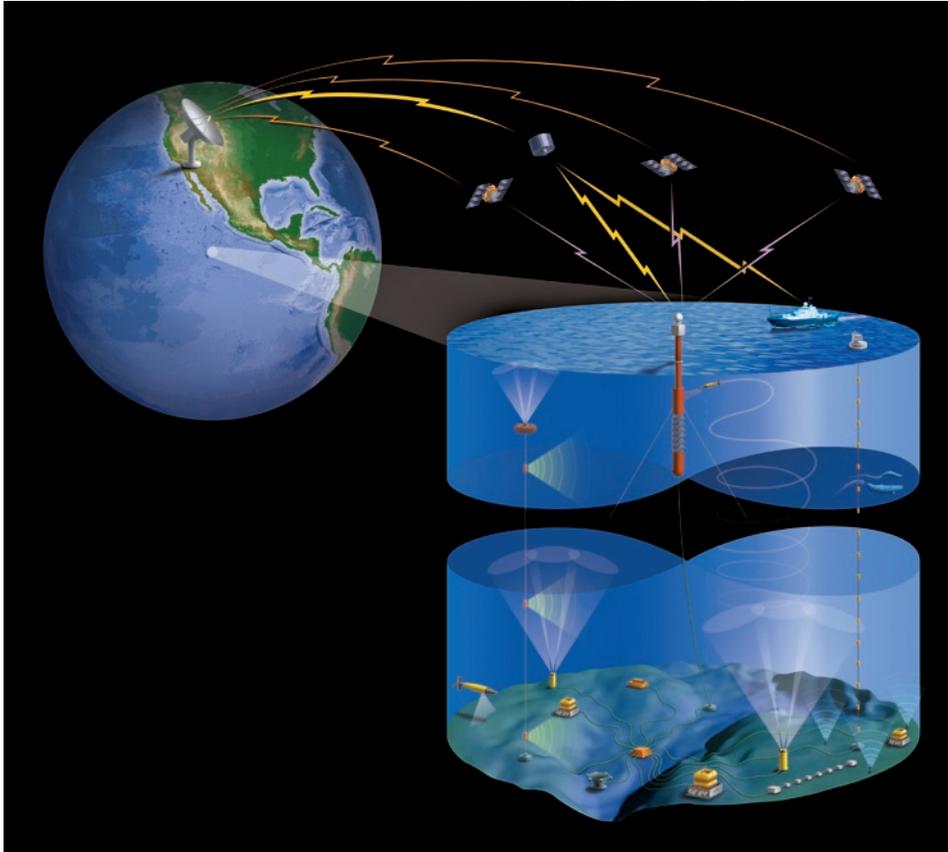


Ocean Research Interactive Observatory Networks (ORION)

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Ships have served oceanographers through the years ably supporting measurements and sampling by a wide range of disciplines. The use of ships, coupled with the intimate mingling of physics, chemistry, geology, and biology have fostered the interdisciplinary growth of oceanography ultimately leading to a major new effort in ocean sciences research, the Ocean Observatories Initiative.

The Ocean Observatories Initiative (OOI), a proposed project in the U.S. National Science Foundation,



seeks to establish a permanent presence in the ocean to improve our capacity to measure physical, chemical, biological, and geological parameters on multiple time and spatial scales. This NSF Major Research Equipment and Facilities Construction (MRE-FC) project will provide the initial investment in infrastructure necessary for this major new approach in oceanography.

For centuries oceanographers have relied upon brief expeditions for advancing our understanding of the global ocean. While this approach has led to fundamental discoveries including global circulation patterns; the concentration of energy in mesoscale circulation; plate tectonics and the continuous, rapid repaving of the bulk of Earth's surface; and thermophilic, chemosynthetic archaea, the OOI will have a significant impact on our understanding of fundamental Earth and oceanic processes by providing a means of observing transients and

Figure 1: Mid-ocean deployment from a tri-moor buoy. Power and telemetry are sent to the seafloor through a fourth electromechanical cable to a seafloor junction box. Mid-water and air-sea moorings are supported from cables to the junction box. Duplex communications ashore are provided by satellite communications.

change as well as enhancing the signal-to-noise ratio of oceanographic data.

The need for timeseries data and recent independent advances in cyberinfrastructure and sensors, have motivated the scientific community to investigate the feasibility of creating long-term 'ocean observatories' where sensors are deployed at the air-sea interface, within the water column, and beneath the seafloor. The data collected will be available on the Internet in real time and the ability to resolve individual instruments and tools through the network's Internet Protocol (IP) will allow scientists to interact with the remote environment as well as troubleshoot and repair instruments remotely. Ocean observatories will enable Earth and ocean scientists to study multiple, interrelated processes over timescales ranging from seconds to decades; to conduct comparative

studies of regional processes; and to map whole-Earth and basin-scale structures.

The OOI has three elements: (1) a lithospheric plate-scale observatory in the northeast Pacific consisting of interconnected sites on the seafloor that span several geological and oceanographic features and processes, (2) several relocatable deep-sea observatories based around a system of buoys, and (3) an expanded network of coastal observatories.

The Dynamics of Earth and Ocean Systems (DEOS) Committee was formed in the late 90's, and funded by the NSF through the Consortium for Ocean Research and Education (CORE), to provide advice on the implementation of an Ocean Observatories Initiative. DEOS has explored two technologically distinct approaches for ocean observations: (1) observatories linked by submarine telecommunications cables to land and the Internet (c.f. LEO-15, HUGO, H2O, and NEPTUNE projects), and (2) moored-buoy observatories providing the platform to telemeter data back to shore using commercial telecommunications satellites. Figure 1 depicts a mid-ocean installation with instrumentation at the air-sea interface, in the water column and at and within the seafloor typical of installations throughout the various elements of the OOI.

The National Science Board approved the OOI in 2000 and the President's Budget for FY04 included the Initiative for funding in FY06 for a period of five years at a total cost of nearly \$210M. As the project approaches reality, the organizational structure of the initiative will change substantially. The DEOS Committee will end its activities early in 2004 as the new Program Office begins. The overall structure of the program is playfully depicted in Figure 2 reflecting the author's favorite cocktail. The OOI comprises a number of investments including the observatory infrastructure, project management, data management, and core instrumentation. The available MRE-FC funding is restricted to the pimento in the stuffed olive. The larger ORION program encapsulates the OOI, but includes the larger program of science funding, education and outreach, the bulk of the instrumentation, and mobile platforms including a greatly enhanced demand for the use of modern oceanographic ships and tools, especially remotely operated vehicles (ROV's).

The OOI and the Integrated Ocean Observing System

The National Ocean Partnership Program, through the Ocean.US interagency office (<http://www.ocean.us/>), is sponsoring the Integrated Ocean Observing System (IOOS) to focus on operational oceanographic needs. The IOOS will focus primarily on the mission-oriented needs of agencies such as NOAA, NASA, and the Navy. The research and technological developments within ORION will provide essential support for the IOOS. The cabled and moored components of the OOI will serve as test beds and incubator sites for the development of new technologies as well as advanced modeling capabilities essential to the evolution of the IOOS.



Figure 2: The pimento in the olive represents the core OOI funding through the MRE-FC. The olive itself is representative of the ocean sciences funding for science and much of the instrumentation required. The OOI will be managed by the OOI Project Office, currently being solicited, while the remainder of the funding will be managed through the Ocean Sciences Division and proposal peer review.

OOI Planning Workshops Held or Underway

A number of workshops are being held this year culminating in a workshop with an anticipated 200-300 participants at the Caribe Hilton, San Juan, Puerto Rico for a five-day period, 4-8 January 2004. More information and registration is available at <http://www.coreocean.org/deos/>. The purpose of the workshop is to draft an initial science plan (iSP) for ORION. The advisory committee structure of the Program Office for the OOI will use the iSP for drafting long-term and FY06 science plans. Other recent or planned workshops related to DEOS planning include:

Workshop	Dates	Location
Linkages between the Ocean Observatories Initiative and the Integrated Ocean Drilling Program	15-16 July, 2003	Seattle
The next generation in-situ biological and chemical sensors in the ocean	13-16 July, 2003	Woods Hole Oceanographic Institution
Cyberinfrastructure for sensor networks	11-14 August, 2003	Scripps Institution of Oceanography
Regional network science planning	7-10 October, 2003	San Francisco

The NSF has solicited proposals for a project office to coordinate the OOI; letters of intent are due on 29 September.