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# Benefits of International Student Exchange and International Cooperation

BY YA-TING CHANG AND MING-HUEI CHANG

Since 2001, American and Taiwanese scientists have been conducting a series of six collaborative programs to explore ocean physics around Taiwan. Two of these programs, the Internal Waves in Straits Experiment (IWISE) and Impacts of Typhoons on the Ocean in the Pacific (ITOP), are still underway. These programs bring together scientists, technicians, undergraduates, and graduate students from both countries, providing excellent opportunities for students to improve their scientific knowledge, gain field experience, and develop their capacity to engage in autonomous research. During the programs, students from the United States became very familiar with Taiwanese research vessels, including *Ocean Researcher 1*, *Ocean Researcher 2*, and *Ocean Researcher 3*. Taiwanese students participated in scientific expeditions on board US R/Vs *Melville*, *Roger Revelle*, and *Kilo Moana*. By prior

agreement among the principal investigators, the programs emphasized growth and learning opportunities for students in addition to research.

One of the most exciting aspects of oceanographic training is conducting fieldwork, which provides students with hands-on opportunities to formulate research plans, gather data, and write up findings. The joint programs provided Taiwanese students with many opportunities to participate in fieldwork on American research vessels (Figure 1), where they learned to deploy and recover instruments rarely used on Taiwanese vessels, including gliders, moored profilers, fast conductivity-temperature-depth (CTD) sensors, and micro-structure probes. Through fieldwork and instruction from scientists, students acquired oceanographic knowledge, and technical and research skills.

During the programs, biannual joint meetings alternated between venues

in Taiwan and the United States. These meetings provided a forum for planning fieldwork and coordinating research resources, identifying scientific issues, summarizing achievements, and sharing new discoveries. The meetings gave the graduate students opportunities to organize and present their research results and to improve their scientific knowledge and logical thinking. Students socialized with their peers in the oceanographic community and developed professional networks. Given the emphasis modern research places on international collaboration, these experiences are invaluable.

The US Office of Naval Research provided financial support to send Taiwanese students to the University of Washington's Applied Physics Laboratory, the Woods Hole Oceanographic Institution, and the University of Maryland's Horn Point Laboratory. Scientists at these



Figure 1. Photo taken during a joint cruise on R/V Roger Revelle.

institutions served as academic advisers and worked with the students to design field experiments and analyze collected data. The students emerged from this excellent learning experience with a better understanding of the methods and attitudes required for ocean research. During their stays in the United States, students presented their results at the joint program meetings and at American Geophysical Union meetings, and they published several research papers. Upon returning to their

home universities in Taiwan, two of the students received their doctorates. One of them is now an assistant professor at National Taiwan Ocean University, and the other is a research associate at Academia Sinica. Both are serving as principal investigators for the current IWISE and ITOP programs.

The exchange students would like to express their deep appreciation for Office of Naval Research support and the professional guidance they received from their advisors. This

type of international exchange is valuable and sustainable, and will eventually contribute to future highly successful collaborations. ☑

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