Chapter 9

A Vision of Oceanographic Instrumentation and Technologies in the Early Twenty-first Century

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Observations based on developments in instrumentation and technologies have led to most of the major advances in ocean sciences. Modeling has also benefited from new technologies and is playing an increasingly important role (e.g., Robinson and Dickey 1997; Le Traon et al. 2001; Stammer et al. 2001). Undersampling is the main limitation on our understanding and modeling of problems such as global climate change as affected by and affecting the oceans, variability in biomass and fish abundance and regime shifts, and reduction of ocean forecasting error (described in other chapters). A major challenge is therefore to massively increase the variety and quantity of ocean measurements. These measurements are expensive, but vital for effective stewardship, preservation, and utilization of the oceans and atmosphere. Fortunately, many innovative technologies involving computing, robotics, communications, space exploration, and physical, chemical, biomolecular, and biomedical research are being developed at unprecedented rates for a great many applications (Kaku 1998). Many of these will be very beneficial for oceanography in the early twenty-first century.

The general aims of this chapter are:

- to present a brief summary of the challenges of observing the ocean environment;
- to describe a variety of observing platforms;