Summer Research Experiences for Undergraduates (REU)

As the fall semester comes to an end, C-MORE Scholars are gearing up for the application season of summer REUs. Many REU application deadlines are in January or February to give their programs time to select the best candidates. Students in the C-MORE Scholars Program are highly encouraged to take part in summer REUs. La'Toya James, a C-MORE scholar alumna, shares her experience participating in two summer REUs with the Massachusetts Institute of Technology (MIT): the MIT Biological Engineering REU and the MIT Summer Research Program.

What did you do at your summer REUs?

For both REUs, I worked within the laboratory of Dr. Alan Jasanoff (Department of Biological Engineering). My project focused on utilizing pulses of ultrasound to disrupt the blood-brain barrier (BBB) of rodents. Though the BBB is crucial for protecting our nervous systems against foreign agents (viruses, bacteria, chemical toxins, etc), it also impedes the delivery of chemotherapeutics as well as imaging contrast agents.

Following the two summers I spent within the Jasanoff laboratory, I successfully provided the group with a set of electrical and dosing parameters that could be utilized to deliver their novel molecular magnetic resonance imaging contrast agents and sensors across the BBB of rodents.

What have you gained from summer REUs?

Participating in summer REUs has allowed me to really gain the focus that I need to be a successful graduate student. In addition to the suite of skills and techniques that I have mastered, I have learned to design experiments from scratch and follow through until I have found an answer to the problem I initially posed.

Check out the summer REUs available for 2013: http://cmore.soest.hawaii.edu/education/undergraduates/summer_opps.htm
Scholars Orientation

The 2012-2013 cohort of C-MORE Scholars gathered together in Waimānalo on September 8, 2012 to take part in the annual scholars orientation. The orientation is the first opportunity for scholars to get to know one another and learn about each other’s projects. They also learn about program expectations and requirements, such as work schedules and outreach hours.

In the past, we had a staff member or graduate student lead the science activity but this year we did something slightly differently. Since we had four returning scholars, Bryan Chinaka, April Goodson, Christina Johnson, and Kahoali‘i Keahi-Wood, we decided to have them teach the activity to the new scholars. The past scholars used the C-MORE Plankton Kit to teach three lessons about plankton, including how to collect and identify them.

The returning scholars had the opportunity to test out their teaching skills in preparation for future educational outreach events. The new scholars learned an activity that they can take to the classroom and teach younger students.
Interview: A Current Scholar’s Viewpoint

CHRISTINA JOHNSON

Christina is a senior majoring in Global Environmental Science at the University of Hawai‘i at Mānoa. She will be graduating in spring 2013. She has been a C-MORE Scholar since fall 2010.

How has the program impacted your undergraduate experience?

My participation in C-MORE and the Scholars Program has been indispensable to my undergraduate career, providing me early education in experimental development, field and laboratory work, data handling and analysis, synthesis of research findings, and the dissemination of research findings through the preparation of scientific posters, symposium talks, and written reports. I will come away from this program with a much better understanding of the inner-workings of academic research in my intended field of study. In addition to this I will also come away from the Scholars program with a high degree of training in professional development, leadership, and community outreach.

What research are you working on as a Scholar?

I am interested in the microbially-mediated coupling of major marine biogeochemical cycles. My scholars project have focused on a particular marine microbial interaction between the carbon (C) and nitrogen (N) cycles through open ocean assemblages of microorganisms called diazotrophs. These microbes come in several flavors, but are united by their ability to tap into a vast, yet widely unavailable storehouse of the vital nutrient, nitrogen. Diazotrophs are unique because they possess the biochemical machinery necessary to transform N from its most abundant, unusable form (N₂, about 80% of our atmosphere) into bioavailable forms that are useful to, and highly demanded by, other lifeforms. This transformation of unavailable N₂ to useful N represents quite an energy investment on the part of the diazotroph; to supplement the energetic cost of the procedure, the diazotrophs that I study turn to sunlight energy and photosynthesis for financing. Since the “synthesis” part of photosynthesis involves the creation of sugars and other organic compounds from carbon dioxide (CO₂), diazotrophs represent a coupling of important transformations within the N and C cycles. In the three years I have participated in the Scholars program, my research has focused on different questions regarding this model.

What are your long-term career goals?

I want to do my part to embroider greater detail into the scientific understanding of global biogeochemical science by helping elucidate transformations mediated by marine microbial machinery. I plan to pursue academia and broad-level science writing. I want to contribute at least as much literature written in language appreciable to the non-specialist as I contribute to technical journals. I reject the notion that science should remain unavailable to the “uninitiated” -- I’m sort of a diazotroph myself, in that respect. My N₂ is scientific knowledge, locked away in technical language, awaiting science bilinguists to make it useful to others. So, in the long-term I hope to build my expertise as a microbial oceanographer, contribute new knowledge to the field, and write the story in language accessible to the non-specialist.

What do you plan on doing after you graduate?

I plan to pursue graduate studies in microbially-mediated biogeochemistry in Fall of 2013, and I hope to carry out a post-graduate internship in the summer prior to that. I am currently speaking with research groups at several institutions – at this point, I can’t predict where on Earth I will be this time next year!
La'Toya James

La'Toya graduated from the University of Hawai‘i at Mānoa with a BS degree in Biology in May 2012.

What have you been doing since you graduated with your BS degree?

Since graduation, I have continued to work in Dr. Grieg Steward's laboratory. However, we have since started a new project. I am also volunteering within a neuroscience laboratory to gain more experience.

What aspects of the Scholars program did you enjoy the most? Did you feel being part of the program helped to prepare you for graduate school?

I loved the networking aspect of C-MORE! I had opportunities through C-MORE that I would not have had otherwise. For example, I was able to travel to the Woods Hole Oceanographic Institution twice to work alongside Dr. Daniel Repeta on deciphering structures of phosphorus compounds. It was through my first experience at WHOI that I fell in love with the Massachusetts Institute of Technology, where I subsequently conducted research (within the neurosciences) for two summers.

What are your plans for graduate school?

I am currently applying for MD/PhD programs. I want to conduct research at the graduate level within the neurosciences to one day provide better treatment options for neuronal diseases and disorders.

What type of research will you be doing for graduate school?

I would love to conduct research investigating microorganisms that are able to cross the blood-brain barrier (BBB) and the changes that result in the BBB following invasion. This would allow me to combine the knowledge and skills I have gained in Dr. Steward’s laboratory with my love and fascination of the central nervous system.

What advice can you give current Scholars about applying to or selecting a program for graduate school?

Although I have not completed the process of applying to graduate programs yet, the advice that I would provide is "APPLY EARLY!!!" It is crucial to apply early as interview slots fill quickly and you may miss deadlines by waiting for applications to be verified (in the case of medical schools or MD/PhD programs). It is just as important to be organized when applying. You want to make sure that you meet all of the requirements for submitting an application. Otherwise, your efforts will be futile.
Interview: Get To Know Your Mentors

TRACY WIEGNER (WIEGNER@HAWAI.EDU) ASSOCIATE PROFESSOR, MARINE SCIENCE, UH HILO

What kind of research do you do in your lab?

My research focuses on how riverine and coastal water quality are affected by human activities. Specifically, I study the effects of invasive species, specific land uses, domestic waste disposal, and precipitation changes on water quality. I literally work from makai to mauka - from the headwater streams to coastal waters with river and groundwater discharge. I am interested in how concentrations and forms of biologically important elements, like nitrogen, phosphorus, and carbon, change as a result of human activities and how biological processes in the downstream ecosystem respond to these changes. To examine the response of these ecosystems, I measure things like nutrients and fecal indicator bacteria. I use stable isotopes to identify sources of pollution and follow the flow of elements from specific watershed sources through food webs. I also use water quality sensors to make coastal water quality maps and monitor real-time changes in water quality from coastal buoys.

What advice do you have for undergrads who may be interested in working in your lab?

I encourage students to seek out as many research opportunities as possible to discover what they are interested in and also, what they do not like. It is always better to try something out, than to wonder about what it would have been like and to regret not trying it. I prefer to have students of a junior standing to work with me on projects because by this time they have taken at least one year of inorganic chemistry, oceanography, statistics, and a methods and analyses course. This coursework allows students to work more independently because they have a sufficient course background in the material they would need to know to successfully initiate and execute a project. I often pair undergraduates up with my MS students so that they can work as a team together on a project. The undergraduate student gains experience in doing research for the first time, while the MS student gains leadership experience.

Can you describe the path you took to get to where you are today in your career/research?

My career path was pretty straightforward. It really started in high school when my friend and I started an environmental science club (Preserve Our Planet, POP). It was one of the first in New York State and it all started from complaining about the summer heat and wanting to do something about it. From here, I went to college. I started out at Colgate University in New York as a biology major and transferred to Cornell University (New York too) and this was probably the best professional decision I ever made. At Cornell, I was able to get involved in research. But, the faculty members didn’t approach me; I got brochures (this is before websites) and found out what different faculty did for research. I made appointments to meet them and from there was able to become involved in projects first as an independent study student and then as a senior thesis research student. I thought I wanted to be professor and I knew that to do that I would need to continue on to graduate school. I asked my advisor to recommend names of people who he liked and respected and then I sent them letters introducing myself and seeing if they had available positions in their laboratories. I then went to Rutgers University in New Jersey and was one of the first students in the Oceanography program at the Institute of Marine and Coastal Sciences. Graduate school was challenging. It was the first time I was really pushed to think for myself and it was hard. My advisor pushed me to develop my own research and seek out funding for it. She also pushed me to publish and present my results at conferences. After completing my PhD (I didn’t do a MS like many do), I took a post-doc position at the Stroud Water Research Center. Here, I was asked to lead a funded research project from implementing it, working with technicians and students to execute it, to writing progress reports and manuscripts. Since post-docs are not permanent positions, I was seeking out ones that were. I applied for jobs all over the U.S. and the institution that was interested in me was the Marine Science Department at UH Hilo. At the time, I didn’t realize that the position offered was a really good fit for me. I didn’t yet realize that I enjoyed teaching and working with students one-on-one on research projects. The latter is my favorite part of my job.

Who is your role model or favorite scientist?

I actually do not have one. I have reflected much on my past experiences being mentored. I try to emulate what worked and I try not to repeat what did not work with me and my mentors. I often think about what I would have liked out of my mentors, and try to make sure that I provide that to my students. I really like working closely with students on projects as a team.
C-MORE Scholars Outreach

Every semester, C-MORE scholars conduct at least ten hours of educational outreach in the community. Working in formal or informal educational settings, they utilize C-MORE educational resources (such as the C-MORE Outreach Box or Science Kits) to teach about ocean properties, marine microbes, climate change and ocean acidification. Participating in outreach helps scholars build their science communication skills, and helps the community learn about the research that’s being conducted at UH.

About the Program

The C-MORE Scholars Program provides hands-on, closely mentored research experiences for full-time undergraduate students within the University of Hawai‘i (UH) system who are interested in ocean and earth science-related careers. Students, especially underrepresented students such as Native Hawaiians and Pacific Islanders, from all UH campuses are encouraged to apply. Three levels of awards are offered, depending on the student’s skills, knowledge and experience. All Scholars receive guidance and help from a mentor who is an ocean or earth scientist. Mentors can be chosen by the student, or we can help find a mentor based on the student’s interests. In addition to conducting research, all Scholars attend monthly meetings on career/professional development, participate in educational outreach and present their research results at the end of the year. More information about the C-MORE Scholars Program can be found at: http://cmore.soest.hawaii.edu/scholars

New Applicants

The C-MORE Scholars Program will be accepting applications for its 2013-2014 academic year cohort starting in late March 2013. Applications can be downloaded from the program website.

Please send any contributions to the newsletter to Jessica Ayau (editor) via email at scholars@soest.hawaii.edu.