

Statement of Instructional Activities

Although my faculty appointment is as a Researcher (R), I am committed to science education at all levels. I enjoy the challenges and rewards of working closely with graduate research assistants. I am fortunate to have been able to provide graduate students with many interesting and exciting research opportunities, as well as long-term continuity in financial support. I also enjoy teaching and working with undergraduate students. Undergraduate assistants working in my laboratory are treated as student researchers and are integrated into the academic as well as the practical aspects of laboratory and field research.

OCN 320 (Aquatic Pollution): I have taught OCN 320 WI (Aquatic Pollution) every fall since 2001. Teaching the undergraduate course of Aquatic Pollution (OCN 320) is challenging; the class attracts students from a wide range of disciplines; the search for just the right approach is a continuing journey. This is a subject of tremendous relevance to all students, regardless of their majors. I am trying to find a combination of ways to reach most of the students. I want to keep the course both demanding and fulfilling for the most motivated, best prepared science students, while also reaching the students on the periphery. My evolving approach is an attempt to emphasize both learning about the important processes and how to think critically; I am trying to incorporate new ways of engaging the students in active participation.

The OCN 320 course is also Writing Intensive. I have been greatly dismayed at the writing abilities of many of the students at the beginning of each semester. However, I am committed to this aspect of the course, which is also constantly evolving. Basically, I incorporate a series of essay assignments into the course; the intent is to support and extend other course material; to allow students the opportunity to follow their interests in a systematic, efficient and judicious manner; and to help them discover techniques that may help their writing abilities. The objective is not 'science writing' per se, but rather it is basic clear, concise written communication such as expected in business, journalism, politics, and science. We spend a significant amount of class time on the 'written communication' theme, including discussions and peer-editing. We also discuss the relative merits of different types of reference materials and take a trip to the science reference librarian for a serious introduction to the electronic library resources. I spend a tremendous amount of time on each essay for each student. By the final essay, almost every student shows significant improvement in their writing; it is the memory of this outcome that gets me through the next semester's 'first essay'.

Graduate Students: Graduate students working in my laboratory have usually been supported nearly fully by my research grants, including summer overload. Occasionally, a student has also sought a Teaching Assistantship for the teaching experience, which I support. The dependable RA support has afforded my students maximum opportunity to pursue their classes and their own research projects. At the same time, it is my general policy that all students participate to some degree in the overall research efforts ongoing within my laboratory. While this policy does help to move the projects forward, it also provides students with multiple research experiences and a solid broad-based perspective for their own specific thesis or dissertation work. All students participate in my interdisciplinary research cruises that invariably involve investigators from other institutions and countries, providing additional opportunities for exposure to different technical and creative ideas. I routinely provide travel

funds for my students to attend national meetings, encouraging them to present their research results from an early stage of their graduate careers.

Undergraduates Students: Undergraduate students are a constant and important part of my laboratory and field effort. They are trained and given increasing responsibilities commensurate with their interests, time and abilities. These students are treated as full members of the research team; they are encouraged to participate fully in lab meetings, group seminars and field work. Several of these undergraduates have participated in research submersible dives, numerous others in surface ship cruises. Many students have worked in my laboratory over the past 20 years, usually 2-3 students at any one time; they have included students from UH (majority) as well as from Hawaii Pacific University, CalTec (summer), University of California at Santa Barbara (summer), UC at Santa Cruz (summer) and University of Alaska. I have hosted at least 6 students through NSF's Research Experience for Undergraduate program. Currently, Shane Warburton, Caitlyn Lawrence, Marcus Welker, and Diana Quach are student assistants in my lab. Another student, Kristin Mailheau, recently graduated in Dec. '05. I also worked with an Engineering Support Facility student intern (Lena Mobin) on modifications and documentation of an in situ instrument developed as part of a previous grants (ascending/descending particle trap).

Global Environmental Science Undergraduate Major: I am a strong supporter of the Global Environmental Studies (GES) major, hosted within the Department of Oceanography. I usually serve as faculty advisor to 2-3 students per year. In advising the students I try to help keep them on an efficient academic progress track and make them aware of academic and research opportunities; I try to understand their future academic and employment aspirations and discuss with them the various requirements, pathways and level of commitment necessary to reach their goals. I rely heavily on GES Chair Dr. J. Schoonmaker and GES education specialist N. Koike for clarifying academic requirements and administrative rules. I have also served as faculty research mentor for two GES students for their senior theses: Carolyn Berger graduated in spring '04 and Chris Contos graduated in spring '06 (co-mentor with Mark Merrifield).

Science Education Outreach: I am also an advocate of reaching out from the University to elementary and secondary school children. I have attempted to do this in a number of ways, including yearly participation in District and State Hawaii Science Fairs, participating in/hosting student symposia and student career days, many classroom discussions and projects, and numerous demonstrations in my own UH laboratory to classes of all ages. I have come to believe that such interactions, especially when frequent, casual and stimulating, can add significantly to the child's receptivity of science and the natural world around them. It also is stimulating for most teachers. Years ago I initiated a "ship-to-classroom" project with a 4-6 grade class in which I spent time with the class prior to a research cruise and then communicated with the class while at sea, describing ongoing ship-board and submersible research, life at sea and answering the students' questions. In 2001, I expanded this outreach effort to include a "teacher-at-sea" component to provide local elementary/high school teachers with hands-on research experience, including field research participation and internet-based ship to shore communication. Meetings were arranged so that the teacher, 4-6 grade 'master' teacher Jerry Mueller, was able to attend after his normal school day. Modest NSF funding

provided release time to the school (to hire a substitute teacher while Mr. Mueller joined the cruise) and the purchase of the computer hardware and network connection necessary to communicate with the classroom from sea. I also worked closely with Mueller and his classroom to provide scientific background for the project (microbial geochemistry on hydrothermal plumes). This project was wildly successful. The whole school became involved from the students in all classes (grades 1-6), their teachers, and parents. Mueller was fully integrated into the cruise, acquiring a highly productive hand-on research experience, including a submersible dive. Throughout the cruise Mueller also stayed in frequent email contact with his school's students. He and I would devise and perform simple experiments around the students' questions. One of the local HI television news stations even arranged (with the help of Dan Fornari, WHOI) a live-feed radio interview with Mueller while he was on a submersible dive at the bottom of the ocean. Part of the arrangement was that Mueller would share his experiences beyond his own classroom and school; consequently, Mueller spoke about his 'teacher-at-sea' experiences at many Hawaii schools as well as at several national meetings of teachers. This 'teacher-at-sea' program will be expanded upon during the recently funded 5-year grant to study the subseafloor biosphere.

As part of another project (UH NASA Astrobiology Institute), and in collaboration with former post-doc Brian Glazer and Ming Chen, we also recently set up a web site (<http://www.ifa.hawaii.edu/UHNAI/subseafloor.htm>) designed to show the connection between engineering and science in oceanographic research. The site, still underdevelopment, highlights a recent research cruise and is oriented for k-12 students.