

Oceans From a Global Perspective:
Marine Science Information Transfer
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Why Is The Ocean Drilling Program Producing Those Heavy, Shelf-Gobbling Books?

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Abstract

Publishing the plethora of results from the international Ocean Drilling Program (ODP) is a formidable challenge being approached in well thought out and innovative ways. Consider that, every two months, a team of about 24 scientists from around the world joins the JOIDES Resolution, the world's best equipped vessel for scientific ocean drilling and related investigations, to collect core samples and to make measurements in a new area of the ocean. Those samples and related data are also studied later by shore-based scientists and the curated samples and data records are eventually made available to the scientific community at large. Consequently, ODP will, over the next 10 years, produce thousands of printed pages unravelling the evolution of the world's ocean basins. Before the drill ship docks at the end of a two-month leg, the shipboard scientific party prepares a unified report that gathers the thoughts of all shipboard scientists on each site drilled. That document is distributed within 30 days of docking to each shipboard participant for review and forms the raw basis for the Proceedings of the Ocean Drilling Program. The initial report of this series is the 500-1000 page heavy book now distributed one year after the cruise, and the second part contains the peer-reviewed results of 1 1/2 years research on the samples collected and is distributed 40 months after the cruise. When ODP peaks, up to 12 Proceedings volumes per year will be produced.

Introduction

This morning, ladies and gentlemen, I hope to give you an appreciation of one of the largest earth science studies ever undertaken and in particular of the publications that are the major product of this international venture. In only 20 minutes, I cannot do justice to so complex a program, but I do have with me several excellent brochures and

booklets on the Ocean Drilling Program (ODP) that I will be pleased to hand out to any of you who would like a fuller account. [For further information on the ODP, interested readers may contact: Joint Oceanographic Institutions, Inc., 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036.]

The Ocean Drilling program is a ten-year study begun in 1985 of the structure and history of the world's ocean basins. ODP is the successor to programs run from 1968-1983 aboard the Glomar Challenger drilling vessel. These programs - the Deep Sea Drilling Project and the International Phase of Ocean Drilling - were run by the Scripps Institution of Oceanography and produced results that led to the rewriting of textbooks. They documented, for example, the drying up of the Mediterranean Sea 5 to 12 million years ago, the evolution of the Atlantic Ocean from a group of stagnant basins to today's expanding ocean, and how past climates were affected by tectonic processes. It was in fact DSDP that proved that seafloor spreading occurs and that the theory of plate tectonics could account for many observed crustal movements.

ODP is sponsored by the United States through its National Science Foundation, which provides about \$20 million (U.S.) per year. An additional \$15 million (U.S.) per year is provided in equal shares by six partners: Canada, the Federated Republic of Germany, France, Japan, the United Kingdom, and the European Science Foundation. The latter is a consortium of 12 countries: Belgium, Denmark, Finland, Greece, Iceland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, and Turkey. Each participant also agrees to fund a national research program that complements ODP and supports scientists associated with it. This International Partnership is called the Joint Oceanographic Institutions for Deep Earth Samplings (JOIDES).*

The initial scientific direction for ODP came from a special conference on the future of ocean drilling that was held in 1981. This meeting of 150 leading earth scientists recommended directions for future research that would build on the successful Deep Sea Drilling Project while recognizing that a new drilling vessel with capabilities far greater than those of Glomar Challenger would be required for the task. The conference's conclusions were enthusiastically endorsed by the National Science Foundation.

The NSF contracted with Joint Oceanographic Institutions, Inc., a consortium of ten major oceanographic institutions, to serve as the principal contractor for the Ocean

*JOIDES institutions are: Scripps Institution of Oceanography; Lamont-Doherty Geological Observatory; Hawaii Institute of Geophysics; Rosenstiel School for Marine and Atmospheric Sciences; Oregon State University, College of Oceanography; University of Rhode Island, Graduate School of Oceanography; Texas A&M University, Department of Oceanography; University of Texas at Austin, Institute of Geophysics; University of Washington, College of Ocean and Fishery Sciences; and Woods Hole Oceanographic Institution. Non-U.S. members are Department of Energy, Mines, and Resources, Earth Sciences Sector, Canada; European Science Foundation Consortium; Bundesanstalt für Geowissenschaften und Rohstoffe, Federal Republic of Germany; Institut Français de Recherche pour l'Exploitation de la Mer, France; University of Tokyo, Ocean Research Institute, Japan; and Natural Environment Research Council, United Kingdom.

Drilling Program. Texas A&M University is the science operator for ODP: it operates and staffs the drill ship, retrieves cores from strategic sites and ensures that they are adequately analysed, maintains shipboard laboratories, provides support for shipboard laboratories and scientific teams, curates the core samples and scientific results, and manages post-cruise activities including publication production. The Lamont-Doherty Geological Observatory is the ODP wireline logging contractor responsible for drillhole research and maintaining an ODP data bank.

Selection of drill sites and planning for each cruise of ODP are handled by a series of international and interdisciplinary JOIDES committees in a process that takes about three years. The committees, notably the Planning and Executive Committees, receive support and assistance from a series of panels comprised of knowledgeable people from all participating countries. (One of these is the Information Handling Panel, which advises on the data handling, publication, and other information aspects of the program.)

In 1987, the second international Conference on Scientific Ocean Drilling, known as COSOD-II, was held in Strasbourg, France, to review progress and plan the future work.

The early work of ODP concentrated on the search for a suitably advanced drilling vessel: a vessel built in Halifax in 1978, the SEDCO/BP 471, was finally selected. After being contracted for long-term use with SEDCO FOREX, the offshore petroleum-drilling rig was extensively modified in 1984 into a scientific research vessel capable of achieving the ambitious goals of ODP. In January 1985, the vessel, now informally known as JOIDES Resolution, sailed on her shakedown voyage.

The JOIDES Resolution is outfitted with thoroughly modern laboratory, drilling, and navigation equipment that is unequalled in all but the finest shore-based laboratories. The 143-m long ship is capable of drilling in all but the deepest parts of the world ocean. She can deploy over 9000m of drill pipe and work in water depths in excess of 8000m. The scientific heart of the ship is a seven-story laboratory structure that was designed and installed as part of the refit exercise. It offers 1080 m² of laboratory space, which includes, on the foc'sle deck, a science library that contains over 500 basic reference works as well as monographs, maps, and the collected reprints relating to the scientific objectives of each ODP voyage. JOIDES Resolution can carry sufficient fuel, water, and stores to work at sea for 70 days without replenishing; she has an ice-strengthened hull for drilling in high-latitude waters; and she is extensively computerized both for dynamic control and positioning on site as well as for carrying out her scientific tasks. In addition to this, engineering experts with ODP are introducing new technology to expand the capabilities of the ship. For example, bare rock on the ocean floor until recently could only be drilled if a thickness of 50 to 100m of sediment "cover" was present to stabilize the bottom of the drill string. Today, a new technique permits

fixing a cement-filled guidebase to the ocean floor into the bare rock which stabilizes the drill string and permits direct drilling into the rock.

The actual scientific work of the Ocean Drilling Program is structured as a continuous series of cruises called legs, each about two months long. The JOIDES Resolution carries a crew of 52 and a scientific complement of 50 people, 24 of whom are usually paleontologists, sediment geologists, petrologists, specialists in magnetics, geophysicists, and/or geochemists. Shipboard operations run continuously on site with members of the scientific party standing 12-hour watches.

At the end of 1988, over 20 legs of the Ocean Drilling Program will have been completed in latitudes ranging from Baffin Bay to the Indian Ocean. Results from each leg will be reported in at least four formal scientific publications as well as informal planning documents, press releases, and other reports.

Aboard ship, the scientific party for each leg prepares a series of reports using the 50 personal computers distributed throughout the laboratories and linked to two VAX 11/750 mainframe computers onboard. Authors can call on systems analysts onboard Resolution for help in using the computers and accessing the software made available for data processing, plotting figures and tables, and other applications.

The first report prepared is called the "Hole Summary". It contains the results and data collected by each scientist at each site drilled. This informal report is duplicated and distributed to those who need to know about one month after a leg.

A Preliminary Report, also informal and selectively distributed, is prepared to discuss in a condensed and general way the main results of the leg. If the results are especially significant, a press conference will be held when the ship docks: in any case, the two scientific leaders on each leg, who are called "co-chief scientists," will prepare a press release for use by the public relations office at the ODP building on the campus of Texas A&M University.

Also written aboard ship are two journal articles, each about 1000 words long, to summarize the scientific highlights of the leg for a wide audience. These are published in Nature and Geotimes within 3 months of docking. ODP requires that these articles be published before authors submit material to other journals. In addition, any article published within 12 months of the end of a leg must credit all members of the shipboard scientific party as authors.

About 6 months or less after a leg, the entire shipboard scientific party meets for one week at the ODP building at Texas A&M University (TAMU). Here they harmonize their scientific differences and prepare a revised and streamlined manuscript of all the basic information from the leg. They also prepare a table of contents for the second part of their publication requirements: a peer-reviewed volume to appear after they have studied and researched the results they have obtained on the leg. At the conclusion of

their meeting, an essentially complete manuscript on floppy disk is left at TAMU.

After the post-leg meeting of the shipboard scientific party, the ODP Publications Group at TAMU swings into action. The makeup of this group and the extent of the work they perform to get manuscripts to the printer are outlined in Tables 1 and 2. To carry out their work cost effectively, the Publication Group is using a variety of computer techniques. Editorial revisions are made on video display terminals. Computer art stations are used to compile scientific data into tables and illustrations ready for publication. Original illustrations provided by authors as rough copies are digitized and produced on computer. An optical character reader is used to capture hard copy in machine readable form when necessary. Finally, the edited electronic copy is transferred from disks to magnetic tape and sent to a typesetter.

About 12-14 months after the JOIDES Resolution has completed one 2-month leg, the Initial Report of the Proceedings of the Ocean Drilling Program for that leg (also called "Part A") is published. These 500 to 1000-page volumes are printed in a traditional and long-lasting, high-quality, hard-bound, 8.5 x 11 inch format. They contain the basic data from the sites drilled on that leg including results of analyses, descriptions and selected photographs of the samples collected, and the scientific reports that were ready when the shipboard scientific party met after the leg. Up to six Initial Report Volumes per year are published by ODP.

About 36-40 months after completion of a leg, the final report of the Proceedings of the Ocean Drilling Program for that leg (also called "Part B") is published. These volumes are printed in the same format as the Initial Reports but with a distinctive cover design and colour. This publication contains peer-reviewed scientific papers describing the detailed investigations and interpretations made by the members of the shipboard scientific party over a period of 1 1/2 years.

The final scientific results volume of the Proceedings of the Ocean Drilling Program will be indexed by drilling site and individual borehole and the index, which will contain an average of 6000 entries, will cover both the Initial Report volume as well as the scientific results one. These indexes will be available in printed form within the volumes and in machine-readable, ASCII-encoded magnetic tape. Up to six final reports (Part B volumes) will be published per year.

In conclusion, the publications emanating from the Ocean Drilling Program are being published on acid-free paper in a highly durable format because the organizers and participants involved in ODP are confident that the information will be of lasting value to the scientific community. I too believe that, long after the sun has set on the Ocean Drilling Program, scientists will be poring over the publications that were produced and the curated samples and making new discoveries about how our world works.

ODP PUBLICATIONS GROUP

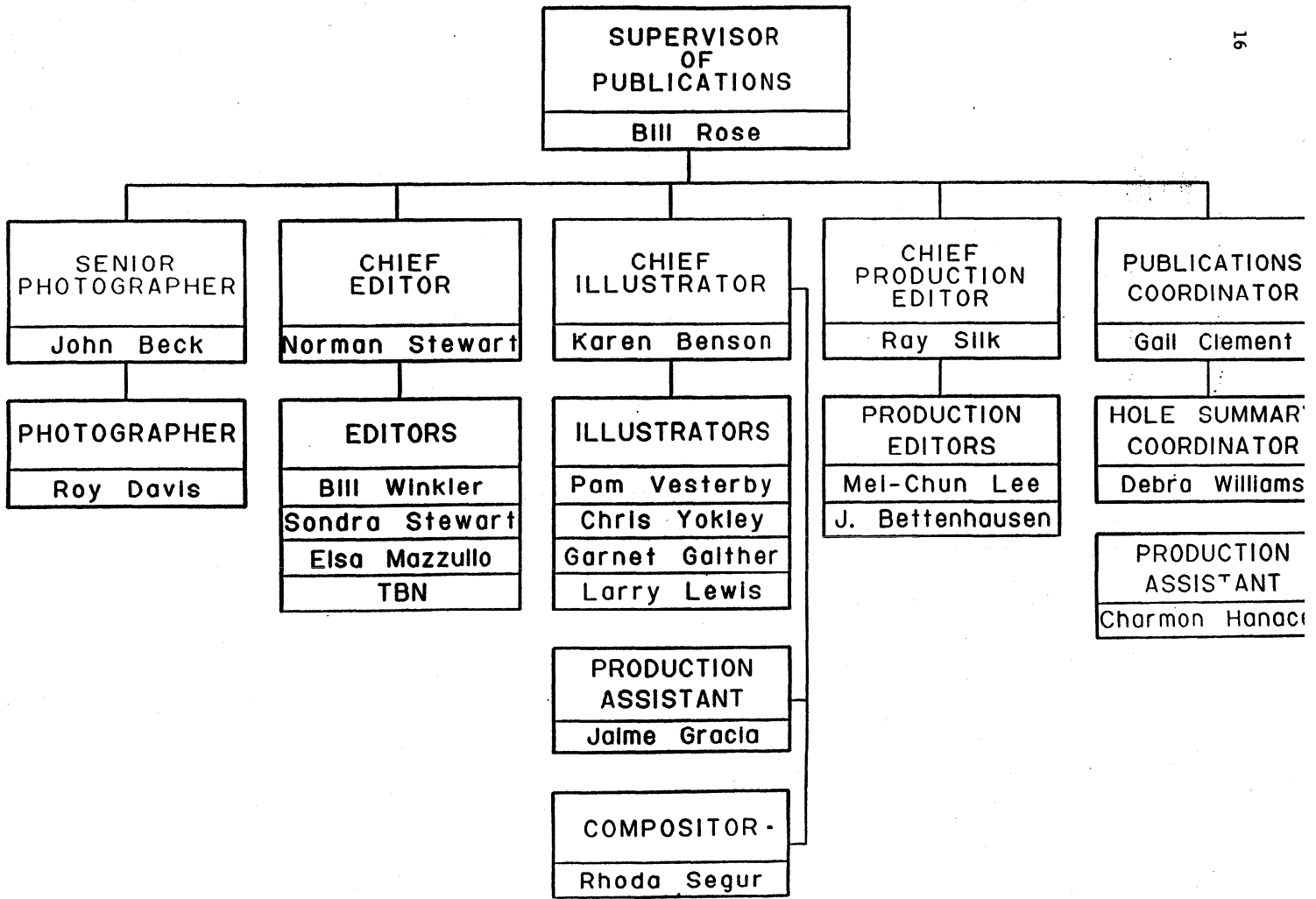


TABLE 2. ODP PROCEEDINGS FLOW CHART—PART A

