The Apprentices Become the Masters

Cal Poly Biology Students are Among a Small Group of Experts on a New Protein Analysis Method

By Rachel Henry

Cal Poly biology students are among the few experts in the country on a new method of protein analysis that can help predict the results of climate change. Last December they shared their expertise by teaching the process to professors and doctoral students from other universities.

The students planned and led a National Science Foundation (NSF)-funded workshop in environmental proteomics, a method of analyzing how organisms respond to different environmental stresses.

“My group just took over,” said Lars Tomanek, professor of biological sciences. “I gave an introduction and a talk at the end, and in between I helped odor pizza.”

The biologists are studying how environmental conditions affect an organism’s production of proteins, which predicts its reaction to climate change, “we can tell by looking at these proteins who will be the winners and who will be the losers,” Tomanek said.

Tomanek’s group and many of the workshop participants focus their research on marine life, as the climate changes, fish, coral, mussels and other organisms may be subjected to seawater that is hotter and more acidic but contains less oxygen and light.

Scientists at Northeastern University, the University of Hawaii, and CSU Northridge are studying coral bleaching. The techniques they learned at Cal Poly will help them better understand what conditions are necessary for coral to survive.

“Using this method, we can predict that if the Earth’s temperature rises to a certain point, the coral reefs will disappear,” Tomanek said.

In the second step of the analysis, the scientists identify the protein using a tandem mass spectrometer, which measures the molecular mass of unique protein identifiers called peptides. Only three environmental proteomics labs in the country currently have this spectrometer. Using the instrument as an undergrad gives Cal Poly students an unparalleled “Learn by Doing” experience.

“Our students learn the entire proteomic workflow, from the experiment and preparation to the bioinformatics analysis. It’s really unique that an undergraduate or even graduate student is involved in the conduct of all the steps along the workflow,” Tomanek said.

“Our students are the first ones to use the instrument,” he said. “This workshop gave me confidence in my laboratory capabilities that will serve me well in the future,” said Ichika Mize, a student who had earned his bachelor’s degree only a few months prior to being an instructor.

In the future, Cal Poly’s Environmental Proteomics Lab will run the second step of the analysis for workshop attendees who don’t have a tandem mass spectrometer on their home campuses.

“One of NSF’s grand challenges is how to share and spread technology,” Tomanek said. “The NSF program director pointed to Cal Poly’s proteomics lab as the only example he’s seen of how to address these challenges.”

Students, participants, and the NSF are excited about the collaborative nature of the workshop. “Biology covers a wide range of possible studies, and it was great to learn about the particular research and the role proteomics can play in the improvement of their results,” Garland said.

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