

Advanced Instrumentation in an Undergraduate Program in Oceanography

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Abstract: The Sea Education Association (SEA) is a non-profit academic institution located in Woods Hole, Massachusetts. Since 1971, SEA has offered multidisciplinary academic programs in ocean education to undergraduates, K-12 teachers, and high school students. SEA educates future scientists and engineers in ocean sciences, and provides a better understanding of the process of science to all of its students. Many of SEA's more than 5,500 alumni have continued in science and engineering graduate programs and are now active in professional fields.

SEA initially offered academic programs on a single ship, the 125' schooner SSV *Westward*, purchased in 1971 and converted to meet our scientific and academic needs. SEA expanded to a two-ship operation in 1988 with construction of the 134' brigantine SSV *Corwith Cramer*. SEA has recently constructed the 135' SSV *Robert C. Seamans* and carried out a mid-life refit of the *Corwith Cramer*.

SEA's has installed a multi-component system of sampling and analytical gear that enables users with a wide range of technical backgrounds to participate in modern oceanographic research. Each vessel is currently equipped with a hydrographic winch with 4000 m of hydrowire, two Seabird CTD systems, a Seabird Carousel system, a towed CTD system, Shipek sediment grab, gravity corer, dredges, otter trawls, and a variety of plankton nets. The laboratories are equipped with stereo and compound microscopes, an oxygen titration unit, salinometers, spectrophotometers, fluorometers, an RD Instruments ADCP, Chirp multi-frequency sub-bottom profiler, ROV and a

continuously recording data acquisition and logging system. This instrumentation has provided our students with an unequalled introduction to oceanographic and scientific techniques, and allowed them to collect data for a wide range of oceanographic research projects.

The oceanographic sampling equipment carried on these vessels is used to support SEA's educational mission, train scientists and engineers in marine sciences, and increase the understanding of scientific principles in a wide population. As the research capabilities of our vessels become increasingly sophisticated, our vessels have become research platforms unique in their ability to routinely sample in remote locations over long distances and time duration, especially in yearly and decadal studies. These vessels are used for primary research by SEA's faculty and in cooperative research efforts with other researchers.

The new, computer-controlled equipment with graphical interfaces is proving itself both more reliable, and easier for a wide student population to use and understand than the equipment it replaces. Our faculty are able to instruct students in the operation of very sophisticated instrumentation. With familiar graphical displays, the data is now more accessible and more easily understood than was often the case with the earlier, electro-mechanical equipment. The high quality data produced by these instruments is both easier for students to understand and use, and is becoming the basis of research projects by SEA scientists and associated researchers.