TOWARD THE FUTURE

Future ships, submarines, submersibles, and other instrument-carrying platforms will benefit from rapid advances in composite materials (e.g., high-performance fibers) whose properties are superior to those presently used (see box 9.1). Ships will likely continue to serve as essential oceanographic platforms. Their utilization for process-oriented and transect sampling will continue, but probably with less weighting because of increasing autonomous sampling platform deployment and recovery operations (e.g., Knox and Wallace 1999). Ships used for direct sampling are expected to use more advanced instrumentation, often using fiberoptics for greater data bandwidth. Newly designed ships are likely to be faster and have improved sea-keeping characteristics in order to make them more cost-effective. Lightships and specialized manned platforms with unique sampling capabilities (e.g., such as Research/Platform Floating Instrument Platform [R/P FLIP]) can play important roles as well.

Ships have served the oceanographic community well. But their limitations in terms of cost, availability, limited synoptic sampling, sample degradation, and contamination, etc., have stimulated development of other complementary platforms as described below. In addition, it is likely that international cooperation through sharing of ships and other seagoing assets will be accelerated in order to make the best and most economical use of ships. Most submarines are used for military purposes, but more may become available to the research community in the future.

Moorings, Bottom Tripods, Offshore, and Shore-Based Platforms

PRESENT AND NEAR-FUTURE CAPABILITIES

Interdisciplinary moored and bottom tripod measurement systems and sensors are being used primarily by the research community to study environmental changes in the ocean on time scales from minutes to years. An increasing number of bio-optical, chemical, geological, and acoustical parameters are being measured from moorings (e.g., Dickey 1991, 2001; Tokar and Dickey 2000; Varney 2000). This work has led to discoveries of new processes, such as:

- primary production variability associated with ENSO and equatorial long waves (e.g., Foley et al. 1997; Chavez et al. 1999);
- sediment resuspension through internal solitary waves (e.g., Bogucki et al. 1997);