like to pursue graduate studies and eventually go back to Puerto Rico to contribute to the island with my knowledge. I would also like to become a professor, have the opportunity to publish my work and make a difference by expanding the world’s knowledge for the benefit of future generations.

Paul: Travel! I’ll be headed down to American Samoa to help on a research project creating a coral thermal tolerance threshold stress map. After that I’ll be headed off to Washington D.C. to compete in FameLab: Exploring Earth and Beyond a competition for students, postdocs, and intellectuals who make a difference by expanding the world’s knowledge for the benefit of future generations.

**Do you have any advice for prospective Scholars?**

Edna: My advice to new and future Scholars is to always take a chance. Even if you don’t think it will work out for any reason, take the chance and answer the e-mail or go to the interview. Things are not always what you expect and might be better than you expected.

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**Fast Facts**

*about the C-MORE Scholars Program*

- % of present Scholars who are community college students: 19
- # of current Scholars who are parents: 4
- % of current mentors who are faculty: 50
- # of present Scholars researching marine bacteria: 8
- # of students who have participated in the program to-date: 63
- # of people who have served as mentors in the program to-date: 59
- % of current Scholars from under-represented minority groups: 63
Interview:
Notes from the Field, Part 2

ROB WHITTON: RESEARCH ASSOCIATE, BISHOP MUSEUM

What is your role at the Bishop Museum?

I am an underwater videographer and application developer. I go on research expeditions throughout the Indo-Pacific, during which I collect visual data of fish and invertebrates. I also build software tools for organizing and managing these data. I take most of my footage for research, but some of it is also used by National Geographic and smaller television productions.

Can you describe the path you took to get where you are today?

I got my dive certification in 1994. Soon afterward, I had the chance to dive from a live-aboard on the Great Barrier Reef and became inspired to become a dive instructor, so I returned to the U.S. and did just that. I certified a couple of hundred people within my first year, but ultimately I found it hard to make a living from that alone.

I later took over another diver’s business filming tourists underwater and discovered that I was more interested in taking footage of fish than of my clients! Eventually, all my wildlife footage made me want to know what I was seeing, plus I had to figure out how to keep all my video clips organized. Fortunately, I had learned how to build websites and design databases while running my business as a dive instructor, and I used this computer background to build software to manage my video files.

My passion for fish identification and documentation brought me into contact with John Earle and Dr. Richard Pyle, both from the Bishop Museum. We became fast friends, and the rest is history. I have now been on about 30 biodiversity survey expeditions around the world and just returned from the Philippines.

What special training do you use in your work?

I am one of just a handful of deep-diving researchers. I specialize in mixed-gas rebreathing, which allows me to spend more time at deep sites (up to 400 feet). At those depths, standard SCUBA is very inefficient – you might only get 2 hours of time on-site over an 8-hour period, whereas with rebreathers, you can spend 2.5 hours out of 3 at the target spot. This is especially important when time is limited and you’re at remote sites that are expensive or difficult to access.

The other critical piece is my IT background. We record everything that we see on our dives, and the software that I wrote allows us to document occurrence data for each organism without having to re-enter it.

What are your future goals?

My current goal is to secure a grant for ship time to sail to the Phoenix, Line, and Gilbert Islands. These are extremely isolated spots that would be better to access by boat than plane, since trying to get helium, oxygen and other diving supplies on each island would be challenging and costly.

Another goal of mine is to work with the Taxonomic Databases Working Group to create standards, naming conventions, and ontologies. The scientific process takes months to years from starting a project to publishing results, and I want to figure out how to make it easier to disseminate data.
C-MORE Scholars Reach Out

Every semester, C-MORE Scholars conduct at least ten hours of educational outreach in the community. Participating in outreach helps Scholars build their science communication skills and helps the community learn about the research that's being conducted at UH.

This past semester, Scholars engaged in nine outreach events that boasted a combined attendance of 9,140 individuals! In Hilo, Scholars set up booths featuring C-MORE science lessons at the Waiuli Ocean Fest and Hawai'i County Fair. On O'ahu, Scholars conducted outreach during SOEST Open House and the Kapi'olani Community College STEM Fair. Notably, Paul Bump drummed up public interest in marine microbes as a presenter at TedX Honolulu.

Announcements

Ocean Sciences Meeting: Mentor a Student!

The joint annual meeting of the Association for the Sciences of Limnology and Oceanography, The Oceanography Society, and the American Geophysical Union will be held in Honolulu 23–28 February 2014. For the first time in the meeting’s 17-year history, there will be a special youth poster session. This is a fantastic opportunity for Hawai'i’s middle- and high-school students to participate in an international conference. C-MORE Scholars are invited to mentor a middle- or high-school student through the poster session and will receive training and outreach credit for their participation. Help inspire a young scientist! Contact Michele Guannel at mguannel@hawaii.edu with your interest by January 15th.

Website Updates

The C-MORE Scholars webpage has been updated with loads of new features! The Research Experiences for Undergraduates page has over 20 new listings for summer undergraduate opportunities throughout the world. The database is searchable by location and application deadline. From the Scholars webpage, you can also access the Pathways to Science and Marine Advanced Technology Education websites, which provide scholarship and internship listings, tips for identifying a graduate program, and guidelines for writing application essays. Visit the website soon: http://cmore.soest.hawaii.edu/education/undergraduates/index.htm

Upcoming REU Deadlines

The REU application season is upon us! The highly coveted MIT Summer Research Program and Smithsonian Institution Natural History Research Experience programs both have deadlines at the end of January. Check out the Summer Opportunities webpage and apply now! http://cmore.soest.hawaii.edu/education/undergraduates/summer_opps.htm