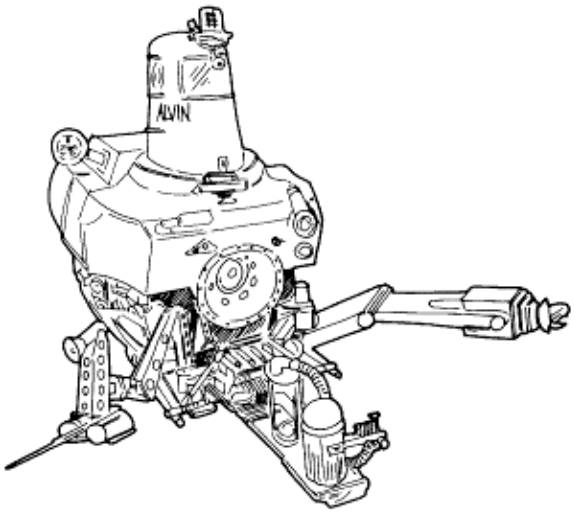
SECTION V
EXPLORATION, RESEARCH AND COMMUNICATION

Exploration of aquatic habitats, particularly the oceans, has changed radically in the last several decades. Although humans have looked beneath the water by jumping in or with a variety of somewhat crude diving machines through the centuries, recent technological advances making both firsthand exploration and remote sensing possible are opening up a vast new frontier. People had been collecting information on tides, depths and currents for many years, but the first major oceanographic expedition, the four year voyage of the *H. M. S. Challenger*, occurred in the 1870's only a little more than one hundred years ago. The *Challenger* used nets, lead lines and water samplers to collect information just as scientists still do today in both marine and freshwater environments. In recent years, new technological advances have made possible several other means of gathering data. Sophisticated sonar has presented us with accurate pictures of bottom contours, taught us about the grooves gray whales make when they feed, and even located the *Titanic*. Submersibles like *Alvin* have taken humans to the bottom of the sea floor to make discoveries like the deep vents. Remote cameras send back pictures of strange creatures thousands of feet beneath the ocean surface. Current meters scattered throughout the world periodically surface and radio back information about water movements at various depths. Satellites send back information on phytoplankton abundance, surface temperatures and weather patterns.



How is all this information shared among scientists? Researchers write papers which are read by other scientists. Some of the really exciting findings also appear on the evening news or in magazine articles. The National Geographic Society funded part of the expedition which explored the deep vents of the Galapagos Rift. Many of the incredible discoveries of the expedition were reported in National Geographic before they appeared in scientific journals

because journals require a lengthy review process by other scientists before they will publish papers. While the scientific literature is not accessible to children, magazines like Oceans, Sea Frontiers and National Geographic are good places for them to do library research on marine and aquatic science.

The best way for children to really appreciate how scientists study aquatic habitats is to go on a field trip which enables them to do the real thing and be scientists themselves. Where they go is not so important as what they do. Children need to understand the process a scientist would use. First, they should read whatever they can about the kind of habitat they will visit. A scientist starts a project with a literature review to find out what is already known. Second, they should plan exactly what kind of information they want to collect and how they are going to collect it. A scientist would plan the trip, collect needed gear, and make data sheets to organize the information collected. On the trip the students should work cooperatively to accomplish the goals they established in their planning. A scientist frequently works with others and supervises the work of graduate students or research associates. The samples collected on the trip should be brought back to the classroom for analysis. A scientist may spend a week in the field and a year studying the materials collected back in her/his laboratory. When the data are assembled and analyzed, the students should write reports and/or give papers which share their findings with others. A scientist's work is not finished until it is shared with other scientists.

Communication is the final part of the scientific process. If a scientist does not share his or her results with others, then a field of study cannot advance. Communication may take the form of words, graphs, charts and pictures. Scientists write papers for scientific journals, give talks at meetings, share their knowledge with politicians and public interest groups, write articles for magazines, publish books and textbooks, and make movies and videos for television and schools. A very modern form of communication involves using computers. Scientists send each other email and even publish on-line journals. All are forms of communication and are important.