OPPORTUNITIES IN THE Marine Sciences

BY BRIAN BINGHAM

St. Paul Island is a remote, windswept place in the midst of Alaska's Bering Sea. Only 40 square miles in total area, the island is famous for its remarkable bird populations and for the hundreds of thousands of Northern fur seals that annually swarm its beaches to breed and pup.

This is where Pamela Lestenko was born and raised. But Lestenko, Aleut, is currently far from her tiny island home. She is in Vancouver, British Columbia working toward a master's degree in science.
Coming from a family of commercial halibut fishers (her father is president of the Central Bering Sea Fisherman’s Association), Lestenkof is the first in her family to earn an undergraduate degree and pursue graduate education. What motivated Lestenkof to leave home and seek advanced education? Graduating with an eighth grade class of only 12 students, Lestenkof could have remained on the island to complete her high school education. However, she wanted the broader experience afforded by a larger school in a larger community. To achieve that goal, she moved to Sitka, Alaska to attend Mt. Edgecumbe High School, a boarding school for rural Alaska students. "In high school, I had to learn good time management skills since my parents were not there to tell me what to do. I was very studious and got good grades," she states.

During the summer of her junior year, Lestenkof participated in the Rural Alaska Honors Institute (RAHI) at the University of Alaska Fairbanks (UAF). This six-week summer program helped Lestenkof prepare for college-level coursework. She lived on the UAF campus taking courses in writing, study skills, biology, and swimming. After the RAHI experience, it was an easy next step for her to enter the undergraduate biology program at UAF.

Participation

Lestenkof was active in her AISES (American Indian Science and Engineering Society) chapter at UAF. At a chapter meeting in her sophomore year, she heard a fellow student, Ricardo Lopez, Aleut, report on a special program he had recently completed at a marine laboratory in Anacortes, Washington. The program was the Minorities in Marine Science Undergraduate Program (MIMSUP).

MIMSUP is a program developed to address the dramatic underrepresentation of individuals from minority racial/ethnic groups in the marine sciences. Few students from minority backgrounds (including Native American and Alaska Native) have traditionally pursued careers in this area and it is increasingly clear that recruitment and retention of minority scientists is crucial to maintaining and enhancing the intellectual health of marine science disciplines. In fact, a recent National Science Foundation (NSF)-sponsored workshop (see website at end of article) concluded that the near absence of minorities in the ocean sciences is a priority issue that must be addressed.

Science benefits from the knowledge, experience, and insights of all kinds of people. A diversity of perspectives leads to a richer intellectual pool; that pool is currently missing important contributions that could be made by Native American and Native Alaska scientists.

Careers in Ocean Sciences

In a 1998 address to the National Oceans Conference, then Vice-President Al Gore estimated that over 20% of our national economy is based on ocean-related activities and that one in six jobs are ocean-related. The National Science Foundation is working to prepare individuals to fill those jobs. Lisa Rom (associate program director, NSF Division of Ocean Science) states, "An important part of the National Science Foundation’s mandate is to ensure that the United States scientific workforce remains the best in the world. NSF focuses much of its resources on training the next generation of scientists and ensuring that all Americans who have an interest in science are given the skills they need to succeed.”

With support from the National Science Foundation and Western Washington University, the Shannon Point Marine Center (SPMC) launched the MIMSUP program in 1991; the program has been offered annually ever since. The goals of this program are: to introduce students from racial/ethnic groups underrepresented in science to the possibility of pursuing a marine science career; to help participants learn skills, gain experience, explore career opportunities, and develop contacts that will help them succeed and to prepare students for science graduate education.

Based on Ricardo Lopez’s recommendation, Lestenkof joined the 2001 MIMSUP group, spending January to June at SPMC before returning to Alaska to complete her undergraduate degree. According to Lestenkof, MIMSUP was a great stepping stone to graduate school. She asserts: “Because of MIMSUP I made many contacts and was exposed to opportunities that have helped me get where I am now.”

Lopez, who introduced Lestenkof to MIMSUP, continued his studies in science and now works in Anchorage for the Rasmuson Foundation, a private foundation that supports non-profit...
Valuable Experience

Not all students who have participated in MIMSUP over the past 15 years have chosen careers in the marine sciences. Yet even for those who ultimately pursue another life course, the experience is valuable. After completing MIMSUP in 1991, Herb Wounded Head, Oglala Sioux, went on to earn a master’s of divinity from the Luther Seminary and now serves a parish in Toronto, South Dakota. He says of MIMSUP, “The MIMSUP program gave me a multitude of gifts that helped me throughout my academic career. I was better prepared to critically examine pertinent issues. Students often learn about theory and foundations, but rarely get the opportunity to apply those theories. At MIMSUP I learned how to use complex principles and see how they applied in multifaceted environmental relationships. I learned that those theories and foundations had relevance in practical and real systems. But, the invaluable part of the whole experience was the opportunity to learn in a small setting where I was challenged as a student, yet affirmed for the gifts that I brought to the field.”

This outcome aligns well with National Science Foundation goals. Lisa Rom states, “The MIMSUP program is a very important piece in our broader efforts within the Division of

Opportunities in the Marine Sciences

The marine sciences encompass an enormous array of fields. Researchers study everything from ocean chemistry and global climate change to tropical coral reef ecology and reproduction of deep-sea fishes. Major disciplinary areas include marine geology, marine chemistry, oceanography, marine biology, marine fisheries, ocean physics, ocean engineering and marine policy. However, scientists are not limited to work within a single field; projects tend to be cross-disciplinary with individuals working at the boundaries between these various areas.

Employment opportunities in marine science are similarly diverse. Federal, state and tribal governments hire marine scientists. So do colleges and universities, international organizations, public aquaria, legal firms, private companies and nongovernmental agencies.

The kind of job you find will depend on your level of education. A four-year degree could lead to a position as a public school teacher, a laboratory technician in a government laboratory, or a research assistant in a university laboratory. A two-year master’s degree would open additional doors perhaps leading to more administrative responsibility in a private consulting company or a state regulatory agency. A Ph.D. is generally required to teach or do research in a college or university.

Salaries

Salaries vary depending on level of education, discipline and the geographic area in which you work. General salary information according to education and discipline can be found on the National Sea Grant Marine Careers net at www.marinecareers.net/salary/sector1.htm.

Additional websites:
National Science Foundation: www.cosee.net
American Society of Limnology and Oceanography: www.aslo.org/mas.html
Centers for Ocean Sciences Education Excellence (COSEE): www.oceancareers.com
Ocean Sciences to engage more minority students in the fields of oceanography and marine science. We hope that these students go on to careers in ocean science, but even if they don’t, we feel the program is successful because these students gain critical thinking skills, writing and presentation skills, and an appreciation for the complexity of our environmental system. They go on to be leaders and role models for future students."

**Discoveries**

Since 1991, 119 students have participated in MIMSUP and a full 60% have gone on to advanced degree programs: 11% to professional programs (environmental law, medicine, business, theology); 36% to master’s of science programs and 13% to Ph.D. programs (six of those individuals earned a master’s of science along the way). Two alumni have now completed Ph.D. programs and are in NIH post-doctoral positions.

An additional measure of MIMSUP’s effectiveness is the productivity of the program alumni. Student participants have published scientific papers, made many presentations at scientific conferences, and received numerous internships, fellowships/scholarships and research grants. The continued success of the program was recognized when the Shannon Point Marine Center received a 2002 Presidential Award for Excellence in science, math, and engineering.

MIMSUP is unusual in that it is not a summer program. Instead, it runs from January to June. During the first quarter (January to March), program participants complete three courses. Class sizes are small (limited to the MIMSUP students) with heavy participation by SPMC faculty and staff. The courses include a hands-on, field-intensive oceanography course and a course titled, “Current Trends in Marine Science.” In the current trends course MIMSUP students participate in instrumentation workshops, literature discussion groups, guest seminars, math and writing workshops and visits to potential employers in academia, government agencies, private companies, and non-profits.

A third course, modeled as a mini-thesis experience, is devoted to independent research. Students make contact with potential advisers at SPMC and work out placement in a lab based on mutual interests. They then design and complete a research project complete with a literature review, formal proposal, and regular oral presentations. The projects have spanned a range of topics from population dynamics of jellyfish to toxicological effects of creosote on marine forage fish.

Matthew Richards, Chippewa, chose to research feeding of larval crabs during MIMSUP 2004. He was interested in determining whether larvae of the commercially important Dungeness crab (Cancer magister) could feed on microscopic protozoans and whether he could measure that feeding. Of his research experience he says, “MIMSUP gave me the opportunity to experience how science works first hand and helped me build a solid confidence base to continue research in other areas. Research helped me become more passionate about science, inspired me to expand my knowledge, and increased my classroom learning.”

Richards’ MIMSUP research paved the way for research he conducted the following summer through a Research Experience for Undergraduates (REU) program at the University of Alaska. His work centered on measurements of hormone levels and growth potential in a deep-water spider crab (Macropagida macrochira). That work included making a dive to 2,700 meters in the Alvin submersible. Of the broader MIMSUP experience, Richards relates, “MIMSUP brought challenges, valuable lessons, cherished memories, new life-long friends, and the confidence to be successful and reach all my goals in life. The MIMSUP program was probably one of the most pivotal and influential experiences in my academic career. In addition to building a solid foundation in marine science and research, the intensive program strengthened my critical writing and thinking skills that were easily transferable to any professional field.”
Serving as Teachers

In addition to spending time as students in courses, MIMSUP participants also serve as teachers. This happens through a directed outreach program. Under the tutelage of a K-12 education specialist, the MIMSUP students develop marine science units and take them into grade school classes located near the marine center. This has been an extremely successful effort that benefits the schools, the K-12 teachers and the MIMSUP students who gain valuable teaching experience while exploring another career track.

In the second quarter of the program (April to June), MIMSUP students choose two marine science courses from those offered at SPMC (e.g., marine ecology, marine algae, marine invertebrates, marine toxicology, etc.). They also take a third course titled, “Scientific Communications.” In this course, they gain experience developing formal scientific presentations that are based on the research they completed in the first quarter. They develop manuscripts appropriate for a scientific journal, research posters for presentation at regional and national science conferences, and oral presentations for an SPMC symposium and, generally, a regional or national science conference.

The culmination of the quarter is a trip to a national science conference where the students formally present their work to an audience of scientists. This is usually a meeting of the American Society of Limnology and Oceanography (ASLO). This is possible through a partnership with Hampton University which, with support from the National Science Foundation and ASLO, supports students from underrepresented groups to attend the annual conferences (see website at end of article).

Culmination

MIMSUP students have found fellowships, summer internships and other opportunities while participating in the program. For example, Lestenko found a Research Experience for Undergraduates (REU) position at the Scripps Institute of Oceanography in the summer immediately following her MIMSUP experience. For her REU research, Lestenko studied dormancy and mandibular tooth development in the copepod Calanus pacificus. Her summer work gave Lestenko valuable experience with copepod research that later led to an internship at NOAA’s (National Oceanic and Atmospheric Administration) Alaska Fisheries Science Center in Seattle. There, she studied egg production rates in copepods collected from the Gulf of Alaska.

Lestenko believes that MIMSUP has contributed much to her career path and the success she has enjoyed along the way. “I got a lot out of the MIMSUP program. Examples include excellent references, research experience that made me more competitive for internships and graduate school, marine science-related coursework that was not available at the University of Alaska, manuscript writing and presentation experience, exposure and contacts at national conferences, informative tours of the Vancouver Aquarium, NOAA and other research centers, universities and colleges, networking experience and motivation to pursue graduate school.”

Lestenko’s unique abilities, background and experience, have led to a successful, productive career in science. Interestingly, her pursuit of a graduate degree has taken her full circle. She is doing her thesis research at the University of British Columbia through the Marine Mammal Research Unit. Her topic? The foraging ecology of Northern fur seals on St. Paul Island. Lestenko’s voyage out into the world of science is bringing her home.

Pamela Lestenko examines a collection of copepods.

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