JOIDES Journal

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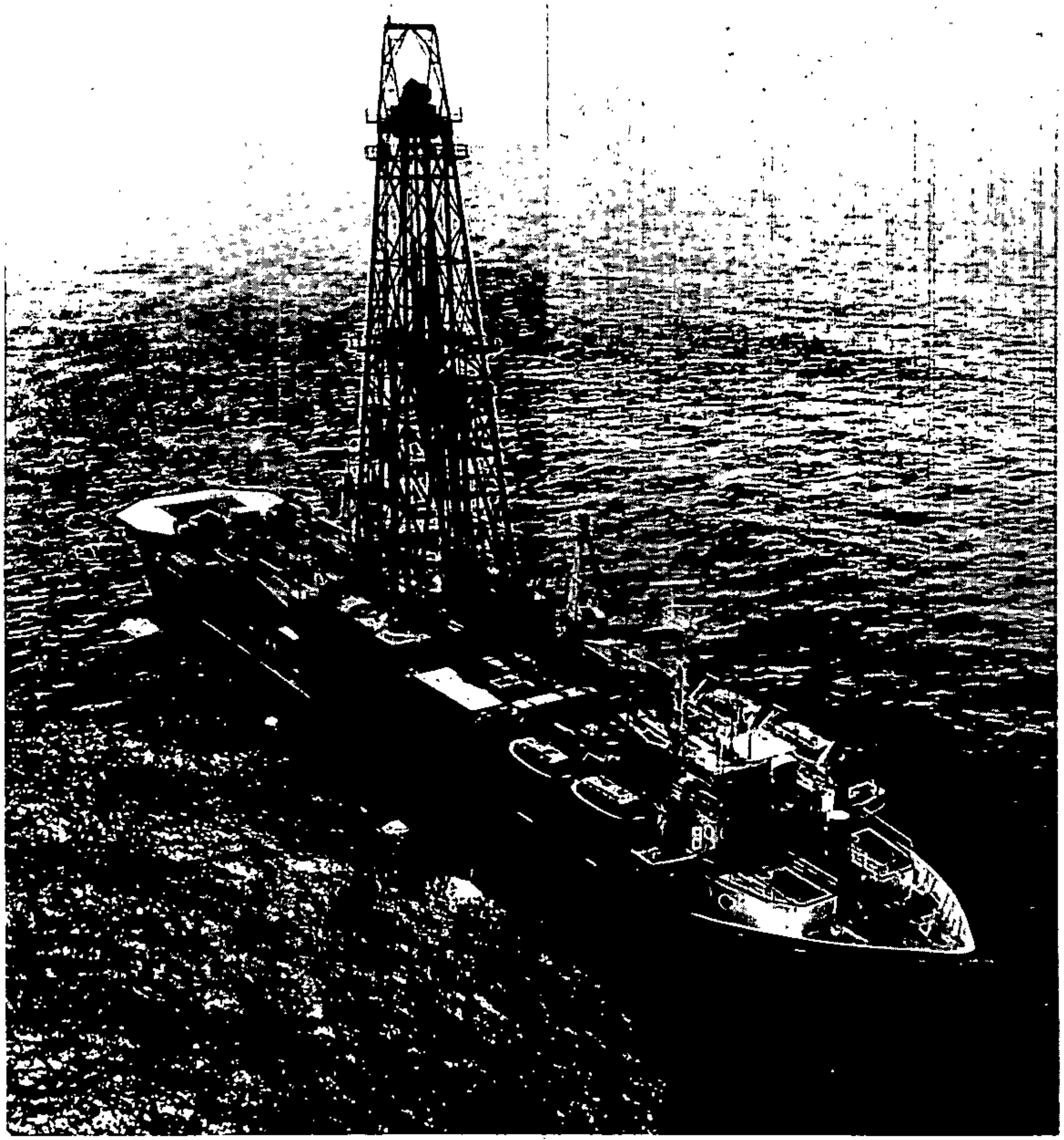
GUIDE TO THE OCEAN DRILLING PROGRAM



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GUIDE TO THE OCEAN DRILLING PROGRAM

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PUBLICATION STATEMENT

The JOIDES Journal is prepared and distributed for the Ocean Drilling Program by the JOIDES Office at the Graduate School of Oceanography, University of Rhode Island, under a contract provided by the National Science Foundation and administered through the Joint Oceanographic Institutions Inc., 1755 Massachusetts Avenue, N.W., Suite 800, Washington, DC 20036. The material is based upon research supported by the National Science Foundation under Contract No. NSF OCE 83-17349.

The JOIDES Journal serves as a means of communication among the JOIDES committees and advisory panels, the National Science Foundation, the Ocean Drilling Program and interested earth scientists. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of the National Science Foundation.

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Request additional copies of this issue and available back issues from: Joint Oceanographic Institutions Inc., 1755 Massachusetts Avenue, N.W., Suite 800, Washington, DC 20036.

PREFACE

The evolution of scientific ocean drilling from the Deep Sea Drilling Project into the Ocean Drilling Program has resulted in many changes in the organization and in the facilities which are available.

The continuing requests for information about the Program and its constituent parts have resulted in this Special Issue of the JOIDES Journal which is intended to be a brief but reasonably comprehensive guide to the Ocean Drilling Program.

Within such a compilation, the amount of detailed information is necessarily restricted. Users are advised to consult the appropriate contact points which are listed in the Special Issue.

Updates to the Special Issue will be published in the regular issues of the JOIDES Journal.

September 1985

OCEAN DRILLING PROGRAM: ORGANIZATION & STRUCTURE

Introduction

The Ocean Drilling Program (ODP) is an international partnership of scientists and research institutions organized to explore the structure and history of the Earth beneath the ocean basins. The focus of ODP is to provide core samples from the ocean basins and to provide facilities for the study of these samples. These studies will lead to a better understanding of the processes of plate tectonics, of the Earth's crustal structure and composition, of conditions in ancient oceans, and of changes in climate through time. This understanding will in turn lead to a fuller comprehension of the evolution of the Earth.

The Ocean Drilling Program is funded by the U.S. National Science Foundation (NSF) from U.S. funds together with contributions from non-U.S. partner nations (co-mingled funds), who are currently Canada, France, the Federal Republic of Germany, and Japan.

The Ocean Drilling Program is managed by Joint Oceanographic Institutions Inc. (JOI Inc.) as the prime contractor to NSF. JOI is a consortium of ten major U.S. oceanographic institutions which provides management support to large multi-institutional scientific research programs. The overall objectives of ODP are established by the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) which is an international group of scientists drawn from the JOI institutions, other U.S. institutions, and representatives of the non-U.S. partner nations. JOIDES provides overall science planning and program advice with regard to scientific goals and objectives, facilities, scientific personnel, and operating procedures.

The Science Operator of ODP, with facilities at Texas A&M University (TAMU), manages the operation of the drillship which includes the planning and implementation of cruises. TAMU has facilities that serve as a respository for ODP cores and recently collected DSDP cores from the Pacific and Indian Oceans. Previously collected DSDP cores from the Pacific and Indian Oceans are stored at Scripps Institution of Oceanography. As Science Operator, TAMU is further responsible for implementing science planning and operations; engineering development and improvement of drilling technology; selecting scientists for the shipboard scientific parties; designing, furnishing, and maintaining shipboard and shore-based laboratories; curating and distributing all core samples and data; publishing scientific results; and providing public information about ODP.

The Lamont-Doherty Geological Observatory (L-DGO) manages the wireline logging operations for obtaining electronic measurements in the drill holes. ODP facilities located at L-DGO will store ODP cores as they are collected from the Atlantic, Mediterranean, and Caribbean Oceans. Presently, the facility stores previously collected DSDP cores from these areas. The ODP Databank for regional geophysical and site survey data is also located at L-DGO.

The JOIDES Office provides support for the JOIDES Executive and Planning Committees and for the science advisory structure in general. The JOIDES Office rotates amongst the JOI institutions with the exception of Texas A&M University as the Science Operator.

The relationship of all these bodies is shown in Figures 1 and 2.

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OCEAN DRILLING PROGRAM MANAGEMENT STRUCTURE

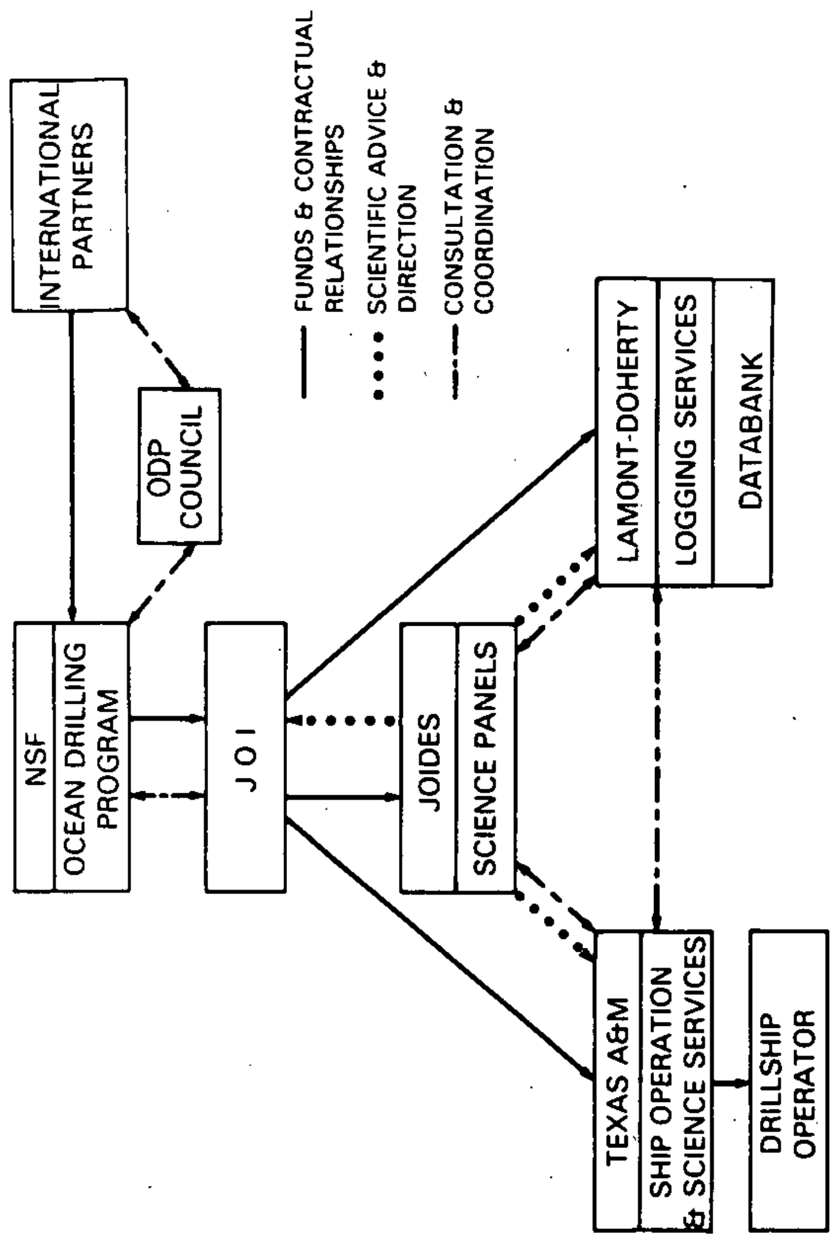

Figure 1

OCEAN DRILLING PROGRAM

ORGANIZATIONAL CHART

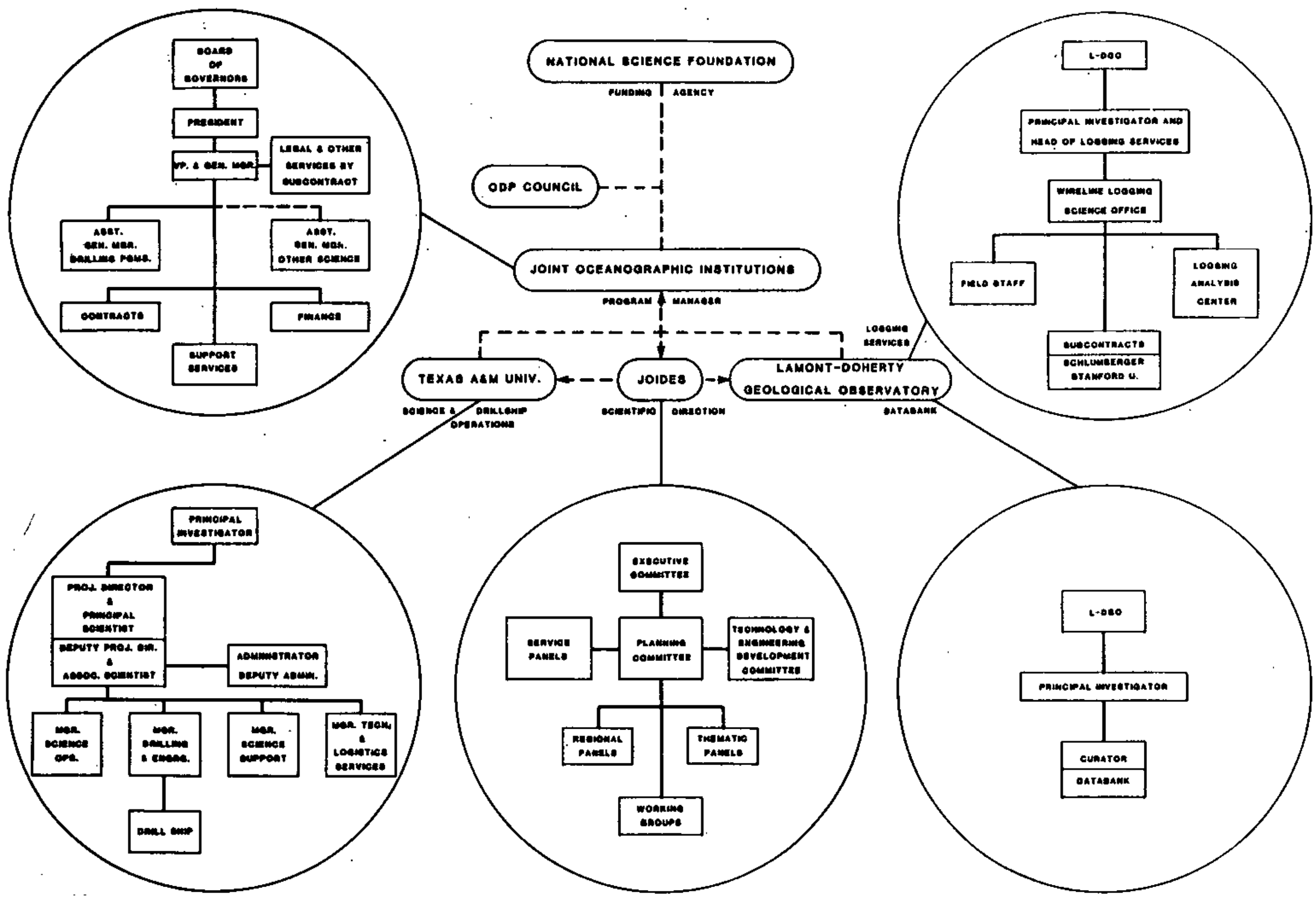

Figure 2

National Science Foundation

The National Science Foundation (NSF) is an independent federal agency established by the National Science Foundation Act of 1950 in order to promote and advance scientific progress in the United States.

The Ocean Drilling Program is within the Oceanographic Centers and Facilities Section (OCFS) of the Ocean Sciences Division (OCE) of the Directorate for Astronomical, Atmospheric, Earth and Ocean Sciences (AAEO). This Directorate manages most NSF programs in the environmental sciences and other programs requiring large scale facilities or logistical support.

The Ocean Drilling Program directorate in NSF is responsible for oversight of the Program and for administering co-mingled funds from the NSF and the non-U.S. partner nations. It is also responsible for support of U.S. science drilling-related activities. The NSF convenes the annual meeting of the international ODP Council and acts as permanent chairman of this consultative body. The Council itself provides a means of communication between NSF and the other international funding agencies.

MEMORANDUM OF UNDERSTANDING

A prerequisite for membership in JOIDES is a Memorandum of Understanding (MOU) between NSF and the responsible funding agency in a non-U.S. partner nation.

The articles from the Memorandum of Understanding for Regular Membership in the Ocean Drilling Program in Table 1 outline the relationship between NSF and the partner agency. These articles form the basis for all MOUs signed to date. With minor changes, they will be the basis of future MOUs as well.

* * * * * * * * *

Table 1: Memorandum of Understanding

Between the National Science Foundation and Participating Countries in the Ocean Drilling Program as a Regular Member

Article 1: MEMBERSHIP STATUS - The (institution) of (country) elects to be a regular member with rights, privileges, and financial commitments as defined.

Article 2: DURATION - (Institution) endorses, in principle, a ten-year program of Ocean Drilling including the first-year planning period followed by a nine-year drilling and coring program. This Memorandum of Understanding ensures (country) involvement in all scientific activities that take place between its effective date and September 30, 1993.

Article 3: SCIENTIFIC PLANNING - Scientific planning and direction of the Ocean Drilling Program shall be the responsibility of JOIDES. (Institution) will be a member of JOIDES, and will be represented on each committee, panel, or working group thereof. International membership and representation in JOIDES is restricted to regular and candidate members, including consortia, but excluding the individual members of consortia. Candidate members will be members of JOIDES during the planning period only. JOIDES shall have the right to comment and advise on the annual program plans and budgets prepared by the contractors, prior to their adoption by the National Science Foundation.

Article 4: OCEAN DRILLING COUNCIL - (Country) will be a member of the Ocean Drilling Council. The members of the Council will be representatives of each country contributing to the support of the Ocean Drilling Program, regardless of whether it is participating as an individual member or as a member of a consortium. Members of the Council and their alternates will be designated by the participating countries. There will be one representative of each participating country, except that additional representation from the United States may be appropriate.

The Council shall serve as a consultative body reviewing financial, managerial, and other matters involving the overall support of the Ocean Drilling Program. The Council shall provide a forum for exchange of views among the contributing countries. No formal voting procedures will be established.

The National Science Foundation representative will serve as permanent Chairman of the Council. A formal agenda will be prepared for each meeting and written records of each meeting will be kept. The National Science Foundation will provide secretariat services to the Council.

The Council will normally meet once each year. The annual meeting shall include a financial report and discussion, an audit report, a review of scientific and technical achievements for the past year, draft program plans and budgets for the coming year, and other topics of mutual interest. Normally, all regular meetings of the Council will take place in Washington, DC.

Liaison representatives of prime contractors and important scientific planning entities will be available to the Council.

Article 5: RIGHT TO MAKE PROPOSALS; DATA PRIVILEGES - The (institution) will have the right: a) to make proposals to JOIDES of scientific projects of technical objectives of special interest to (country); b) to participate in the analysis, and have access to the data, of geophysical and other site surveys performed in support of the program; and c) to all engineering plans, data or other information developed under contracts supported as program costs.

Additional site surveys may be contributed by (country) as its scientific interests and available resources allow. Site surveying will be coordinated by JOIDES.

Article 6: VISA AND CUSTOMS FACILITATION - The National Science Foundation will facilitate, to the extent feasible, through collaboration with the appropriate authorities, the granting of visas and other forms of official permission for entry to and exit from the United States of personnel, equipment, and supplies when required for participation or utilization in the Ocean Drilling Program.

Table 1 (Cont.)

Article 7: PARTICIPATION ON BOARD THE ODP DRILLSHIP - The Science Operations Contractor, with the advice of JOIDES, selects the scientific team for each cruise. Space on the average will be available for two scientists representing (country) on each cruise of the ODP drillship. It is recognized that some cruises may be of special scientific interest to (country) scientists and more (country) participation may be appropriate. It is expected that one (country) scientist per annum will be invited to serve as co-chief scientist on Ocean Drilling Program cruises.

(Country) will have the opportunity to participate in the technical parties on Ocean Drilling Program cruises.

Article 8: INITIAL REPORTS OF THE OCEAN DRILLING PROGRAM - (Country) scientists will have access, through the (institution), to Ocean Drilling Program data and core samples. The (institution) will endeavor to ensure that the participating (country) scientists and institutions shall provide the scientific data resulting from site surveys and laboratory analyses in time for preparation of the Initial Reports of the Ocean Drilling Program or their equivalent. One hundred copies of each volume of the official scientific publications will be provided to the (institution) for free distribution among (country) scientific establishments. These volumes may be published in (country) in full or in part, without payments to or additional agreements with the United States. The (institution) will provide the National Science Foundation with copies of all (country) publications that are based on program material.

Article 9: FINANCIAL CONTRIBUTION - The (institution) will support the Ocean Drilling Program with financial contributions payable to the National Science Foundation in U.S. dollars in amounts and periods to be specified by Annex A to this Memorandum of Understanding. Such Annex will be amended at regular intervals, but not more than once annually, in order to adjust contribution levels in proportion to changes in the level of drilling operations costs actually experienced by the Program. Estimates of potential adjustments will be submitted to (institution) 18 to 20 months prior to the U.S. fiscal year concerned by the adjustment, for appropriate discussion during the annual Ocean Drilling Program Council meeting.

The financial contributions of all participants will be co-mingled to support the total program costs. "Program costs" are determined by the National Science Foundation, and are those costs incurred in support of contractors performing functions for joint planning and operations of the Ocean Drilling Program, and program direction and management costs incurred by the National Science Foundation which relate to international participation. Activities which may be carried out by the National Science Foundation's contractors in direct support of the United States scientific undertakings are not program costs and will not be funded from co-mingled accounts.

Article 10: SALARIES, TRAVEL AND EXPENSES - Salaries, travel and expenses for participants representing (country) will be borne by (country).

Article 11: CONSULTATION - Meetings of the National Science Foundation and representatives of the (institution) may be held at any time upon the request of either party to discuss the terms and conditions of this Memorandum and other matters of mutual interest.

Article 12: TERMINATION NOTICE - Obligations arising from this Memorandum of Understanding may be terminated by either party giving the other party written notice at least one year in advance. Provisions for refunds of contributions, arising out of unilateral termination, are specified in Annex A.

*Annex A outlines financial obligations and accompanies all MOUs.

Joint Oceanographic Institutions Inc.

Joint Oceanographic Institutions Inc. (JOI) is a consortium of ten U.S. academic oceanographic institutions that was established in order to bring the collective capabilities of individual institutions to bear on large oceanographic research projects. The Corporation acts as a coordinating body and systems manager for the member institutions.

The Corporation consists of the ten major U.S. academic oceanographic institutions: Scripps Institution of Oceanography, University of California (SIO); Lamont-Doherty Geological Observatory, Columbia University (L-DGO); Hawaii Institute of Geophysics, University of Hawaii (HIG); Rosenstiel School of Marine and Atmospheric Science, University of Miami (RSMAS); College of Oceanography, Oregon State University (OSU); Graduate School of Oceanography, University of Rhode Island (URI); Department of Oceanography, Texas A&M University (TAMU); Institute for Geophysics, University of Texas at Austin (UTA); College of Ocean and Fishery Sciences, University of Washington (UW); and Woods Hole Oceanographic Institution (WHOI).

JOI evolved from a unique and effective scientific body, the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), which conceived of and provided the scientific leadership for the highly successful Deep Sea Drilling Project (DSDP). JOI began operations in 1978 as a non-profit corporation designed to plan and manage the geological and geophysical ocean explorations done by the institutions involved in the DSDP and to foster other oceanographic research.

The affairs of the Corporation are governed by a Board of Governors composed of the Directors, Deans, or Department Heads of the ten-member institutions. The Corporation's work is directed by a President, and its staff is assisted by professional consultants in science and management. The Corporation has undertaken no scientific work with permanent staff and has instead relied solely on subcontracts with academic organizations (both member and nonmember) and other organizations as appropriate. Special consultants are used where necessary.

JOI is currently responsible for the scientific planning and operations management for the Ocean Drilling Program, ensuring that the scientific directions provided by JOIDES are adequately carried out in a cost-effective manner by Texas A&M University, Lamont-Doherty Geological Observatory, and other subcontractors. Under contract to NSF, JOI has the responsibility for the geophysical site survey and related activities supporting the U.S. scientific community's participation in the ODP.

* * * * * * *

Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES)

In 1964, four institutions -- Columbia University's Lamont-Doherty Geological Observatory, the University of Miami's Rosenstiel School of Marine and Atmospheric Science, the Woods Hole Oceanographic Institution, and the University of California's Scripps Institution of Oceanography -- joined together to form the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). This became a national effort to explore the worldwide geological and geophysical structure of the seafloor through a long-term systematic program of ocean drilling, the Deep Sea Drilling Project (DSDP).

In 1968, the University of Washington and, in 1975, the oceanographic institutions of the University of Hawaii, the University of Rhode Island, Oregon State University, and Texas A&M University joined the original four institutions of JOIDES. The University of Texas at Austin joined the consortium in 1982, bringing the total number of U.S.-member institutions to ten.

International participation in this worldwide deep sea drilling project has always been one of its distinctive features. From 1974 to 1976 five nations formally joined with the United States to begin the International Phase of Ocean Drilling (IPOD). The oceanographic institutions of the Federal Republic of Germany, France, Japan, the United Kingdom, and the U.S.S.R. became members of JOIDES and participated as full scientific and financial partners in the DSDP. Of these five, the first three are current members of JOIDES and are active in the new Ocean Drilling Program (ODP). Canada has recently joined as a participant in the ODP.

JOIDES is responsible for providing the scientific direction for the Ocean Drilling Program. Currently the members of JOIDES are the ten JOI institutions together with the Department of Energy, Mines and Resources (EMR), Canada; Bundesanstalt fur Geowissenschaften und Rohstoffe (BGR), Federal Republic of Germany; Institut francais de recherche pour l'exploitation de la mer (IFREMER), France; and the Ocean Research Institute of the University of Tokyo (ORI), Japan.

JOIDES consists of an Executive Committee (EXCOM) together with a science advisory structure headed by the Planning Committee (PCOM). The Executive Committee designates the members of the Planning Committee which, in turn, appoints members of panels and working groups. The JOIDES organization is shown in Figure 3.

JOIDES EXECUTIVE COMMITTEE TERMS OF REFERENCE

1. This Committee shall formulate scientific and policy recommendations with respect to the Ocean Drilling Program (ODP). It shall conduct the ODP planning, as well as evaluation and assessment of the Program as to its accomplishments as compared to the goals and objectives which have been established. It may be assigned managerial and operational responsibilities for appropriate tasks.

2. The members of this Committee shall be representatives of oceanographic and marine research institutions or other organizations which have a major interest in the study of the sea floor and an adequate capability in terms of scientific manpower and facilities to carry out such studies.

3. The initial membership of this committee will be comprised of one representative of each of the four non-U.S. countries participating in the International Phase of Ocean Drilling (IPOD) under active Memoranda of Understanding (MOU) with the National Science Foundation (NSF) [France, Federal Republic of Ger-

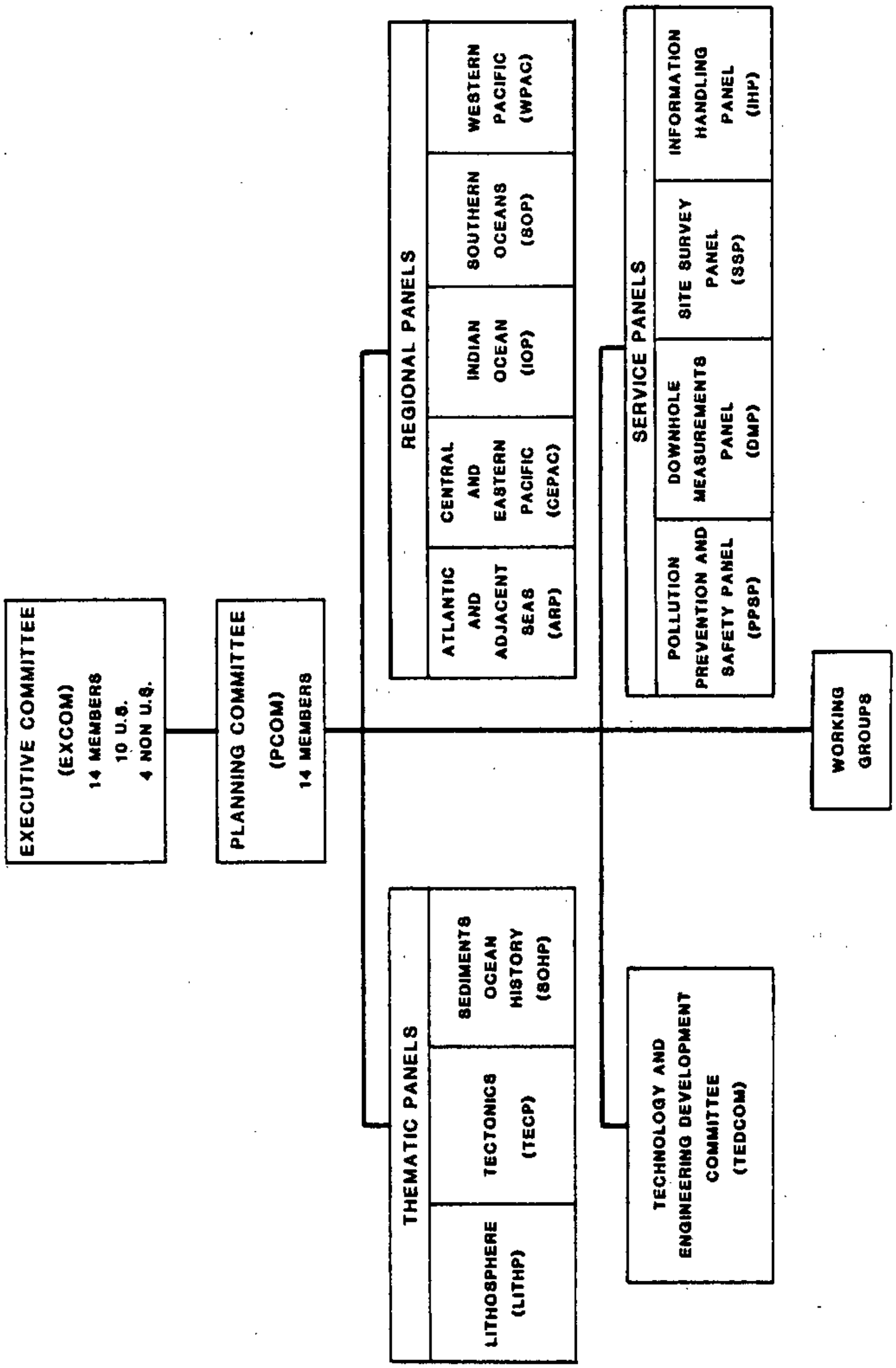

Figure 3: JOIDES Organization

many, Japan, and the United Kingdom]* and one representative of each of the ten existing U.S. institutions (University of Miami, University of Washington, Oregon State University, University of Hawaii, University of Rhode Island, University of Texas at Austin, University of California, San Diego, Texas A&M University, Woods Hole Oceanographic Institution, and Columbia University) which are currently participating in the JOIDES Executive Committee for IPOD. The appointment of additional members will be determined by the Board of Governors on the recommendation of the JOIDES Executive Committee. In the case of representatives of non-U.S. country participants, the existence of a valid MOU with NSF is a prerequisite to membership.

Membership of any member may be cancelled by the Board of Governors on the recommendation of the JOIDES Executive Committee or in the event of a non-U.S. country participant ceasing to have a valid MOU in existence.

4. Each institution or organization designated for participation on this Committee by the Board of Governors shall provide one voting member, normally the director or senior deputy thereto.

5. The Executive Committee shall reach all its decisions by the affirmative vote of at least two-thirds of all members including members from at least two countries. A quorum shall constitute two-thirds of the Executive Committee. Notices of meetings and agendas will be sent to members 60 days prior to the time of the meetings. If a member of the Executive Committee is absent from a duly called meeting of the Executive Committee, he or she may designate an alternate from his or her institution, with full authority to act for him or her in his or her absence.

*At the time of publication, the U.K. was unable to sign a full MOU with NSF for participation in ODP and has ceased to be a member of the Executive Committee. Canada has signed a full MOU thereby becoming a new member of the Committee.

6. The Committee may establish subcommittees for cognizance of certain components of the Ocean Drilling Program. Areas of cognizance and the terms of reference for each subcommittee shall be defined by the Executive Committee. In particular a Planning Committee shall be established. It shall be composed of one member (with an alternate) designated by each member of the Executive Committee. This Committee shall act on the basis of a vote of a majority of all members.

7. The Committee, and all subcommittees thereto, shall keep written records of their proceedings.

8. Members of this Committee, and members of subcommittees duly appointed therby, while acting within the terms of reference, shall be indemnified, and held harmless by the corporation from and against any and all liabilities, damages and demands, losses, costs, and expenses arising from acts or omission related to performance as Committee members.

9. These Terms of Reference, upon ratification by members of the existing JOIDES Executive Committee for IPOD and adoption by JOI as an amendment to its By-Laws, will supercede all previous JOIDES agreements.

TERMS OF REFERENCE
SCIENCE ADVISORY STRUCTURE OF JOIDES FOR THE OCEAN DRILLING PROGRAM (ODP)

The purpose of the Terms of Reference for the ODP Science Advisory Structure of JOIDES is to formulate the most productive scientific plan for the program. Thus the SAS is open to suggestions and proposals from the entire scientific community, and its plans shall be open to continued review and revision.

1. The Science Advisory Structure of JOIDES will consist of a Planning Committee, a Technology and Engineering Development Committee, three thematic panels, five regional panels, and five service panels. Ad hoc working groups may be created by the Planning Committee as requested

by the panels or by the Planning Committee itself.

2. Each committee, panel and working group will operate under a mandate, along with guidelines as to membership and frequency of meetings. Mandates, guidelines, and their amendments shall be proposed by the Planning Committee for approval by the Executive Committee.

3. PLANNING COMMITTEE

3.1 General Purpose. The Planning Committee recommends to the Executive Committee and to the Science Operator plans designated to optimize the scientific productivity and operational efficiency of the drilling program, normally by coordinating, consolidating, and setting into priority the advice received from the panels. More specifically, the Planning Committee is responsible (a) for planning the general track of the drilling vessel about 3 years in advance of drilling; (b) for fostering communications among and between the general community, the panels, the Science Operator, and itself: (c) for soliciting, monitoring, and coordinating drilling proposals; and (d) for the establishment of a scientific drilling program about one year in advance of drilling.

3.2 Mandate. The Planning Committee is responsible for the mandates of the various panels and working groups and their membership. It approves their meetings and agendas and may assign special tasks to them. The Planning Committee sponsors and convenes COSOD-type conferences about every three years. It identifies the proponents of proposals and assigns to thematic and regional panels proposals for review. It sets the scientific objectives of the proposals into a final priority after they are reviewed by the Thematic Panels and Regional Panels. The Planning Committee nominates the chief scientists to the Science Operator. It periodically reviews this advisory structure in the light of developments in science and technology and recommends amendments of its panel structure and mandates. Much of the working of the Planning Committee is carried out by the commissioning of reports from the panels, the working groups, and *ad hoc* subcommittees of its own membership, and by its chairman at the JOIDES Office.

3.3 Structure. The Planning Committee is empowered to establish an infrastructure appropriate to the definition and accomplishment of tasks described in its annual program plan as approved by the Executive Committee and the National Science Foundation. Communication with its panels is maintained by having their chairmen meet with the Committee annually, and by assigning committee members as non-voting liaison members to its panels and working groups. Where counsel and communication are deemed important, other individuals may be asked *ad hoc* to meet with the Committee or a panel.

3.4 Membership. Each member of the Executive Committee shall designate one member of the Planning Committee and an alternate to serve in the absence of the designated member. Commencing January 1, 1984, one quarter of the Planning Committee members shall rotate off the Committee annually, so that its membership is replaced every four years. Reappointment shall be made only in exceptional circumstances. All appointees to the Planning Committee shall satisfy the fundamental criteria of having the ability and commitment to provide mature and expert scientific direction to the program. Balance of fields of specialization on the Planning Committee shall be maintained as far as possible, by informed consultation amongst the U.S. member institutions prior to selection of their appointees. The chief scientists of the Science Operator and Wireline Logging Services Contractor and an appointee of the NSF are non-voting, liaison observers.

3.5 Organization. The planning Committee meets at least three times a year, normally in January, May, and September.. Robert's Rule of Order govern its meetings.

3.6 Vote and Quorum. Within the framework of the Memoranda of Understanding with each non-U.S. participating country (or consortium designee), it is intended that the U.S. members shall constitute at all times at least a majority of members. Substantive issues decided by formal vote require the vote of a majority of all members. A quorum shall consist of at least two-thirds of the non-U.S. members and at least two-thirds of the U.S. members.

3.7 Chairmanship. The Chair of PCOM shall rotate with the JOIDES Office among the U.S. JOIDES institutions, excluding the Science Operator institution. The term of office is normally two years.

4. THEMATIC PANELS

Thematic Panels are mainly, but not exclusively, process oriented. They are established by the Planning Committee to redefine as scientific drilling objectives scientific problems identified by COSOD (16-18 November 1981) and by the JOIDES 8-year program for drilling (April 1982). They are responsible for reviewing any other scientific objectives proposed by the pre- and post-1983 reports and "white papers," the national science structures of the various non-U.S. participants, and the scientific community at large. Thematic Panels maintain a constant review of science in their discipline. Thematic Panels are composed of a number of members from U.S. institutions and one member from each non-U.S. participant. PCOM approves the panel membership. Panelists appointed in 1985 and future years serve 3 years, with one-third of the panelists being replaced each year. The chairmen are appointed by PCOM. Thematic panels meet at least twice a year, but may meet more frequently as requested by PCOM. PCOM convenes the panel meetings and approves their meeting dates, locations, and agendas. The mandates are guidelines and do not restrict panels. Considerable overlap in thematic coverage has evolved and is expected to continue to evolve. The Planning Committee may ask Panels to take up topics not in their original mandates.

4.1.1. Ocean Lithosphere Panel: Mandate

The Ocean Lithosphere Panel is concerned with the origin and evolution of oceanic crust, and more particularly with volcanic, metamorphic, hydrothermal and diagenetic processes occurring in the ocean crust:

(a) Processes of submarine and volcanology, intrusion and plutonism; crustal construction at spreading axes; petrology, geochemistry, mineralogy, and magnetic and other physical properties of igneous and metamorphic rocks from the ocean floor, from seamounts, from oceanic plateaus, from volcanic arcs and from basins adjacent to volcanic arcs.

(b) Processes of submarine hydrothermal circulation; petrology, geochemistry and mineralogy of hydrothermally altered rocks and hydrothermal deposits from the ocean floor; geochemistry and physical properties of hydrothermal solutions.

(c) Processes of submarine diagenesis; geochemistry of pore waters from sediments and hard rocks; petrology geochemistry and mineralogy of diagenetically altered sediments and hard rocks.

4.1.2. The Ocean Lithosphere Panel will be responsible for planning the drilling of sites concerned with these problem areas at the following levels:

(a) Long-range identification of objectives and review of research proposals for future drilling operations.

(b) Selection of target areas within which these objectives can be met.

(c) Helping the site survey organization to plan surveys of the target areas.

(d) Identification of proponents or working groups for particular target areas.

(e) Selection of sites for location of drill holes within the target areas, so that objectives can be reached.

(f) Advice to the Planning Committee and the project chief scientist on the selection of co-chief scientists and other scientists.

(g) Encouragement of specific shore-based laboratory work on the samples recovered by drilling.

(h) Advice to the project curator on the handling of recovered samples.

(i) Advice to the Planning Committee and the project chief scientist on provision of equipment for use on the drilling ship and in shore-laboratories run by the Science Operator.

(j) Coordination of plans for downhole experiments in projected holes.

4.1.3. In the course of the work specified in paragraph 4.1.2., the Ocean Lithosphere Panel will maintain the closest contact with the appropriate Regional Panels and other specialists.

4.1.4. The Ocean Lithosphere Panel is responsible to the Planning Committee, and will respond directly to requests from it, as well as reporting to it on a regular basis.

4.1.5. The Ocean Lithosphere Panel will act as a means of disseminating and correlating information in the appropriate problem areas by:

(a) Receiving reports from co-chief scientists on the progress with shorebased research on samples.

(b) Encouraging and sponsoring symposia at which the results of drilling will be discussed.

(c) Publishing progress reports in the open literature to inform and encourage participation in the project.

(d) Generating "White Papers" as requested by PCOM.

4.2 <u>Tectonics Panel: Mandate</u>

The Tectonics Panel is concerned with the standard history of ocean margins and plates, especially studies in critical transects and along-strike by coordinated geological, geophysical, and drilling programs:

(a) Special emphasis is placed on the early rifting history of passive continental margins, on the dynamics of forearc evolution, and on the structural sedimentological and volcanic history of island arcs, back-arc basins, and marginal seas.

(b) Additional problems under the purview of this panel include the development of continental slopes and rises; detailed histories of vertical movements at margins; thermal and mechanical evolution of passive margins; structural variability along-strike; sheared margins; post-rifting tectonism of passive margins; the study of stress fields at active margins; global relations among arc systems; collision tectonics; the development of passive margins in back-arc basins; studies of transform faults at fracture zones; the origin, structure and tectonic evolution of oceanic plateaus and aseismic ridges; and the determination of plate-kinematic models.

(c) Of interest to this panel as well as to other panels are the composition, structure and formation of the oceanic crust and upper mantle, tephrochronology, and the study of "global" unconformities and the synchroneity of tectonics and sea level events along margins as well as coral atolls and guyots.

4.3 <u>Sediments and Ocean History Panel: Mandate</u>

The Sediments and Ocean History Panel is concerned with investigations of marine stratigraphy, marine sedimentology and paleoceanography. Areas specifically include:

(a) Stratigraphy including the subdivision, correlation and dating of marine sediments. Examples are refinement of magnetostratigraphy, radiometric dating, chemostratigraphy, biostratigraphy, tephrochonology, and seismic stratigraphy.

(b) Processes of formation of marine sediments, diagenesis, organic and inorganic sedimentary geochemistry and global mass balancing of oceanic sediments.

(c) Long-term history and driving mechanisms of the oceanic atmosphere and biosphere. Central to this theme are relations among plate tectonics and ocean paleocirculation, sedimentation patterns, global paleoclimates, glacial and ice-sheet evolution, sea level change and its effects on marine sedimentation and evolution of marine life.

5. REGIONAL PANELS

The Regional Panels are responsible for:

(a) Helping Thematic Panels to translate their broad thematic programs into concrete regional drilling plans.

(b) Identifying regional problems not covered by Thematic Panels.

(c) Recommending integrated drilling programs in their regions.

(d) Monitoring the status of knowledge on regional geology and geophysics.

(e) Advising on regional and site surveys needed for future drilling.

PCOM chooses panel members for their expertise and experience in a region. PCOM nominates a number of members from the U.S. and from non-member countries as appropriate and each non-U.S. JOIDES member can nominate one member to each Regional Panel. Panelists appointed in 1985 and future years serve 3 years, with one-third of the panelists to be replaced each year. The chairmen are appointed by PCOM.

Regional panels meet at the request of PCOM as frequently as required by ship scheduling and routing.

PCOM establishes liaison between Regional and Thematic Panels by overlapping memberships.

The map (Figure 4) shows the general areas of prime responsibility for the Regional Panels, but the boundaries are not fixed limits. Panels view their responsibility as including all areas relevant to their regional problems. The Regional Panels are Atlantic Ocean, Central and Eastern Pacific Ocean, Western Pacific Ocean, Indian Ocean, and Southern Oceans.

6. AD HOC WORKING GROUPS

Ad hoc working groups may be created by the Planning Committee as requested by the panels or by the Planning Committee itself, for more intensive study of certain aspects of planning that may arise. Working groups will be held to the minimum necessary membership and travel expenses, chairmanship to be held by a member of the parent committee or panel, and will be dissolved when their assigned work is complete.

7. TECHNOLOGY & ENGINEERING DEVELOPMENT COMMITTEE

The Technology and Engineering Development Committee is responsible for ensuring that the proper drilling tools/techniques are available to meet the objectives of targets to be drilled according to the planned schedule. The TEDCOM identifies within a proper time frame the new drilling tools/techniques to be developed, helps JOI/Science Operator write RFPs for engineering firms leading to the development of the tools/techniques, and monitors the progress of their development. The members of the TEDCOM are engineers nominated by PCOM. One of the functions of the TEDCOM is to collabo-

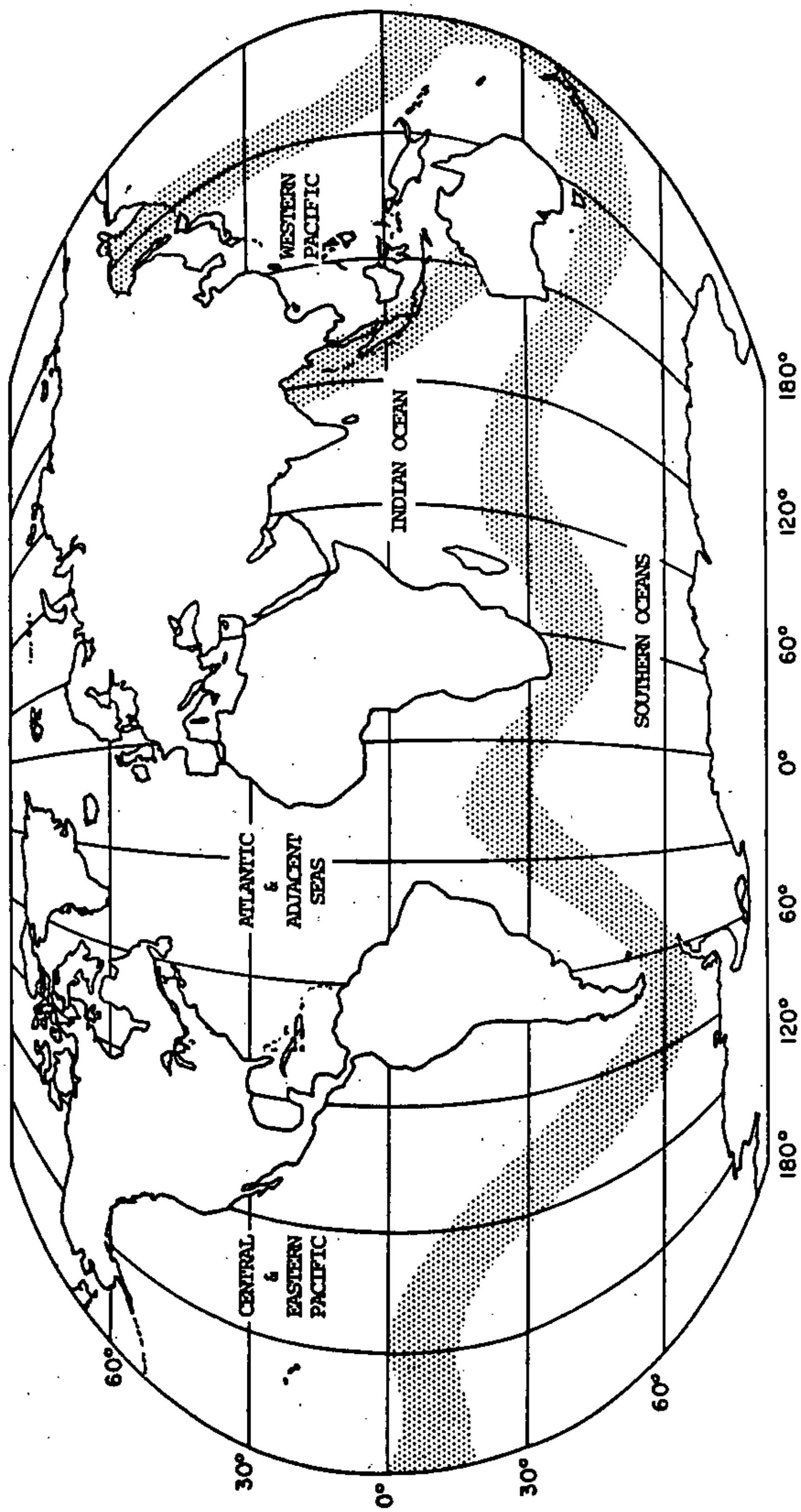

Figure 4: General areas of prime responsibility for JOIDES Regional Panels

rate with the Downhole Measurements Panel.

8. SERVICE PANELS

Service Panels provide advice, services and products to the JOIDES Advisory Structure, to the Science Operator, and to the various entities responsible for the processing, curation and distribution of samples, data and information (including publications) to the scientific community. The Service Panels, beyond their help to the JOIDES Advisory Structure, are not directly involved with selection of drilling targets or definition of cruise objectives. Service Panels have specific mandates. Service panels meet at least once a year or as requested by PCOM. PCOM appoints the chairmen and panelists and keeps membership under review.

8.1 Site Survey Panel: Mandate

8.1.1. The general purpose of the Site Survey Panel is to provide information and advice to the Planning Committee on the adequacy of and need for site surveys in relation to proposed drilling targets.

8.1.2. The Site Survey Panel is mandated to:

(a) Receive mature proposals from regional and thematic panels, to review site survey data packages prepared by the ODP Data Bank and to make recommendations as to their adequacy to the Planning Committee.

(b) Identify data gaps in proposed future drilling areas and to recommend appropriate action to ensure that sufficient site survey information is available for pinpointing specific drilling targets and for interpretation of drilling results.

(c) Provide guidelines for proponents and panels as to required site survey data and to examine the opportunities and requirements for the use of new technologies for surveying potential drill sites.

(d) Promote international cooperation and coordination of site surveys for the benefit of the Ocean Drilling Program, particularly between participating ODP nations' survey activities.

(e) Promote the lodging of all data used for planning drilling targets with the ODP Data Bank.

8.2 Pollution Prevention and Safety Panel: Mandate

8.2.1. The general purpose of the Pollution Prevention and Safety Panel is to provide independent advice to the Planning Committee and to the Ocean Drilling Program with regard to safety and pollution hazards that may exist because of general and specific geologic circumstances of proposed drill sites.

8.2.2. Mandate: All drilling operations involve the chance of accident or pollution. The principal geologic safety and pollution hazard in ocean drilling is the possible release of substantial quantities of hydrocarbons from subsurface reservoir strata. In most deep sea regions, the risk of hydrocarbon release can be reduced or elimated by careful planning and proper site surveys. Additionally, safety problems may arise in drilling hot hydrothermal systems for lithosphere targets. Those who plan each Ocean Drilling Program cruise and select its drilling sites are initially responsible to propose only sites that are considered reasonably safe. The JOIDES Pollution Prevention and Safety Panel independently reviews each site to determine if drilling operations can be conducted safely.

The preliminary site survey information and the operational plan are reviewed for each site. Advice is communicated in the form of site approval, lack of approval, or approval on condition of minor site relocation or amendment of the operational plan. Approval is based on the judgment of the Panel that a proposed site can be safely drilled in light of the available information and planning.

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and shore-based computer facils for equipment and procedures; (2) ware development; (3) data co tion techniques; and (4) meetin erm computational needs of shipboard at- shore-based scientists, as wel on providing access to data bases m- all interested parties. of m

8.3 Information Handling Panel: Mandate

8.3.1 The general purpose of the Information Handling Panel is to provide information and advice to the Planning Committee, the Ocean Drilling Program and the Deep Sea Drilling Project (DSDP) with regard to satisfying the needs of the scientific community for timely access to data, samples and publication and to assist program managers in setting priorities.

8.3.2. The Information Handling Panel is mandated to:

(a) Advise on (1) types of publications to be produced; (2) publication formats; (3) schedules and deadlines: (4) publications policy and goals of the publications program. (Both ODP and DSDP publications are included.)

(b) Advise on (1) the operation of the core repositories; (2) curatorial policy; (3) filling of sample requests; (4) curatorial data management; (5) long-term goals for the preservation of the core materials and other physical samples obtained by ODP and DSDP; and (6) establishment and operation of the various micropaleontology reference centers.

(c) Advise on (1) the types and contents of the data bases to be maintained by ODP and DSDP; (2) the treatment of raw data; (3) the establishment of uniform procedures and standards for data handling and processing; (4) the structure, philosophy and goals of the information systems produced by the program; and (5) the management of data bases, information systems and data centers. This last topic also includes coordination between various data centers established by ODP and DSDP.

(d) Advise on the minimum standards of quality and completeness necessary for data to be included in the various data bases and information systems, including data recording, transcribing and checking proedures.

(e) Advise on (1) shipboard

(f) Advise on (1) long-te preservation of the raw data genera ed by ODP and DSDP; (2) preservatic of all past records bearing on sample history; and (3) preservation of any other records of the program which might benefit future workers.

(g) Advise on the relationship between the ODP and DSDP data centers and national depositories such as the National Geophysical Data Center, World Data Center A for Marine Geology and Geophysics, etc., and the fulfillment of statutory obligations for data transfer. It also includes transfer of data to data centers established by ODP member countries, such as the one in France, and to the Micropaleo Reference Centers.

8.4 Downhole Measurements Panel: Mandate

8.4.1. The general purpose of the Downhole Measurements Panel is to determine the physical state, chemical composition, and dynamic processes in ocean crust and its sediment cover from downhole measurements and experiments. Areas of responsibility include: routine logging (including industry standard and special tools widely used in ODP); routine data processing and interpretation; new and adapted logging tools, techniques, and data processing; downhole experiments and data acquisition (including downhole recording).

8.4.2. The Downhole Measurements Panel is mandated to:

(a) Report to and advise PCOM on logging and downhole measurement programs of ODP.

(b) Advise on and recommend to the ODP Wireline Service Contractor the required logging faciliti-

(c) Advise the ODP Science Operator on the scientific desirability, technical feasibility, scheduling and operational requirements of proposed programs.

(d) Interface and coordinate with Woods Hole Oceanographic Institution (U.S.) and other national downhole instrumentation development groups.

(e) Solicit and expedite new logging capabilities and experiments.

(f) Evaluate new technology and recommend future measurement directions.

8.4.3. Membership consists of a well-balanced representation, approximately half being logging and other downhole technologists and half having scientific backgrounds and interests. The Wireline Services Operator and Science Operator of ODP shall each be represented by non-voting members on the Panel.

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Conference On Scientific Ocean Drilling

Throughout the fifteen-year Deep Sea Drilling Project, JOIDES, through its subunits of marine geoscience disciplines and with the international participation of the world's renowned geoscientists, has provided the scientific leadership. One of its key contributions in scientific direction was the Conference on Scientific Ocean Drilling (COSOD). JOIDES appointed a steering committee and directed that conference to examine the question, "How can ocean drilling and associated scientific programs be organized and coordinated to attack the most important scientific problems in the most organized and productive way?"

The COSOD Steering Committee met and formed a number of working groups. These groups prepared position papers that served as the basis for discussion at the conference.

The Conference on Scientific Ocean Drilling was held at the University of Texas at Austin on November 16-18, 1981. In attendance were approximately 150 earth scientists from the United States, the Federal Republic of Germany, France, the Soviet Union, the United Kingdom, Australia, Canada, the Netherlands, and Norway.

The Report of the Conference on Scientific Ocean Drilling, dated November 16-18, 1981, is the scientific basis and justification for the Ocean Drilling Program.

Extracts of the COSOD summary follow and indicate the main scientific themes and concepts which JOIDES has accepted as the objectives for ODP. The full COSOD report may be obtained from JOI Inc., 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036.

EXTRACTS FROM THE SUMMARY OF THE CONFERENCE ON SCIENTIFIC OCEAN DRILLING

A. INTRODUCTION

The drilling of sediments and rocks of the ocean basins makes contributions to many branches of science. The continuous and detailed record of microfossils preserved in ocean sediments may give the best data for describing evolutionary changes and for understanding their causes. Sediments bear the imprint of ocean temperatures and currents, information critical to the reconstruction of oceanic circulation of the past and hence to the reconstruction of ancient climates. Drilling provides access to the rocks of the oceanic crust and thus helps to unravel their structures and motions, information required to understand the phenomena of sea-floor spreading and continental drift and, more broadly, the structure of the earth as a planet. Deep-sea sediments record the contributions of the rivers and winds of the past and thus the history of the continents, records otherwise lost by erosion of the land. In addition to greatly increasing our knowledge of earth history in general, the scientific information gained by drilling is basic to the search for mineral and petroleum resources both on land and beneath the seas. As the ocean is the last frontier for these resources, the importance of a thorough understanding of its geologic history and framework cannot be overstated.

Before the GLOMAR CHALLENGER ever set sail on her initial trials, JOIDES identified as primary objectives for the Deep Sea Drilling Project "the determination of the age and processes of development of the ocean basins." Implicit in these objectives was the need to have long cores for "biostratigraphy, physical stratigraphy, paleomagnetism...and for studies of the physical and chemical aspects of sediment dispersal, deposition, and the post-depositional changes in sediments." The success of the program in achieving or progressing toward these goals is almost legendary. Indeed the results confirmed the concept of sea-floor spreading, the relationship of crustal age to magnetic anomalies, the basaltic nature of the oceanic crustal rocks, and, through the systematic sampling afforded by the drill, initiated an entirely new field of study -- paleoceanography.

This technology has taken the science through more than a decade of unprecedented advancement and has been instrumental in bringing us to our present level of understanding of the origin and history of the ocean environment. That understanding stems primarily from reconnaissance drilling based on reconnaissance geophysical studies. We now need to advance our level of technical expertise in both drilling and geophysical surveying, as well as in downhole instrumentation. It is clear from the discussion and position papers presented at the Conference on Scientific Ocean Drilling that we are entering into a new era of ocean exploration utilizing the concepts of natural laboratories on the sea floor and carefully chosen arrays of drill sites to study general processes and global problems. In the past decade we have learned that the keys to geological processes and much of the history of the earth for the past 200 m.y. are recorded in the sediments and rocks of the ocean basins. We have only begun to read and to interpret the story that they hold.

B. GENERAL RECOMMENDATIONS OF THE STEERING COMMITTEE

1. A world-wide program of long-term drilling is an essential component of research in the earth sciences. The projects described here will require at least a decade to complete and will require drilling in the Atlantic, Pacific, Indian, and polar oceans...the drilling system would almost certainly be operated without a riser and blowout prevention system for at least several years.

2. Future drilling must be part of a larger scientific program that includes adequate support for problem definition, site surveying, geophysical experimentation, and sample analyses. Broad-scale problem definition and fine-scale site examination and selection must precede drilling. The cores from the drill hole then become the ground truth that translates these geophysical parameters into geological reality. Lead times of two or three years are required for pre-drilling activities and support is required for post-drilling scientific analyses.

3. The integration of continental geology and marine geology should progress through scientific drilling programs. The oceans are the modern laboratories in which we can observe geologic processes typical of those that have occurred over the past 200 m.y. Understanding these processes is one of the keys to understanding ancient continental geology. We encourage this integration to proceed through the planning and execution of geophysical and drill-site transects from the dry land to the deep sea across well-chosen continental margins.

4. International cooperation should continue and expand. The GLOMAR CHALLENGER program has cross-pollinated the scientific and cultural thinking of the earth science community in a fundamental and unique way. The resulting international research programs have been essential to the success of the program...this international cooperation should be expanded. The JOIDES/IPOD (International Phase of Ocean Drilling) structure appears to be a good organizational framework for future drilling programs.

C. TOP PRIORITY SCIENTIFIC PROGRAM RECOMMENDATIONS

The following twelve scientific topics were selected by the working groups at COSOD as top priority objectives that should be attacked with scientific ocean drilling and related programs in the next decade. A further prioritization was not attempted by the steering committee, and these topics are listed here in a non-preferential order.

1. Processes of magma generation and crustal construction at mid-ocean ridges. What is the character and composition of the deep portion of the oceanic crust?

2. Configuration, chemistry, and dynamics of hydrothermal systems.

What are the dimensions and characteristics of hydrothermal systems at ridge crests versus those on ridge flanks? How does overlying sediment cover, or the lack of it, affect these hydrothermal systems?

3. Early rifting history of passive continental margins. What is the shallow and deep structure of stretched and normal faulted margins versus those characterized by excessive volcanism?

4. Dynamics of forearc evolution. What are the relative motion, deformation, and pore water characteristics of sediments at accreting and erosional margins?

5. Structure and volcanic history of island arcs. What are the space and time relationships of forearc subduction, accretion, and erosion; and of backarc spreading, compression, and volcanism at island arcs?

6. Response of marine sedimentation to fluctuations in sea level. Which stratigraphic sequences and intervening unconformities represent fluctuations of sea level, and which represent vertical tectonic motion? What is the response of deep-sea sedimentation to fluctuations of sea level?

7. Sedimentation in oxygen-deficient oceans. What are the ocean circulation, paleoclimate, and potential hydrocarbon characteristics associated with black shale deposits?

8. Global mass balancing of sediments. What are the best estimates of the world sediment mass and composition balances in space and time?

9. History of ocean circulation. How do patterns of ocean circulation respond to changing ocean boundaries, e.g., changing ocean size, the extent of shallow continental seas, and the opening and closing of oceanic passages, especially the Drake passage, the Isthmus of Panama, and the Tethys seaway?

10. Response of the atmosphere and oceans to variations of the planetary orbits. How do gravitational interactions with other planets, especially Jupiter, affect paleocirculation in the atmosphere and hydrosphere?

11. Patterns of evolution of microorganisms. How has the process of evolutionary change proceeded in marine organisms?

12. History of the earth's magnetic field. What is the nature of the magnetic field during a magnetic reversal? What is the detailed history of magnetic reversals and changes in the intensity of the magnetic field during the past 200 m.y.?

D. SUMMARY OF THE WORKING GROUP POSITION PAPERS

This summary statement is organized around the top-priority scientific recommendations listed above. The complete position papers of the working groups are printed in the following section. In this summary, recommendations duplicated by two working groups have been condensed under one heading. Each topic is numbered in the same manner as in the previous list. We again emphasize that this numerical listing is not an attempt to further prioritize these topics, and that they are discussed in non-preferential order.

D.1. Origin and Evolution of the Oceanic Crust

Introduction - The oceanic crust is built from overlapping volcanic units measuring approximately a few kilometers by a kilometer. These are erupted at mid-ocean ridges from vertical fissures within the very narrow zone where plates spread apart. The volcanic heat brought up by this process drives vigorous systems of hot springs that emerge at temperatures of up to 350°C, carrying with them iron, copper, zinc, and hydrogen sulfides, which react to form surficial sulfide ore deposits at the axes of ocean-floor spreading. As the crust cools, this initially vigorous circulation is replaced by different, gentler systems that carry iron and manganese oxides to the sea floor.

The circulation not only alters the ocean crust and produces hydrothermal deposits but also controls the composition of the world ocean by exchanging elements, such as magnesium, calcium, sulfur, and oxygen, between sea water and rocks.

The highest priority proposals for drilling oceanic crust center on the concept of natural laboratories. These are arrays, or clusters, of holes, some deep, some relatively shallow, grouped together in fours and fives in particularly critical parts of the ocean floor. Not only would samples be extracted from the holes, but they would be used for emplacement of sophisticated instruments, some during the drilling period, and others for long-term monitoring after drilling had ceased. The group of holes in any such cluster would be spaced closely together, often no more than a few hundred meters apart, to facilitate the conduction of experiments and collection of samples on the same scale as that of the architecture of the oceanic crust.

1. Processes of Magma Generation and Crustal Construction at Mid-Ocean Ridges - Within each laboratory complex, one hole would be targeted for deep penetration to allow sampling material from hitherto unreached levels in the ocean crust. Developments in drilling techniques and in vessel capability have at last put such targets within our grasp and open the possibility of sampling the layers of the crust as yet characterized only indirectly by geophysical studies. Such information would allow both the calibration of the great resource of existing geophysical data and the extension of drilling results laterally by geophysical means.

2. Configuration, Chemistry, and Dynamics of Hydrothermal Systems - Some of the natural laboratories would be chosen primarily to study hydrothermal circulation, investigating inflow and outflow areas, collecting both rocks and fluids from the holes, and measuring temperature, fluid flow rates, and in-hole chemistry of flowing water. Initial laboratories would be set up in more technically accessible areas, such as active, medium-temperature systems and extinct, high-temperature systems, using techniques which are now available. Eventually, however, two of these would be placed in zero-age crust, one in the fast-spreading crust of the Pacific and the other in the slow-spreading Atlantic crust, using special new engineering facilities for starting holes on bare rock surfaces. Other laboratories would be chosen to examine the way the crust is constructed, monitoring the chemical characteristics of the lavas and using the signature of the earth's magnetic field, which as frozen into the lavas when they were formed, to act as a marker within the volcanic pile.

Other Important Problems - Drilling has provided important insights into mantle processes, hot spots, heterogeneity, and generation of flood basalts. Many targets of this kind remain to be drilled, especially within the Pacific, and clearly would have great scientific merit. Aging of the oceanic crust leads to changes in crustal structure and interchange of elements between ocean water and crustal rocks. Drilling is the only way to study this effectively. Geophysical work on the large transform faults that offset the mid-ocean ridges suggests models of processes within these important structural elements of the ocean crust. Drilling will clearly be important in testing such models. Young ocean basins, such as the Gulf of California, give insights into processes of crustal splitting and the development of new continental margins. They are also sites of intense high-temperature hydrothermal activity and of complex volcanism. Metamorphism and mineralization occurring in thick sediments in one or more young oceans should be investigated by drilling.

Finally, the region of the island arcs that fringe the Pacific are important elements in the oceanic crustal story. They are zoned where characteristic ore deposit are developed and where a variety of very different volcanic magmas are available. Such zones have been

reincorporated into continental crust, and drilling into regions of active island arcs to understand processes there will not only benefit marine geology, but will have great importance for understanding the development of continents.

D.2. Tectonic Evolution of Continental Margins and Ocean Crust

Introduction - The concept of plate tectonics holds that the outer shell of the earth is broken into a few large plates that move relative to each other. This outer shell, known as the lithosphere, is about 100 km thick and is rigid except at the boundaries of the plates. Plate tectonics can be fairly called a revolution in the earth sciences because most earth scientists now accept the evidence for large scale horizontal motion of the lithosphere. This motion, originally called continental drift, has been quantified by marine geophysical studies in recent years so that the amounts, rates, and directions of past and present horizontal motions are precisely known for most regions.

Plate boundaries occur where two plates are diverging, converging, or slipping past each other. In the oceanic realm, plates diverge at mid-ocean ridges, where new lithosphere is formed from hot, upwelling magma. Evidence for the initiation of this divergence is preserved at the passive margins of the diverging continents. Plate convergence in the oceans takes place at active margins, where one plate is suducted beneath another. These plate boundaries are the focus of major tectonic questions that can be solved with programs of scientific ocean drilling. At divergent boundaries, the major question is the nature of breakup of continents prior to seafloor spreading. At convergent boundaries, the focus is on island arcs, their structure and volcanic history. These volcanic islands, arrayed in a curved, or arcuate pattern, are the dry-land expression of a complex tectonic system. On the oceanic, or forearc, side of the islands lie the deep-sea trench and other compressional structures associated with subduction of the oceanic lithosphere. On the continental, or backarc, side of the islands lie the backarc basins generally believed to form by crustal extension.

3. Early Rifting History of Passive Continental Margins - Two major types of passive margins have been identified. In one there is a significant amount of continental crustal stretching resulting in normal faults. In the other, the early breakup is marked by massive outpourings of volcanic material, resulting in seaward dipping seismic reflectors. The objective of drilling is to study the deep structure of both types of margins, including the nature and extent of stretched continental crust, the nature of the seaward dipping reflectors, and the relative proportion of pre-rift sediments deposited during rifting. This can be accomplished by drilling transects across sediment-starved margins such as the Bay of Biscaye, northwest or southwest Australia, the Lord Howe Rise, and the Grand Bahamas (normal faulted margins), and Norway, Argentina, Southwest Africa, Greenland, or Antarctica (seaward dipping reflectors).

4. Dynamics of Forearc Evolution - The evidence that forearc basins can either accumulate sediments or be eroded through time needs to be evaluated by delineating the characteristics of the sediments in the forearc basin. In particular, the pressure, flow, and composition of fluids in the sediments through time, and deformation stages along and across the sediments at depth need to be studied as functions of material input and convergence parameters. These phenomena should be studied in both erosional and accreting forearc regions; and comparisons should be made between ocean-continent margins and ocean-ocean margins. Examples of accreting margins are the Lesser Antilles, Oregon-Washington, the Aleutians, the Sunda Arc, and Ecuador, whereas non-accreting or erosional margins are found in Japan, Peru, Central America, and the Marianas.

5. Structure and Volcanic History of Island Arcs - The importance of

timing of events across convergent margins is stressed in this type of study. The backarc basins are known to have spread at times, but occasional times of compression are also recognized. The volcanism of the island arc is also episodic, as is the dynamic history of the forearc basin. Transects which cross all portions of a convergent margin will help to determine the relative timing of all these episodic events.

Other Important Problems - In addition to the three top-priority topics listed above, the tectonics group identified top-priority crustal and sedimentary studies which are incorporated with topics 1, 2, and 6. Other important tectonic topics can be grouped into passive margin, active margin, and oceanic crust problems. Future drilling of passive margins should investigate the development of continental slopes and rises, the detailed history of vertical movements (both uplift and subsidence) at margins, thermal and mechanical evolution of passive margins, variability along strike in margin structure, sheared margins, and the nature and origin of post-rifting tectonic events on passive margins. Problems for drilling active margins include the study of stress fields at active margins, global relations between arc systems, collision tectonics, and the development of passive margins in backarc basins. Problems of oceanic crustal tectonics include the determination of plate kinematic models; determination of the magnetic reversal time scale, the crustal structure, and tectonic evolution of aseismic ridges and oceanic plateaus; the timing, extent, and origin of intraplate volcanism; the structure of transform faults and fracture zones; and the study of coral atolls and guyots and their volcanic cores.

D.3. Origin and Evolution of Marine Sedimentary Sequences

Introduction - Sedimentation in the oceans, and ultimately the stratigraphy of marine deposits, depends strongly on the changing depths and shapes of ocean basins that result from processes of plate tectonics. However, marine sedimentation also responds to, and records the variations in, oceanic and atmospheric circulation, biological productivity, continental elevation and runoff, world-wide sea level, and the climate of the planet. The most important questions focus on the global control of sedimentation by the interplay of tectonics, sea level, and climate. We shall depend strongly on ocean drilling in the future to describe the long-term history of this interplay by studying three topics that have particularly far-reaching implications: deep-sea sedimentation versus changes in sea level, sedimentation in oxygen-deficient oceans, and sediment mass balances.

6. Response of Marine Sedimentation to Fluctuations in Sea Level - It is hypothesized that the sequences of onlap and offlap and intervening unconformities observed in the seismic stratigraphy of continental margins often represent global fluctuations in sea level. The timing of these fluctuations can be calibrated with drill core data, although the magnitudes of changes of sea level are poorly known. The proposed curve of eustatic sea level has notable, abrupt regressions that occur at several times in the Cretaceous/Tertiary record. In order to test this hypothesis, drilling should be done in two types of settings. The first is in sediment-rich continental shelves in which seismic unconformities can be seen. This will enable us to identify the sedimentary causes and the timing of the seismic unconformities. It is necessary that good paleodepth control be available, which probably means that shelf areas such as the east coast of the United States are the prime target areas. It will also be advantageous to drill on carbonate banks and platforms, such as the Bahamas, or on atolls and guyots. There the carbonates are produced close to sea level so that the difficulty of knowing the paleowater depth is removed. Provided that good enough age control is available, it should be possible to see unconformities produced by proposed fluctuations of sea level. The large Oligocene fall in sea level and the smaller changes

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during the Mesozoic are of special importance.

Although it is widely accepted that fluctuations of sea level exert a strong control on shelf sedimentation, there is no consensus on how the deep sea responds to these changes, whether deep-circulation varies systematically with sea level, and whether unconformities on the shelves extend into the deep sea. Drilling on transects across seismically well-documented passive ocean margins (e.g. North Atlantic, Gulf of Mexico, western Australia) is needed to answer these questions.

7. Sedimentation in Oxygen-Deficient Oceans - Large volumes of organic-rich sediments were deposited during certain periods in earlier history, such as the Cretaceous and the Eocene, when sea level stood higher and climate was more equable than today. These deposits are both economically important and scientifically puzzling. We recommend a concerted effort to study the sedimentology and geochemistry of these deposits by drilling transects across some Cretaceous ocean basins (North and South Atlantic, equatorial Pacific) and by studying small-scale, modern analogs such as zones of upwelling off Peru, southwest Africa or southern Arabia.

8. Global Mass Balancing of Sediments - Mass balancing implies a global view of sedimentation and depends largely on ocean drilling for basic information on volumes and composition of sediments. Standardized analyses and continuously updated data banks can greatly improve the effect of ocean drilling in this field. Drilling also provides the only opportunity to obtain crucial information on specific areas that acted at certain times as local sinks of materials and had a disproportionately large effect on global mass balance. Examples include giant evaporite deposits in the South Atlantic, the Gulf of Mexico, and the Mediterranean.

Other Important Problems - A number of other problems are of general significance and depend largely on ocean drilling for their solution. These include the sedimentary record of abyssal circulation and its history in the Mesozoic and Cenozoic; the anatomy of gravity-displaced sediments, including both large-scale slumps on continental slopes and submarine fans; glacio-marine sediments as monitors of the waxing and waning of polar ice; carbonate platforms as indicators of changes in sea level, vertical tectonics, and surface conditions in the oceans; the sedimentary signature of specific tectonic domains, such as trenches, continental rises, and backarc basins; marine hydrology, i.e., the movement of pore water fluids and the resulting alteration of slowly compacting sediments, both on continental margins and under hydrothermal conditions over oceanic crust.

D.4. Causes of Long-term Changes in the Atmosphere, Oceans, Cryosphere, Biosphere, and Magnetic Field

Introduction - There now exists an important opportunity to conduct an integrated study centered on the history of circulation of the ocean. Our present knowledge of ocean circulation and its important role in the climate system derives primarily from studies of the modern ocean and its interaction with the atmosphere. Studies of the Pleistocene ocean have added to our knowledge, but we have little understanding of ocean circulation in the more distant past. Insights into the sensitivity of the earth's climate to different oceanic circulatory states can be derived either from modeling these states or studying deep-sea sediments that give us past measures of specific characteristics of these states. Yet models ultimately need evidence from the geologic record to be substantiated.

Since the evolution of marine organisms took place within the changing circulatory regime of the ocean, insight into the evolutionary process can best be gained by studying evolutionary change concomitantly with studies of past oceanographic change.

We are now in a position to launch a global study of past ocean circulation and the simultaneous evolution of ocean biota for three reasons: 1) detailed studies of Pleistocene deep-sea sediment have provided the analytical techniques needed; 2) deep-ocean sediment sampling programs (both piston coring and drilling) have provided a knowledge of the global characteristics of deep-sea sediments so that the best sampling sites for such a project can be carefully selected; 3) the development of the hydraulic piston core has provided a means of acquiring sequences of undisturbed sediments from deep below the sea floor (200 meters).

We envisage an experimental design for a study of the circulation history of the ocean of the following form. A sampling program (after careful analysis of existing data and site survey information) would be designed to produce a global array of horizontal and vertical transects of the world ocean. The vertical component would be achieved by sampling different depths in the oceans such as the flanks of oceanic ridges or continental slopes. Sufficient sites would be needed to monitor major water masses and boundaries of important water masses. This set of cores then would become a global monitoring system for studying the changing patterns of ocean circulation, biotic evolution, and behavior of the earth's magnetic field. The core array would allow monitoring of specific aspects of the hydrosphere, biosphere, and magnetosphere including the following.

9. Ocean Circulation History - How has ocean circulation responded to changing boundary conditions through time, such as changes in ocean size, alterations of important oceanic passageways (e.g. the Tethys Seaway), changing climatic conditions, and changes in the wind driven circulation? What was the structure and circulation pattern of the ocean when there was no permanent ice, and what was the relative importance of evaporation and cooling in the formation of deep water during these ice-free times?

10. Response of the Atmosphere and Oceans to Variations of the Planetary Orbits - The changing geometry of the earth's orbit around the sun appears to have controlled the timing of major Pleistocene climatic changes. Since these orbital changes are caused by gravitational interactions between the earth and the other planets, primarily Jupiter, they should extend into the distant past. The response of the earth's climate system to these changes, however, is dependent upon the configuration of the boundary conditions of the system at any given time. In order to learn more about the sensitivity of our climate to changes in these boundary conditions, we can measure the ocean response to orbital variations when the earth had no permanent ice, extensive shallow seas, and ocean basins of different size and shape. These measurements will be critical to those attempting to understand how our climate system works and to predict future climate.

11. Patterns of Evolution of Microorganisms - Deep-sea sediments provide the best geologic medium for studying evolutionary change. Such studies will be far more reliable if they are coupled with paleoceanographic studies. The global array of cores will allow the mapping of morphologic change in space and time, and the paleoceanographic studies will provide an opportunity to differentiate between morphologic change induced by changing ecologic conditions and morphologic change due to changing genetic structure. The rate of evolutionary change can be measured and the rate at which these changes are dispersed through the ocean by migration can be accurately mapped.

12. History of the Earth's Magnetic Field - It has been hypothesized that the main dipole field component of the earth's magnetic field breaks down during the reversal process, although very little information is available on the details of these transitions. In order to test the nature of the earth's field during reversals, it is necessary to recover high-sedimentation rate cores that are azimuthally oriented from both hemispheres and all oceans. If the quadrupole or octupole field

components dominate during these transition intervals, the records from widely separated sites will be markedly different.

Although the obvious reversal sequences have been documented by studies of deep-sea cores and sequences of magnetic anomalies, there have been many reports, often poorly substantiated, of occasions during which the earth's magnetic field either reversed very briefly or went through a large intensity fluctuation and then emerged in the same orientation. The nature of the earth's magnetic field and the reversal process has been approached with statistical calculations that predict the frequency of occurrence of reversals. Testing such analyses is not possible until the nature of the short events is resolved because inserting even a few short period polarity events into a presently accepted reversal time scale would completely alter the frequency spectrum of that time series. The set of cores necessary for the study of the reversal process is also necessary here because the possibility exists that the short events are non-dipole phenomena. In addition, if care is taken to locate some of these cores downwind from sites of Tertiary and Cretaceous volcanism, it should be possible to establish a direct correlation of radiometric and reversal time scales by dating volcanic ash layers in the midst of the reversal sequences.

D.5. Tools, Techniques, and Associated Studies

Drilling Technology - There must be a continuing effort to improve our capability to drill deeper into both sediments and rock and to recover a greater percentage of the rock cores while maintaining or improving the quality of the condition of the sample retrieved. This may require a broader application of conventional techniques such as the use of mud, casing, and, in hard fractured rock, grouting, and a commitment to advancing the technology. Better heave compensation coupled with downhole sensors could greatly enhance penetration and core recovery by maintaining closer control on bit dynamics of facilitating the use of downhole motors or turbodrills that are sensitive to bit pressure. Coring devices that extend into the sediment ahead of the bit may be modified to cut cores from hard rock.

Currently there is no capability to drill directly into basalts on the sea floor without a sediment cover to stabilize the bit. A system that would enable drilling in areas without sediment cover is feasible and will greatly extend the value of deep-ocean drilling by providing the first opportunity for scientists to probe the system of circulation of hot water and mineral deposition actively taking place.

Logging and Downhole Experiments - A detailed report has been prepared on the use of logging in the deep oceans to enhance the scientific return from a drilled hole. Newly developed techniques will provide for the long-term emplacement of instruments in a hole abandoned by the drill ship by using conventional oceanographic vessels or perhaps even by deep submersibles.

Geophysical and Geological Studies - The COSOD scientific working groups have designed programs that emphasize the solving of geologic problems rather than continuing the quest for reconnaissance information. This new direction requires, more than ever, extensive regional and site-specific surveying and study prior to drilling. Such activities require long lead times and better long-term planning, both for the surveys and the drilling. Long-term planning requires a commitment by funding organizations to a continuing program of drilling beyond the relatively short funding period.

Many new instruments designed for surveys of large and small scale have been developed recently and undoubtedly more will be forthcoming. Scanning sonars, real-time swath mapping of sea-floor features, cameras capable of photographing large areas of the sea floor, sea-floor seismic systems, and submersibles are all available for deployment where required.

* * * * * * * *

SCIENCE OPERATOR: TEXAS A&M UNIVERSITY

The operating institution for the Ocean Drilling Program is Texas A&M University (TAMU), located at College Station, Texas. Its structure is shown in Figure 5.

TAMU's ultimate responsibility as science operator of the Ocean Drilling Program is to collect cores from beneath the floors of the world's oceans and to assure that adequate scientific facilities are available for the analysis and preservation of these samples. In order to properly discharge this major responsibility, TAMU, under the scientific guidance from the JOIDES community, was responsible for the lease-procurement and conversion of a dynamically-positioned drillship with riser capabilities as well as for the outfitting of the drillship (now named JOIDES RESOLUTION) with scientific and drilling equipment and the onboard laboratories for scientific ocean drilling (see section on JOIDES RESOLUTION). In addition to these initial tasks, TAMU's ongoing responsibilities include:

1. Developing an operations plan and drilling schedule based on the scientific directions from JOIDES which includes, amongst other activities, ensuring equipment availability, defining operational limitations, providing an adequate supply of consumables (beacons, drillbits, etc.), assessing safety and operations procedures prior to drilling, and ensuring the organized transportation of personnel and supplies between cruises.

2. Staffing the ship with scientific and technical support personnel. These personnel include: (a) the shipboard scientific staff; typically up to 25 in number that represent a team of specialists in the various fields of geosciences (e.g. paleontology, petrology, sedimentology, geophysics, etc.) and are drawn primarily from universities, government, and industry in JOIDES member countries; and (b) a highly technical support crew, also up to 25 in number, who are TAMU/ODP employees. These include electronic and mari[ne] technicians, curatorial representa[-]tives, computer experts, and an experienced drilling superintendent who oversees the drilling operations and acts as a liaison between the drilling and scientific activities.

3. Maintaining and supporting shipboard laboratories that are adequate to meet the needs of the shipboard scientific staff. The present laboratories have been fully equipped with state-of-the-art research equipment and computer facilities. (The capabilities of the ship and its laboratories are described elsewhere in this issue.)

4. Storing, archiving, and disseminating core and other scientific data collected during the course of the program. TAMU is curator of all cores obtained in the Ocean Drilling Program. It will maintain the repositories presently on the east and west coasts and build a third at TAMU, the "Gulf Coast" repository, with state-of-the-art scientific laboratories and computer facilities (see sections on Core Repositories and Sample Distribution Policy).

5. Publication of an authoritative series of reference books which will summarize the objectives and results of each cruise: the Proceedings of the Ocean Drilling Program. These volumes will be issued in two parts, Part A detailing shipboard results and Part B describing shore-based results and synthesis papers. The reports will include pre-drilling geological/geophysical site surveys, objectives, planning documentation, core records, descriptions of physical and geochemical measurements, logging data, core photographs, paleontology and petrological reports and syntheses. TAMU issues pre-cruise scientific prospectuses based upon the results of JOIDES panel deliberations on site priorities about two to three months prior to sailing date. Post-cruise contributions reporting shipboard results (mainly the Geotimes and Nature articles, and Preliminary Reports) are also issued from TAMU. In addi-

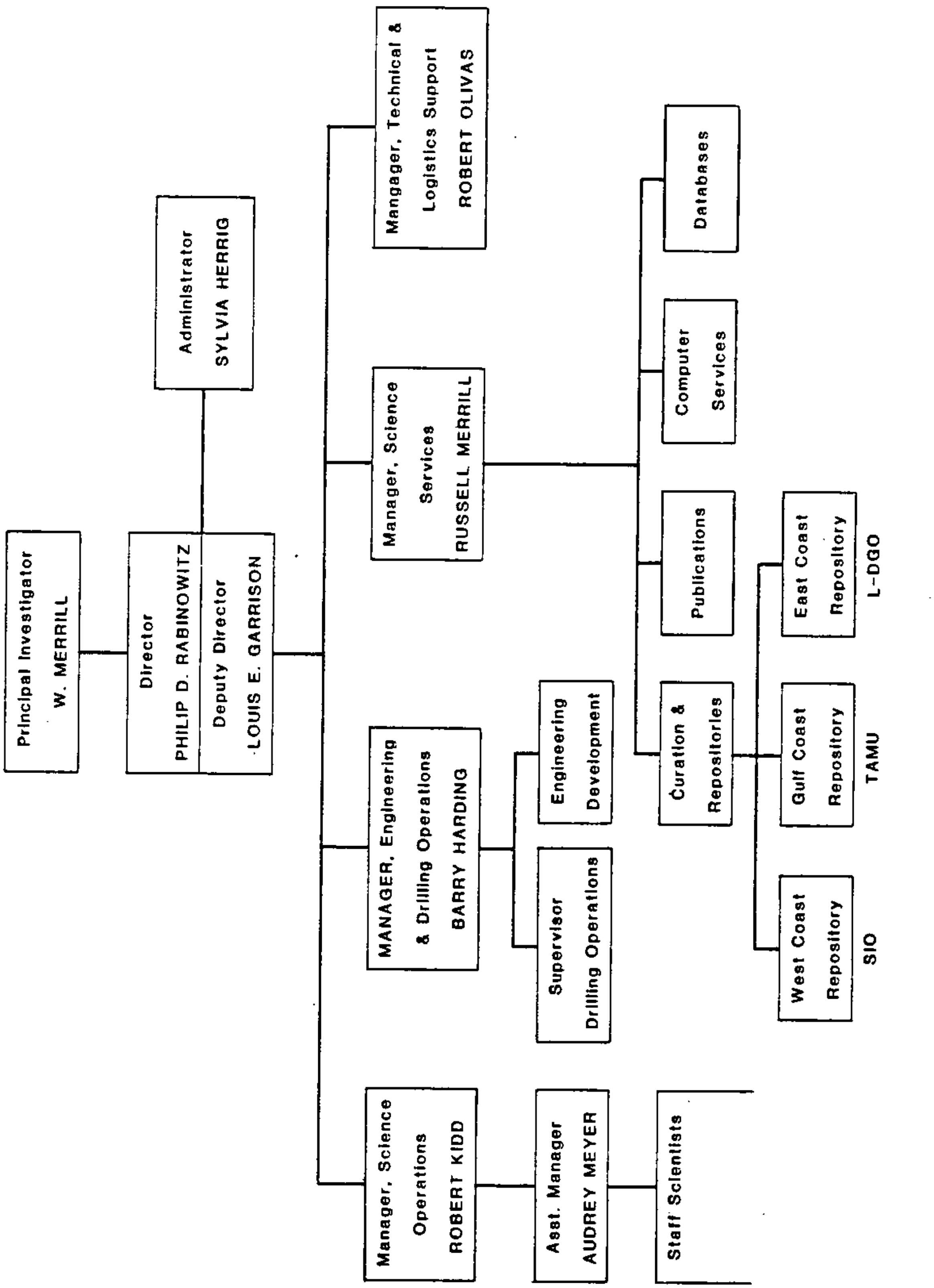

Figure 5: Management structure of the Science Operator

TAMU provides public information such as press releases, informational brochures, films, shipboard tours, and speaking engagements presented by the scientific and technical staff (see section on Publications Policy).

6. Improvement of existing drilling and downhole techniques and development of new ones which are required by the scientific objectives of the JOIDES scientific community at large. Presently these tasks include the development of bare rock drilling; improvements in core recovery, quality, and orientation; research on the operating limits of long drill strings; and application of slim line through-drillpipe mud motor technology to ocean drilling.

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JOIDES RESOLUTION: Facilities and Shipboard Capabilities

1. The Drillship

This section of the Special Issue briefly describes the facilities and capabilities of the main tool of the Ocean Drilling Program - the drillship and its scientific laboratories and equipment.

JOIDES RESOLUTION (officially registered as the SEDCO/BP 471) was originally built as a joint venture between SEDCO and BP. It was designed by Earl and Wright and built in Halifax, Nova Scotia in 1978 by Hawker Siddeley (Canada) Ltd. The ship is 470 ft. (143 m) long, 70 ft. (21 m) wide, and has a displacement of 16,596 long tons. The derrick is 202 ft. (61.5 m) above the water line. JOIDES RESOLUTION was contracted by the Science Operator in March 1984 from a SEDCO subsidiary, Underseas Drilling Inc. The contract is for 5 years with options to continue for an additional 10 years.

JOIDES RESOLUTION is capable of deploying 30,000 ft. (9150 m) of drill string and of conducting drilling operations in water depths up to 27,000 ft. (8235 m) utilizing a computer controlled dynamic positioning system. The primary advantages of the new drillship compared to GLOMAR CHALLENGER of DSDP include increased available power in terms of transit speed and maneuvering capability, more stability, drilling depth capabilities, and new drilling systems and space for berthing, laboratories, and storage.

Drilling Capabilities - Efficiency in the drilling operation results from several factors. A state-of-the-art 400-ton in-line heave compensator provides dependable weight compensation for coring operations and downhole experiments which increases bit life and streamlines drilling operations. The new electric top drive features higher rotary speed range and increased torque, compared with GLOMAR CHALLENGER. The ability to optimize RPM increases bit life and penetration rate. With greater penetration per bit, the number of time-consuming re-entries is reduced. Pipe-handling safety and efficiency is upgraded through the use of an "iron roughneck," which eliminates the use of the cumbersome suspended tongs from most phases of the operation. This makes pipe connections both faster and safer.

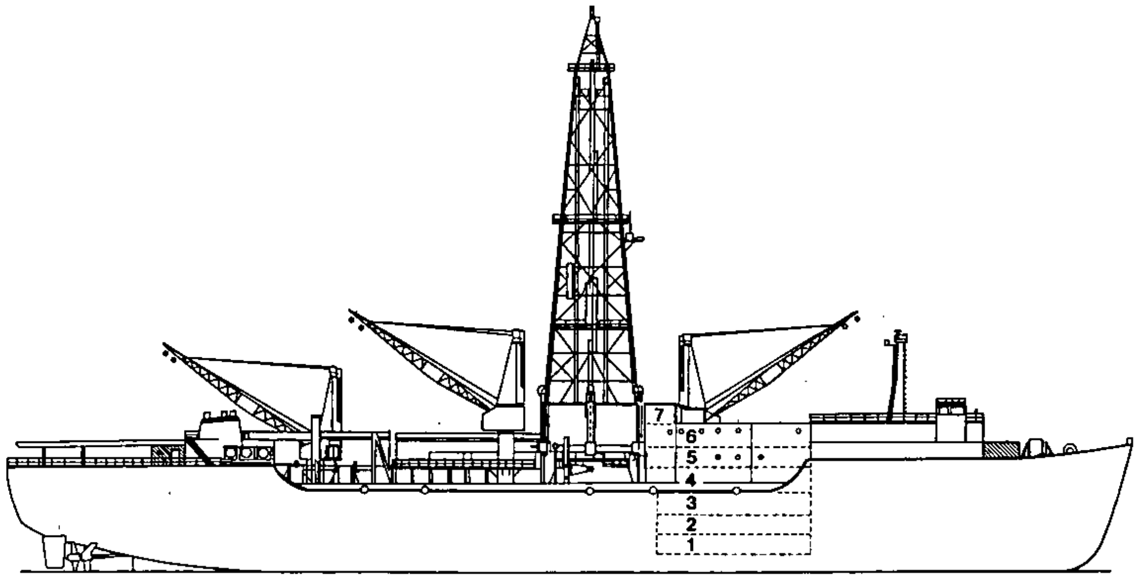
There is an unobstructed 22 ft. (7 m) diameter moonpool on RESOLUTION and a redesigned re-entry cone makes it possible to deploy cones through the moonpool. A new electric-hydraulic logging winch provides effieicnt, quiet and almost maintenance-free performance and has a 31,000 ft. (9450 m) cable.

In the future, the ship can be converted to deploy a marine riser for continental margin drilling where a circulating mud system is required.

Dynamic Positioning - The ship's dynamic positioning system has undergone major modification to include capability for long-base line and short-base line systems, as well as the original ultra-short base line system. This system, which performed remarkably well in hostile sea conditions enables the ship to maintain a fixed position in relation to the hole being drilled in the sea bottom.

Navigation - RESOLUTION is equipped with all the basic systems (including SATNAV and LORAN C). The Global Positioning System (GPS) is a significant improvement to RESOLUTION's navigational capabilities. It provides more precise satellite positioning data and aids greatly in locating drillsites with small margins of error.

Communications - A state-of-the-art satellite communications system offers direct telephone, TELEX, facsimile, direct data transmission and electronic mail capabilities from most operating areas to ODP headquarters in College Station without regard to atmospheric conditions and communications "windows." Continuous wave and limited single-side



Deck 6
- Core Receiving
- Physical Properties Lab
- Paleomagnetics Lab
- Core Splitting
- Core Description and Sampling
- Photo Station

Deck 5
- Paleontology Lab
- Paleo Prep Lab
- Scanning Electron Microscope Lab
- Chemistry Lab
- Thin Section Lab
- Petrology Lab
- X-Ray Lab

Deck 4
- Computers
- Computer User Room
- Science Lounge
- Yeoperson's Office
- Co-Chief Scientists' Office

Deck 3
- Electronics Shop
- Photo Darkroom
- Photo Finish Room

Deck 2
- Refrigerated Core Storage
- Cold Storage
- Second-Look Lab

Deck 1
- Refrigerated Core Storage
- Freezer

Deck 7
- Downhole Measurements

Poop Deck
- Underway Geophysics Lab

Main Deck
- Library

Figure 6: JOIDES RESOLUTION – Ship Schematic

band capabilities are also available on RESOLUTION for operating areas outside satellite communications coverage or as a backup in the event of an equipment failure.

Cruising Range - For normal drilling operations RESOLUTION can remain at sea for about 120 days and carry more than one million gallons (U.S.) of fuel. The cruising range is dependent on underway speed and the ratio of on-site to underway time. RESOLUTION's average speed is in excess of 11 kts.

Ice/Cold Weather Operations - RESOLUTION's hull is rated ABS Ice Class 1B for "navigation in medium ice conditions." This, according to SEDCO, is the highest ice classification of any drillship currently in service. It increases the safety of transiting to and from high-latitude operating areas, but there are no plans for site operations in areas where there is an immediate threat of contact with icebergs or pack ice. The SEDCO vessel was designed and constructed for work in cold-weather localities, and most work areas are enclosed and/or warmed with a hot water heating system.

Stability - Due to its greater size and displacement, RESOLUTION is inherently more stable than GLOMAR CHALLENGER. This is born out by stability calculations and computer modeling, and results of early cruises indeed demonstrate that the newer vessel is less affected by sea/swell conditions at any given time.

Drill Pipe Storage and Handling - Drill pipe is stored on an automatic piperacker which can handle up to 30,000 ft. (9150 m) of pipe. Pipe is transported to the drill floor from three storage bays by an automated handling system.

Casing Storage - The number of linear feet of casing that can be stored on the RESOLUTION is dependent upon the diameter of the casing, other equipment being stored, and whether outside storage is used. There is, however, sufficient belowdecks storage in the riser hold to ensure that operational capabilities will not be limited by inadequate casing storage.

Auxiliary Transportation - A 70 ft. x 70 ft. helipad is installed on RESOLUTION, complete with a helicopter refueling station. This provides a one-way helicopter range in excess of 500 nautical miles which can be very important in terms of transferring equipment and personnel and in emergency medical evacuations. The vessel also has an inflatable Zodiac launch with an outboard motor. Such a boat has been found to be the safest means of transferring personnel between vessels of disp rate size. It can be used also for deploying and recovering various instruments.

Living Quarters - Living quarters on JOIDES RESOLUTION include one-person, two-person, and four-person staterooms designed to accommodate a maximum scientific and technical crew of 50 people. They are located forward of the laboratory spaces with connecting passageways to the laboratories on two levels.

2. Scientific Laboratories and Equipment

The laboratories on JOIDES RESOLUTION contain the largest and most varied array of seagoing scientific research equipment in the world (Figure 6). This modern drillship has more than 12,000 square feet of laboratory space, divided into twelve major analytical areas. Each laboratory on RESOLUTION is designed to include state-of-the-art instrumentation. The selection of this laboratory equipment was made based on advice from the JOIDES Advisory Group on Equipment and Laboratories (JAGEL) Committee.

Underway Geophysics Laboratory - The Underway Geophysics Laboratory is located on the poop deck (Figure 7) immediately forward of the fantail area and is where the collection, processing, and display of a variety of geophysical data is undertaken. Single-channel seismic data are collected and processed principally from two 80 cu. in. and one 400 cu. in. waterguns. For bathymetric data, both 3.5 KHz and 12 KHz pre-

UNDERWAY GEOPHYSICS LAB

1. SUPPLY FAN
2. PRO-350 & MASSCOMP COMPUTERS
3. SEISMIC EQUIPMENT RACKS
4. SONOBUOY & MAGNETOMETER EQUIPMENT RACKS
5. VERSATEC PLOTTER
6. SCIENTIST'S WORK TABLE
7. WORK BENCH
8. 3.5 KHZ P.D.R.
9. 12.0 KHZ P.D.R.
10. FLATBED RECORDER

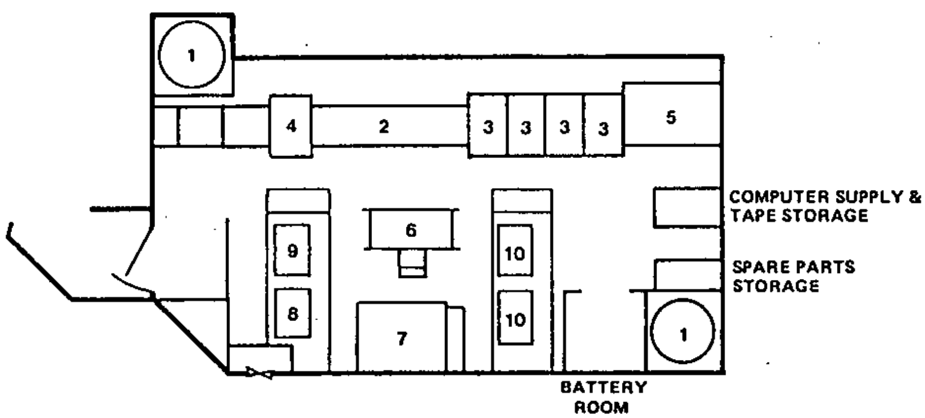


Figure 7: JOIDES RESOLUTION – Poop Deck

cision depth recorder systems are onboard. Magnetic data from a proton precession magnetometer are recorded on the header of the seismic tapes. Navigation data are collected on the bridge by a Magnavox MX702A. Computing for underway geophysics is independent from the main ship's computer and is based on a super-micro 561 Masscomp computer.

Sedimentology Laboratory - (See Figure 8.) The core laboratory on the bridge deck is divided into areas known as the core entry laboratory, core splitting room, sampling area, and the sedimentology laboratory. Core splitting is physically isolated from the remainder of the laboratory. After physical properties using GRAPE (Gamma Ray Attenuation and Porosity Evaluator) and whole core palaeomagnetics have been measured, the cores are split and then are taken to the sedimentology laboratory for core description (including photography) and sampling. Equipment onboard includes a range of microscopes, core sampling equipment, the GRAPE device for scanning cores vertically, and physical properties equipment (including a pycnometer for bulk and dry density, porosity and water content; transducer configurations for shear and compressional wave velocity analyses; motorized varve equipment for shear strength measurements; a consolidation/triaxial testing for analyses of sediment stress history, strength, mechanical properties and permeability; and thermal conductivity equipment designed at WHOI). The palaeomagnetics section has a 3-axis, pass-through cryogenic magnetometer for either whole core scan or discrete samples. There is also a spinner magnetometer available.

Chemistry Laboratory - The chemistry laboratory is situated on the fo'c'sle deck (see Figure 9). Equipment onboard includes two gas chromatographs, one dedicated to hydrocarbon monitoring for natural gas analysis and one with a capillary column for gas stripping. There is a fluorometer and ultraviolet ray box in the core laboratory for qualitative analysis of hydrocarbon shows. Organic carbon can be determined using either a Rock-Eval device for whole rock pyrolysis or an elemental analyzer for measuring amounts of organic carbon, hydrogen, nitrogen, and sulphur.

In addition to the routine carbonate bomb, there is a photometric analyser which provides measurements of carbonate constituents in sediments. Interstitial water dissolved ion determinations are carried out with an ion chromatograph. An automatic titration system for alkalinity and a temperature-compensated refractometer for salinity measurements are run routinely.

Other equipment available includes hydraulic presses, balances, freeze driers, grinders, and equipment and material to be found in a well-equipped, state-of-the-art shore-based laboratory.

Petrology and Thin Section Laboratories - These have been equipped to provide thin sections by traditional methods as well as automated machines for large quantity output. A total of eight microscopes are available for thin section and rock sample study including polarizing petrographic microscopes, microscopes with reflected light, photographic and video capabilities and standard photomicroscopes. The laboratory forms part of the fo'c'sle deck laboratory complex (Figure 9).

X-ray Fluorescence/X-ray Diffraction Laboratory - This is also situated in the fo'c'sle deck (Figure 9) and is the most advanced laboratory of its type on any ocean research vessel. The X-ray fluorescence spectrometer for determination of major and trace element composition of sediments and rock samples is fully microprocessor controlled with automatic sample loading. For X-ray diffraction there is a parallel system also fully automatic and microprocessor controlled to determine the mineral composition of 32 samples in one set.

Palaeontology Laboratory - This laboratory completes the fo'c'sle complex (Figure 9). It is subdivided into smaller spaces for sample preparation and microscope study. Standard preparatory equipment is avail-

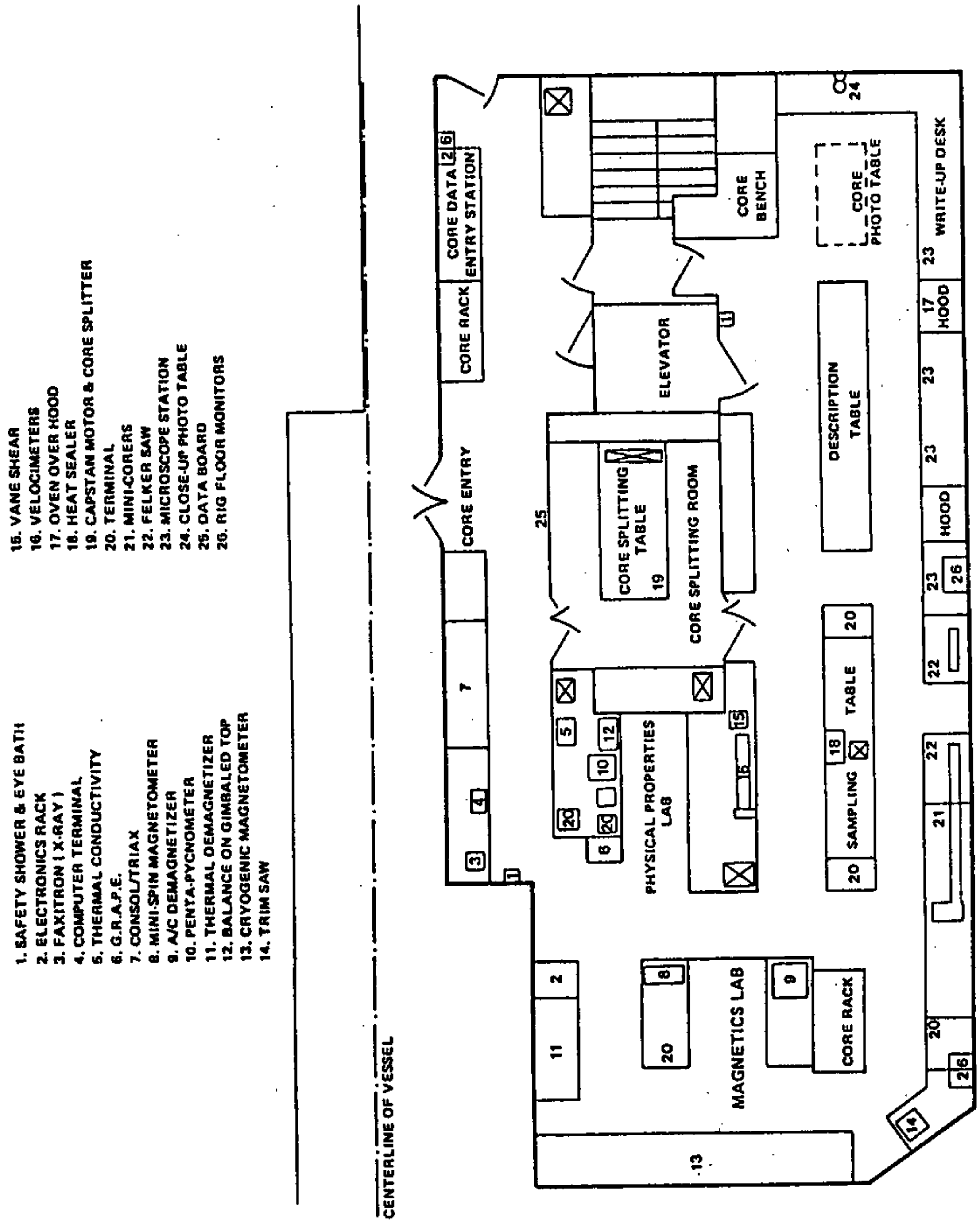


Figure 8: JOIDES RESOLUTION – Bridge Deck

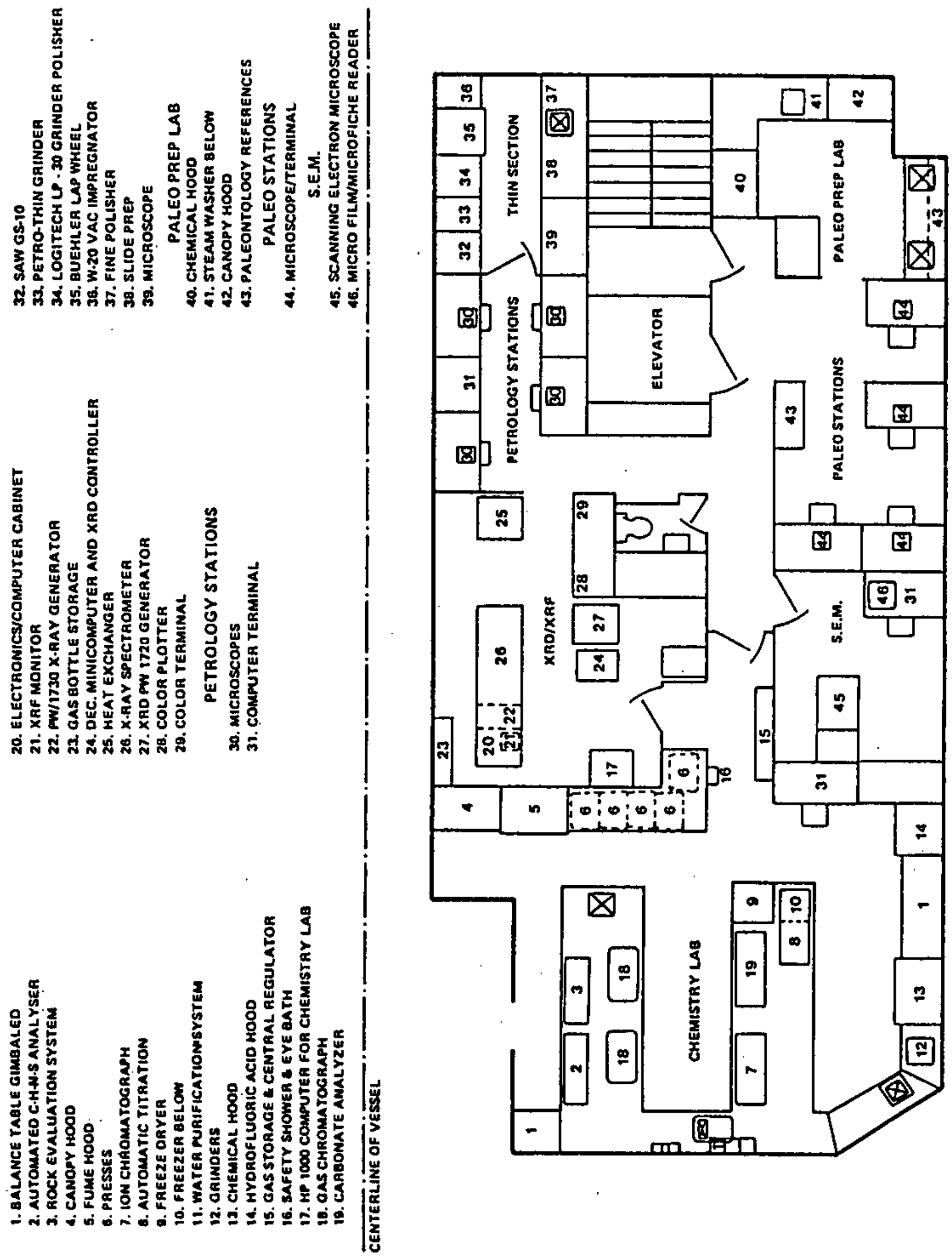


Figure 9: JOIDES RESOLUTION – Fo'c'sle Deck

able as are the microscopes with a full range of objectives. As with the petrographical microscopes, there are facilities for photography and video display. Adjacent to these laboratories is the scanning electron microscope room with an instrument chosen specifically to withstand the rigors of shipboard operation.

Photographic Laboratory - An advanced photographic facility has been installed on the upper 'tween deck (see Figure 6). The laboratory is fully equipped with a large variety of photographic equipment.

Downhole Instrumentation Laboratory- This laboratory is located above the bridge deck and houses equipment for logging tasks (Figure 6). It is divided into a wet laboratory for tool storage, cleaning and repair, and ancillary equipment. The dry section contains electronic equipment and a Masscomp data acquisition system.

3. Computing and Information Services

The shipboard science library is located forward on the main deck (Figure 6) and contains several hundred publications for reference and assistance in shipboard analysis.

The shipboard computer (with a terminals room) is situated on the main deck, adjacent to the Science Lounge. The host system is a VAX 11/50 with 4 meg RAM memory. The system can access databases at TAMU and elsewhere using the ship's satellite communications system. A series of 44 workstations are linked to the host computer and are located in the laboratories and elsewhere around the ship. A variety of printers and plotters are available together with a range of software.

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Further details concerning the drillship, its facilities and capabilities may be found in the following publications:

1) Onboard JOIDES RESOLUTION
2) Operational and laboratory capabilities of JOIDES RESOLUTION, ODP Technical Note No. 2, June 1985.
3) Shipboard Scientists Handbook, ODP Technical Note No. 3, September 1985.

All are obtainable from the Ocean Drilling Program, Texas A&M University, College Station, TX 77843, U.S.A. (Telephone: Mrs. Byrne 409-845-6735).

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Core Repositories

Cores collected from the Atlantic and Antarctic Oceans and the Mediterranean and Black Seas (DSDP Legs 1-4, 10-15, 28, 29, 35-53, 71-82, and 93-96) are housed at the East Coast Repository at the Lamont-Doherty Geological Observatory. Cores collected from the Pacific and Indian Oceans and the Red Sea (DSDP Legs 5-9, 16-27, 30-34, 54-70, and 83-92) are housed at the West Coast Repository at the University of California, San Diego.

Interstitial water samples, gas samples, as well as frozen whole round samples (archived specifically for organic geochemical analyses) from all DSDP Legs are stored at the West Coast Repository.

The Gulf Coast Repository is under construction (at Texas A&M University) and will be ready to receive materials in late 1986. Cores collected by the Ocean Drilling Program from the Pacific and Indian Oceans and the Red Sea will be housed at the Gulf Coast Repository. Interstitial water, gas and frozen organic geochemistry samples collected by ODP will be stored at the Gulf Coast Repository.

Thin sections and smear slides from each leg are archived with the cores at the appropriate Repository. Photographs of all cores, microfilm of prime data, as well as copies of the resulting publications are kept at each repository.

Investigators are welcome to visit the Repositories in order to examine the cores and to select sample intervals when that is required for their research. Advance appointments are required due to limited work areas and personnel. Occasionally, the space may be fully booked several months in advance, so visits should be scheduled well ahead in order to avoid disappointment.

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WIRELINE LOGGING SERVICES: L-DGO

Lamont-Doherty Geological Observatory (L-DGO) is contracted to supply a full suite of geophysical and geochemical services which involve the acquisition, processing, and presentation in usable scientific form to JOIDES scientists of in situ logging measurements. L-DGO is charged to provide state-of-the-art "oil industry" logging customized to the scientific needs of JOIDES scientists, plus certain specialty logs which, though not generally available, are of particular usefulness to scientific logging. It also provides interpretation and dissemination services so that JOIDES scientists can use these logs to help solve their particular scientific problems.

To direct L-DGO in these duties, the JOIDES Planning Committee has designated the Downhole Measurements Panel to plan long-term tool and services development, to assist in the identification of new technology, to assist in recruiting scientific logging scientists to participate in each ODP leg, and to coordinate and integrate the L-DGO logging services with other downhole measurements programs planned for ODP legs.

STRUCTURE OF THE LOGGING SERVICE

The Borehole Research Group at Lamont-Doherty has the management structure shown in Figure 10.

The Logging Services for ODP consist of three major components. First, L-DGO has subcontracted for basic oil-field type services from Schlumberger Offshore Services. Schlumberger, the industry leader, supplies L-DGO with their state-of-the-art commercial logging services on every leg of the ODP. Second, Mark Zoback, at Stanford University and the U.S. Geological Survey at Menlo Park, is a subcontractor for the adaptation of specialty logging services which are not available through Schlumberger. At the present time borehole imaging and 12 channel sonic logging are available to ODP scientists from Lamont-Doherty Borehole Research Group personnel. Each year, it is hoped to bring on-line a new specialty tool to add to the scientific logging capability aboard the ship. For the duration of the Program, additional tools will be developed and tested at L-DGO through the production of prototypes which will be field tested in U.S.G.S.-supplied land holes, on one ODP cruise, and then added to the list of routine logging operations. The development of the following tools is anticipated in future years: a wireline packer porewater sampling and permeability device, a dipmeter, special temperature probes, a magnetic gradiometer and a neutron activation log for geochemical analyses. Third, a log analysis center at Lamont-Doherty has computer processing, log analysis and interpretation services ready for the ODP scientist's use after leaving the ship. This center is designed to provide the JOIDES scientist with the interpretative skills to solve his geological problems with the assistance of these sophisticated in situ measurements from beneath the ocean floor.

To carry out this program at sea, there are three logging personnel on each ODP leg: a logging scientist from the JOIDES scientific community; a Schlumberger field engineer to operate their tools, and a L-DGO logging staff representative to assist the co-chiefs and logging scientist in the design, implementation and subsequent interpretation of the logging program on each leg. The logging scientist is appointed by Texas A&M with the advice of L-DGO and the Downhole Measurements Panel.

LOGGING OPERATIONS

There are two major divisions to the logging program: acquisition and processing. There are three major lowerings of Schlumberger tools required on every ODP hole deeper than 400m: nuclear, sonic and electrical. In addition, a bore-

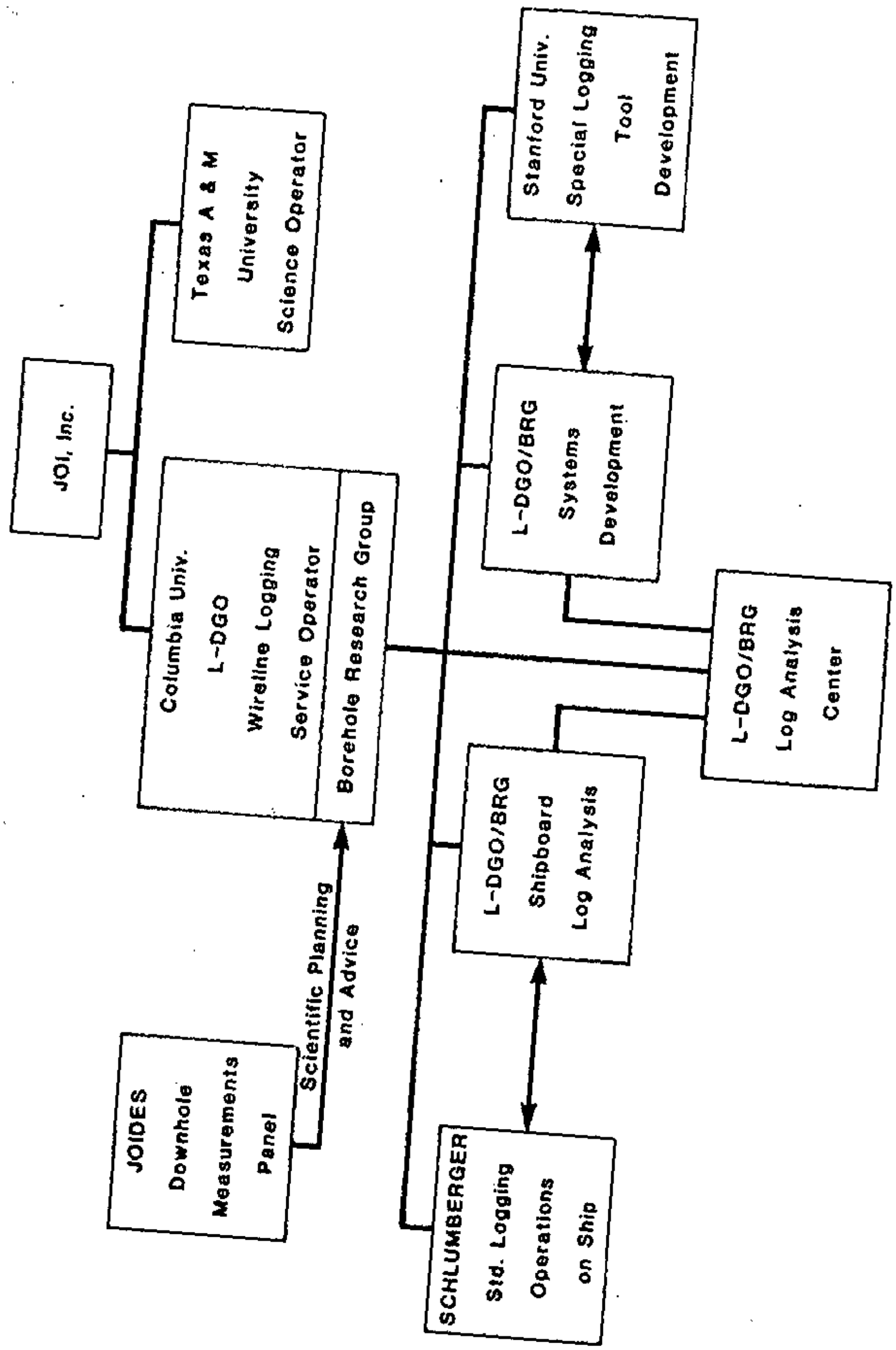


Figure 10: Management structure of the Borehole Research Group, L-DGO

hole televiewer is available for imaging the wellbore wall, a 12 channel sonic logging tool provides accurate velocity and elastic property measurements as well as sonic waveforms for sophisticated spectral analysis of energy propagation near the wellbore, and a Vertical Seismic Profile experiment of VSP which can be run in the hole to record reflectors from below the total depth of the well and for synthetic seismogram matching to surface multi-channel seismic profiles. Temperature and flow-rate tools are also available, as is a passive mode water sampler.

In terms of data processing, programs are or will be available both on the ship and later at the log analysis center which assist the ODP scientist in the interpretation of the integrated logging results. Clay analysis, lithology identification, fracture and porosity delineation, and elemental composition programs give precise geophysical and geochemical readings from the formation. For example, percentages of potassium, uranium, thorium, clay, calcite, quartz, sandstone, limestone, shale, anhydrite, basalt, gabbro, serpentinite, granite and dolomite can be determined from various combinations of logging results. L-DGO is experimenting with a Schlumberger Gamma Ray Spectroscopy (GST) tool which measures calcium, oxygen, carbon, iron, chlorine, hydrogen, and sulphur content, as well.

SCHLUMBERGER LOGS

The following logs are run on RESOLUTION by the Schlumberger engineer. They are combined into three logging runs.

RUN I

A. Natural Gamma Ray Spectrometry Tool (NGT)

The NGT is an extension of the standard natural gamma ray log. It detects natural gamma ray radiation in five narrow energy bands, permitting quantitative estimates of the concentrations of potassium, uranium and thorium, and thus of radioactive heat production. Also, the thorium/potassium ratio can be used to indicate the presence of different types of clays such as illite and kaolinite, and the uranium/thorium ratio gives qualitative information about the oxidation state of the formation.

B. Lithodensity Tool (LDT)

The primary purpose of the LDT is to provide a measure of formation bulk density. It can also be combined with the NGT to provide detailed clay analyses, and is useful in combination with the CNT for porosity calculation and shaliness evaluation.

A two-arm caliper is integral with the LDT tool; it provides the hole size information required to correct the density readings affected by bad hole conditions.

C. Compensated Neutron Tool (CNT)

The CNT provides a measure of porosity which can be improved by cross-correlation with the lithodensity tool. Epithermal as well as thermal neutron energy recordings allow for precise identification of bound versus free water contents. The full suite of logs (LDT, CNT, and NGT or GR) provides porosity, formation density, and clay content or shaliness. Processing techniques can be employed to improve these estimates and the log values can be corrected, if necessary, using physical property measurements made on core from selected intervals.

RUN II

A. Long Spacing Sonic Tool (LSS)

The LSS tool calculates compressional velocities by dividing the distance between two receivers by the difference in arrival-time of a refracted compressional wave traveling along the wellbore. This information can be used in combination with other logs to estimate formation porosity. Sonic velocity can also be combined with density measurements to produce an impedance log to be used as input to a synthetic seismic profiling scheme.

Full waveforms are also recorded by the Schlumberger tool. More reliable compressional and shear velocities are calculated back in the lab from the full waveforms. The velocity ratio is often used to estimate crack aspect ratio within the formation, if matrix properties are known. Spectral analysis leads to determination of energy loss mechanisms in the formation (attenuation).

B. Dual Induction Log (DIL)

The Dual Induction Tool records two resistivity curves with different depth of investigation, ILD and ILM, which read in the virgin and flushed zone respectively, and the Spontaneous Potential. The sonde also includes a focused device, the Spherically Focused Log (SFL) which provides a better vertical resolution, about 30", in the invaded zone. In cases of deep invasion the tool reading close to the borehole (ILM) can be used to correct the deeper measurement, thus providing the true formation resistivity. Since both the ILD and ILM devices are designed for readings in boreholes filled with fresh muds, their response can be greatly affected whenever seawater is used as drilling fluid. The SFL replaces the ILD in resistive (greater than 100 ohm per m) formations.

C. Spontaneous Potential (SP)

The SP measures the potential difference between a downhole electrode and a surface reference. The SP works best in holes filled with conductive fluid and wherever there is a large resistivity contrast between formation and wellbore fluids. Essentially it is used to discriminate between shaly and clean zones. The SP is never run alone but is integral with the DIL.

B. Natural Gamma Ray (GR)

The GR is a measure of natural gamma radiation which is highest in shale or clay and in altered zones or fractures where radioactive elements may be concentrated. A more detailed measurement of natural radioactivity is provided by the natural gamma ray spectrometry tool described above.

C. Caliper (MCD)

Measures wellbore size as a function of depth. Most tools record some measure of hole size in addition to their primary measurement. Measurements of hole size are often required to correct logs whose response is affected by hole conditions.

RUN III

A. Gamma Ray Spectrometry Tool (GST)

The GST measures the relative yields of gamma rays resulting from interactions of fast neutrons emitted by a source on the tool with the different elements present in the formation. The measurements are based on a Weighted Least-Square fit of the gamma ray spectral distribution. By operating in a neutron capture timing mode it is possible to identify up to six elements (Ca, Cl, Fe, H, S, and Si) and their proportions can be calculated.

Additional Schlumberger tools are available, but require additional runs. Also, considerable lead time is necessary to procure the tools for use on the drillship.

A. Well Seismic Tool (WST)

The WST is a wellbore clamped single-component geophone used to record vertical seismic profiles in a borehole. It provides a measure of formation velocity at seismic frequencies by measuring the traveltime between a surface seismic shot and the wellbore geophone. The origin of reflected energy can be determined by following upgoing energy downward to the reflecting horizon. Estimates of depths to reflectors below the total depth can be made with this experiment. This data is useful in depth correlating reflectors on nearby seismic lines.

B. High Resolution Temperature (HRT)

The Schlumberger temperature tool is accurate to within 2 degrees C. Therefore, precise measurements should be made using some other device. However, the tool is useful in determining hole condition, prior to running more sensitive instruments. Precise temperature logs can detect fluid motion in the wellbore and are also useful in determining geothermal gradients and heat flow.

C. Pore Fluid Sampler (PFS)

A single 1500 ml sample of fluid within the annulus can be taken with each lowering of this crude sampling device.

SPECIALITY LOGS

These logs are run by the L-DGO Logging Staff representative.

A. Borehole Televiewer (BHTV)

Borehole acoustic televiewers are employed to detect and evaluate fractures and bedding intersecting the borehole wall. An acoustic beam scans horizontally around the circumference of the borehole wall as the tool is moved vertically. Televiewers are very sensitive and can outline quite small features such as fractures, vugs or other large size porosity and bedding planes. The dip and orientation of fractures or bedding planes in the formation can frequently be determined. Measurement of the travel-time of the reflected pulse yields a 360 degree caliper log which can be used to detect spalled zones in the wellbore related to horizontal stresses.

B. Multi-channel Sonic Log (MCS)

The complete waveform of the acoustic or sonic signal is recorded by the MCS log at each of 12 receivers spaced 15 cm apart. It permits shear wave, Stoneley and normal mode, as well as compressional wave velocity, energy and frequency content to be determined. Thus the various elastic properties of the formation can be estimated. Due to the number and spacing of the receivers, this tool yields significantly better results than the Schlumberger two-channel waveform log.

SHIPBOARD ANALYSIS

Cross-correlation of different logs, and quick data reduction to a geologically meaningful form (such as porosity and density variation, smoothing and filtering) will be provided by the Schlumberger field "quick-look" analysis program called CYBERLOOK. Expanded CYBER UNIT through the use of 1 MB memory will allow approach to the present capabilities of the Schlumberger CORIBAND and SARABAND analysis packages in the field. Estimates of percent alteration, composition and lithology, porosity, permeability, density, pore fluid and sonic velocity will all be displayed together at the end of each logging run.

The borehole televiewer data can be reduced to provide a fracture log and a log of detected structural features. Where present, breakout orientation will be used to determine the orientation of the greatest and least horizontal principal stresses.

The MCS data will be analyzed to obtain improved compressional and shear wave velocities. Estimates of amplitude and frequency content of the arrivals will be obtained which can be related to fracturing and attenuation near the wellbore.

Cross-correlation of the Schlumberger logs with borehole televiewer fracture, void and bedding information and the multi-channel sonic data will allow for identification at sea of such geological targets as over and under pressure zones, fault zones, dip changes, geophysical boundaries such as reflector horizons seen from surface multi-channel seismic profiling, etc.

SHORE-BASED LOG ANALYSIS AT THE LAMONT-DOHERTY LOG ANALYSIS CENTER

The full complement of log analyses will be run after each cruise. Also, a hands-on work station at Lamont will be available for post-cruise log analysis by inter---

ed scientists. Eventually these will be incorporated into the shipboard analysis package. As further analysis techniques are developed, these will be implemented at Lamont and eventually incorporated into the shipboard log analysis system.

These analysis programs currently consist of:

a) Dual Water - separates bound from free water in the formation.

b) Shaly Sand - lithology identification model for shales and sands.

c) Dispersed Clay - lithology identification in formations with clay confined to pore spaces.

d) Complex Lithology - carbonate and mixed lithology model.

e) Clay Typing - curves for determination of degree of alteration can be analyzed, cross plotted and integrated into an alteration content log.

Further details of the tools and procedures used may be found in the ODP Wireline Logging Manual obtainable from: Borehole Research Group, Lamont-Doherty Geological Observatory, Palisades, NY 10964 (tel: 914-359-2900).

* * * * * * *

ODP DATABANK: L-DGO

The ODP Site Survey Databank, formerly the IPOD Databank, is located at the Lamont-Doherty Geological Observatory. It has served the JOIDES community since 1975 by cataloging, collecting, and distributing site survey and other geophysical data to various panels and individuals associated with academic ocean drilling.

The Databank is currently charged with the following specific tasks:

a. Catalog and store data received from past, present, and future international site survey activities related to the Ocean Drilling Program (ODP), and make such data available for JOIDES activities.

b. Assist the Chairman of the JOIDES Site Survey Panel in the preparation and development of the Site Survey Program.

c. Provide data packages to each co-chief scientist for every drilling leg. These packages will consist of sub-bottom and bathymetry profiles gathered during site survey work, as well as any other pertinent data contributed to the Databank. Also provided will be digests, charts, reports, and folios derived from these and other data in areas in which the ODP drilling ship will operate with the prospect of drilling. The foregoing will be provided in a sufficiently timely manner to facilitate pre-drilling planning as well as decisions during drilling. In all, these data will comprise four complete sets in hard copy: two for use on the drilling ship, two for shore-based use of the science operator. As far as possible, these data sets will be of good photographic print quality, or equivalent, and fully readable.

d. Prepare packages of site survey (or any other) data for JOIDES panels and working groups to aid in the proper planning and evaluation of drilling operations. (Note: This has been interpreted to include bonafide individual proponents as well.)

e. Provide data upon request to the designated science operator (Texas A&M University) for the Ocean Drilling Project (ODP) to aid in the planning of the ODP.

A major data resource has been built up, and will continue to grow as data from mature drilling proposals are deposited with the Databank, providing a geophysical data repository akin to the core repositories.

The Databank provides the facility for post-cruise syntheses and for regional syntheses, which are encouraged by the COSOD report.

The most commonly used techniques for pre-drilling site surveying have been bathymetry, coring and dredging, magnetic field measurements, heat flow, gravity field measurements, single-channel and multichannel seismic reflection profiling, and crustal seismic refraction and wide angle reflection sonobuoy measurements. More recently, advanced surveying techniques such as SEABEAM and various side scan sonar systems have been employed during IPOD and ODP site surveys. All these geophysical methods are not appropriate for all sites and specific combinations have been chosen to get the maximum useful information for the minimum cost.

At the ODP Databank, underway geophysical data are stored digitally in NGSDC or MGD77 format, and are available either in the form of a magnetic tape or in any of various geophysical data display methods (annotation of geophysical values along ship track, profiles along ship track, etc.). In addition, seismic profiles collected during the surveys are also archived. Contour maps, heat flow charts, bottom photographs, and other forms of data presentation compiled in the course of the production of a cruise report are also often available. Single channel seismic profiles are generally available in the form of large glossy photographs; multi-channel seismics are usually presented in analog form and are reproduced by diazo processing. In most cases the Databank does not have access to the original digital tapes of seismic data. Side scan sonar data are available as glossy photographs, sometimes in mosaic form, and SEA-BEAM data are presented in the form of large sized contour maps.

In addition to site survey data collected explicitly for the drilling program, the Databank also maintains a vast amount of background underway geophysical and seismic data collected by academic institutions from all over the world. These data are a valuable supplement to the site survey data and are often included in the packages prepared for JOIDES panels and individuals during the course of Databank operations. Also, the Databank has recently acquired access to the SEASAT altimetry and SYNBAPS gridded ocean depth data sets and will soon be taking JOIDES-related requests for computer plots of these gravity and bathymetry data. The output for these data is in the form of contours, or in any of various shading schemes employing either color graphics or more conventional black and white techniques. The plots can be "illuminated" from any angle.

Any individual seeking information and/or data in support of a drilling proposal (or for post-drilling studies) is encouraged to request data from the ODP Databank. Inquiries should be addressed to the Curator, ODP Databank, Lamont-Doherty Geological Observatory, Palisades, NY 10964. The telephone number is (914) 359-2900, ext. 502.

The following tables (2-4) and figures (11-13) show the location of site surveys carried out in support of ocean drilling, and describe the data stored at the ODP Databank. Proponents are reminded that these data represent only a part of the total data base maintained at the Databank.

* * * * * * *

Table 2

IPOD and ODP Site Survey Data – North Atlantic Ocean

SITE	DATA	INSTITUTION(S)
AT-1	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, sonobuoys	UTMSI, WHOI, IPOD LINE
AT-2.0	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics	WHOI, IPOD LINE
AT-2.1	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, piston cores, ocean bottom seismometry	WHOI, IPOD LINE HIG
AT-2.2	Digital navigation, topography, magnetics, single-channel seismics, ocean bottom seismometry	WHOI, L-DGO
AT-2.3	Digital navigation, topography, magnetics, single-channel seismics, ocean bottom hydrophone	WHOI, L-DGO
AT-3	Digital navigation, topography, magnetics, single-channel and multi-channel seismics, piston cores, heat flow, bottom photographs, nephelometry, sonobuoy	L-DGO, IPOD LINE
AT-4	Digital navigation, topography, magnetics, gravity, single-channel seismics, piston cores, heat flow, bottom photographs	L-DGO, IPOD LINE, WHOI, HIG
AT-5	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, bottom photographs, piston cores, dredges, heat flow, ocean bottom seismometry, sonobuoys	HIG, IPOD LINE WHOI
AT-6	Digital navigation, topography, magnetics, gravity, single-channel seismics, piston cores, heat flow, ocean bottom seismometry, sonobuoys	WHOI, USSR
AT-7	Digital navigation, topography, magnetics, gravity, single-channel seismics, piston cores, heat flow, bottom photographs, sonobuoys	L-DGO, FRG, USSR
AT-8	Digital navigation, topography, gravity, single-channel seismics, piston cores, heat flow, bottom photographs, sonobuoys, ocean bottom seismometry	L-DGO, RSMAS, USSR
AT-9	Analog navigation, topography, magnetics, single-channel seismics, sonobuoys	US Navy, FRG
AT-11	Analog navigation, topography, magnetics, single-channel seismics, sonobuoys	US Navy, FRG
AT-12, & 13	Digital navigation, analog topography, single-channel seismics, ocean bottom seismometry, sonobuoys	RSMAS, US Navy, WHOI, Bedford Inst., France
AT-14	Digital navigation, topography, magnetics, gravity, single-channel seismics, dredges	L-DGO, USSR
AT-15 & 16	Digital navigation, topography, magnetics, gravity, single-channel seismics, sonobuoys	L-DGO, UTMSI, Gulf Oil, France
AT-17	Analog navigation, topography, magnetics, single-channel and multi-channel seismics	France
AT-18	Analog navigation, topography, single-channel and multi-channel seismics	France
AT-19	Analog navigation, single-channel seismics	UK
AT-20	Analog navigation, single-channel and multi-channel seismics	FRG, Gulf Oil
Blake Bahama	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, sonobuoys	L-DGO, Univ. of Delaware, France, FRG, UTMSI

Table 2 (Cont.)

SITE	DATA	INSTITUTION(S)
Cape Bojador	Analog navigation, single-channel seismics	FRG
N.W. Africa	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, sonobuoys	FRG, L-DGO
Goban Spur	Analog navigation, single-channel and multi-channel seismics	France, UK
ENA-3 & 4	Digital navigation, topography, magnetics, gravity, single-channel seismics	WHOI, L-DGO
ENA-5, 6, & 7	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics	L-DGO, USGS
ENA-12, 13 & 14	Digital navigation, topography, magnetics, single-channel and multi-channel seismics	UTMSI
CAR-1	Analog navigation, multi-channel seismics	France
CAR-7	Digital navigation, topography, magnetics, single-channel and mult-channel seismics	UTMSI
Miss. Fan	Digital navigation, topography, magnetics, gravity, single-channel seismics and side scan sonar	USGS, UK, L-DGO
Baffin Bay	Analog navigation, topography, magnetics, gravity, multi-channel seismics, velocity analyses	Canada
Norwegian Sea	Digital navigation, topography, magnetics, gravity, multi-channel seismics	Norway, FRG, L-DGO, France

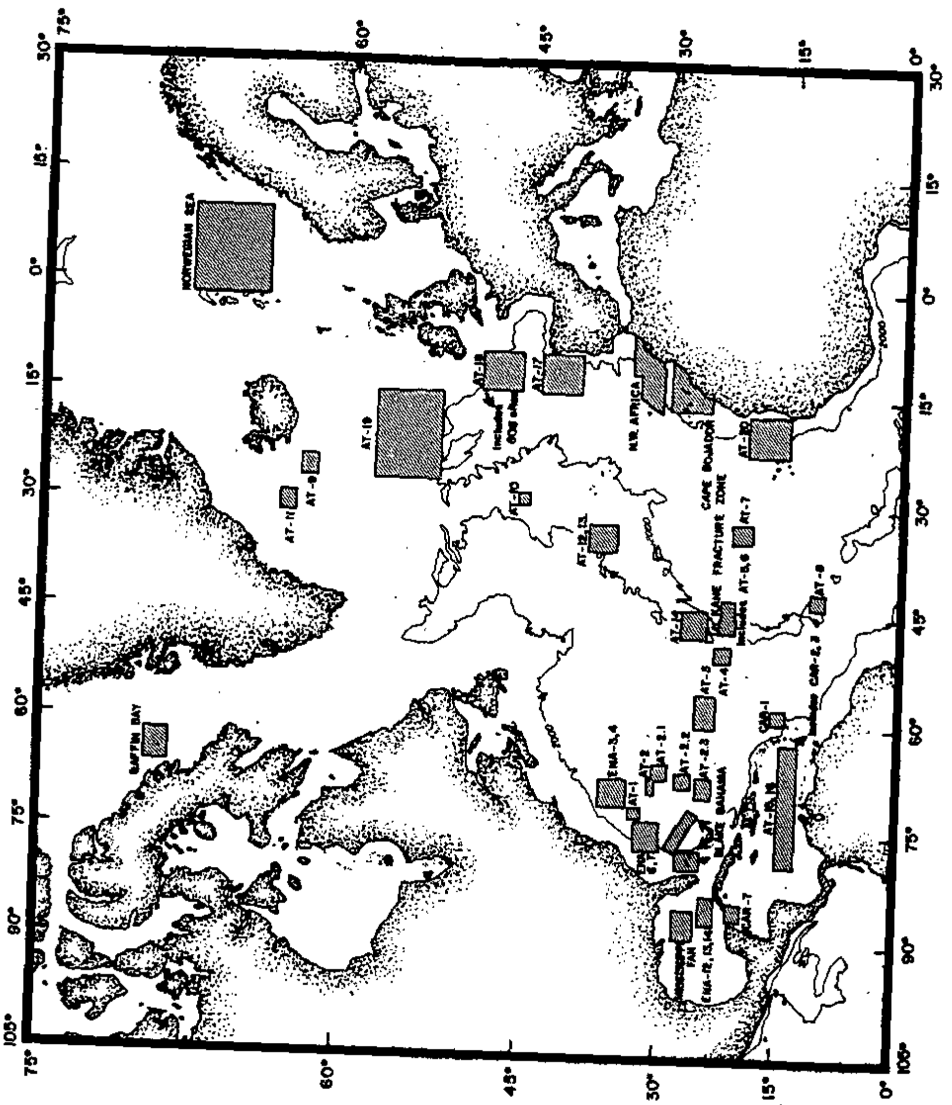


Figure 11: Location of site surveys in the North Atlantic Ocean

Table 3

IPOD and ODP Site Survey Data – Pacific Ocean

SITE	DATA	INSTITUTION(S)
Guaymas Basin and Baja	Digital navigation, topography, magnetics, single-channel seismics, piston cores, heat flow, dredges, ocean bottom seismometry	SIO, Univ. of Washington
PAC-4	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, ocean bottom seismometry	SIO, L-DGO
PAC-5	Digital navigation, topography, magnetics, gravity, single-channel seismics, ocean bottom seismometry, sonobuoys	L-DGO
PAC-6	Digital navigation, topography, magnetics, gravity, single-channel seismics, ocean bottom seismometry, sonobuoys	HIG
Mid-America Trench	Digital navigation, topography, magnetics, single-channel and multi-channel seismics, piston cores	UTMSI
Galapagos & Costa Rica Rift	Digital navigation, topography, magnetics, gravity, single-channel Seismics, heat flow, piston cores, deep-tow	L-DGO, SIO
Kuril Trench	Analog navigation, topography, magnetics, single-channel and multi-channel seismics	USSR, Japan
Sea of Okhotsk	Analog navigation, topography, magnetics, single-channel and multi-channel seismics	USSR
Nauru Basin	Digital navigation, topography, magnetics, gravity, single-channel seismics, ocean bottom seismometry, sonobuoys	HIG
Central Pacific Basin	Digital navigation, topography, magnetics, gravity, single-channel seismics, ocean bottom seismometry, sonobuoys	HIG
Emperor Seamounts	Analog navigation, single-channel seismics	USGS, Japan
Japan Trench	Analog navigation, topography, magnetics, gravity, multi-channel seismics	Japan
North Philippine	Analog navigation, single-channel seismics	Japan
South Philippine Transect	Digital navigation, topography, magnetics, gravity, single-channel and multi-channel seismics, ocean bottom seismometry, two-ship refraction	L-DGO, SIO, HIG FRG
Mesozoic Pacific	Digital navigation, topography, magnetics, gravity, single-channel seismics	HIG
Nankai Trough	Analog navigation, topography, magnetics, gravity, multi-channel seismics	Japan
Equatorial Pacific	Digital navigation, topography, magnetics, gravity, single-channel seismics	SIO, HIG, L-DGO

Table 4

IPOD and ODP Site Survey Data – South Atlantic Ocean

SITE	DATA	INSTITUTION(S)
SA-I	Digital navigation, topography, magnetics, single-channel and multi-channel seismics	UTMSI, FRG, France
SA-II	Digital navigation, topography, magnetics, single-channel and multi-channel seismics, side scan sonar, SEABEAM	Univ. of Capetown, FRG, L-DGO, France
SA-IV	Digital navigation, topography, magnetics, single-channel and multi-channel seismics	UTMSI
Rio Grande Rise	Digital navigation, topography, magnetics, single-channel and multi-channel seismics	UTMSI, L-DGO
AB-5	Digital navigation, topography, magnetics, single-channel and multi-channel seismics	UTMSI

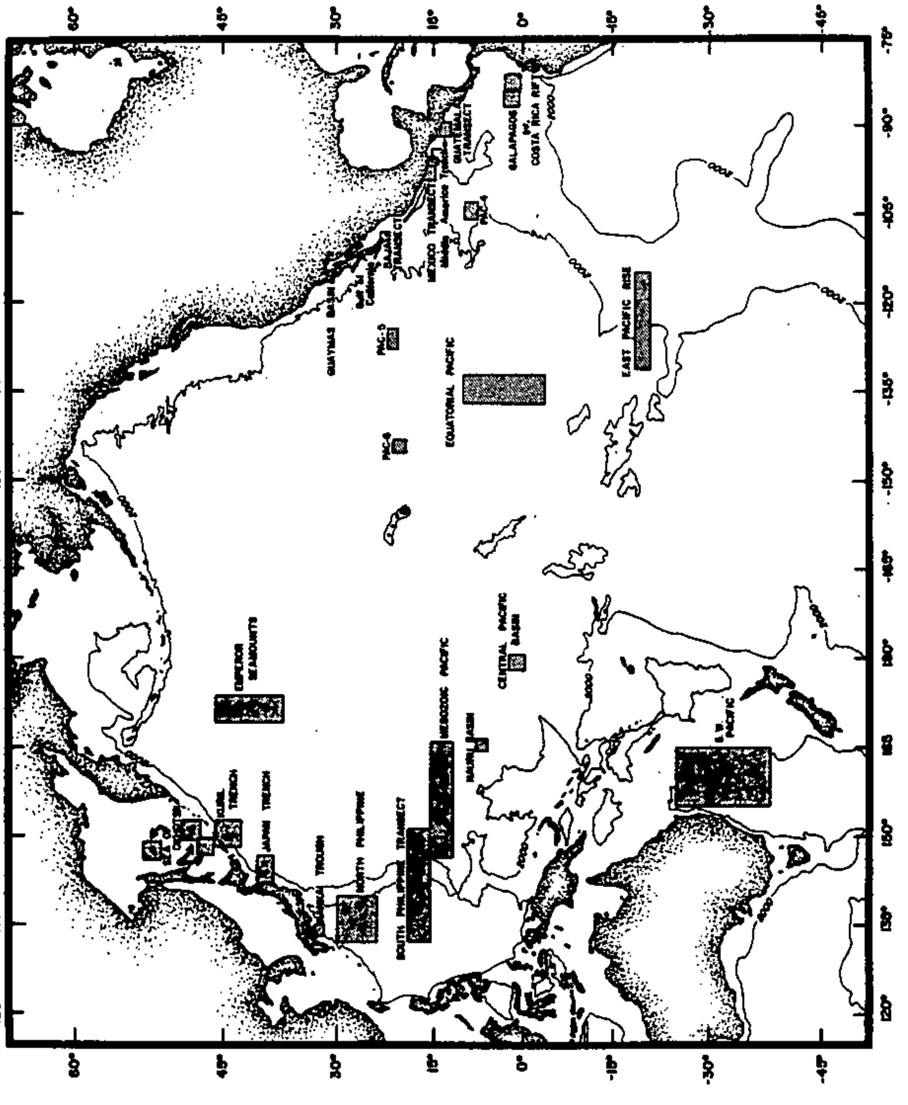
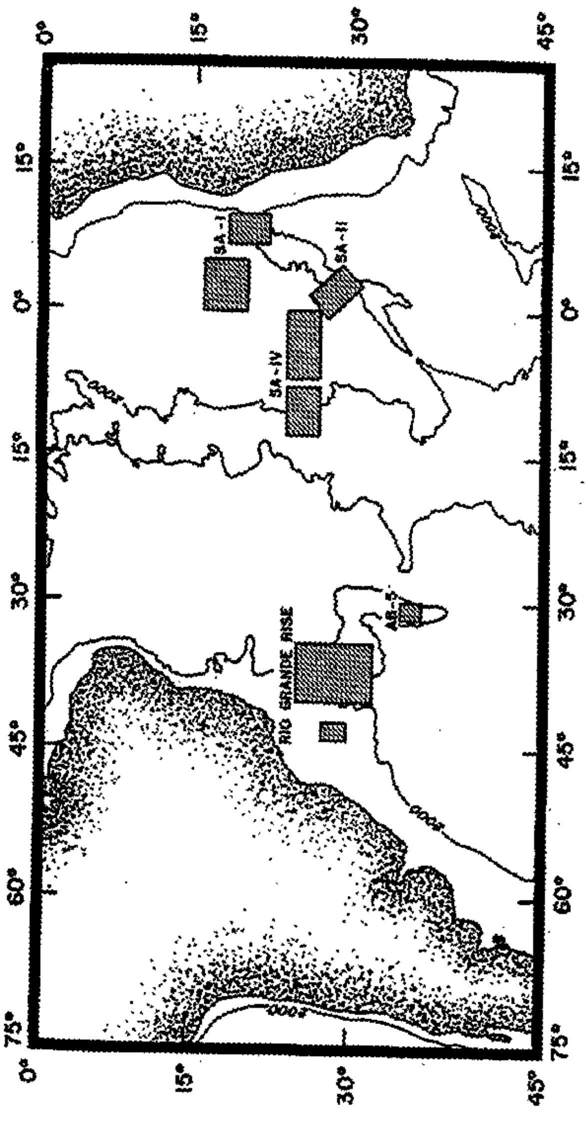


Figure 12: Location of site surveys in the Pacific Ocean



'igure 13· Location of site surveys in the South ^^

PUBLICATIONS POLICY

The publications policy for ODP has evolved from that used in the preceding Deep Sea Drilling Project and consists of a number of distinct elements which are described below:

1. ODP/TAMU PUBLICATIONS

SHIPBOARD SCIENTIFIC REPORTS

There are three informal (published) reports and two formal (published) reports which are prepared by the shipboard scientific party onboard JOIDES RESOLUTION. The informal reports are distributed by ODP/TAMU to a limited number of recipients immediately following completion of the cruise. Each of the five reports is required to be completed before the ship docks.

A. Hole Summaries (Site Reports) - Upon completion of drilling at each site, the shipboard scientists individually and as a group prepare a report of the results. At the end of the cruise, these site reports together with the barrel sheets are assembled into one summary report called the Hole Summary. A copy is returned to ODP where it is duplicated and distributed to shipboard scientists and to others who plan to contribute to the Proceedings of the Ocean Drilling Program for that leg. This report, which has the status of an unreferenceable personal communication, is distributed approximately four weeks after the end of the cruise. Copies of the report include a cover letter which explicitly states that the contents are background information and not intended for publication. Distribution is limited to those who have a real "need to know."

B. Preliminary Report - This report consists of a very general and condensed discussion of the scientific results of the cruise (ten to twenty pages in length) which is distributed to JOIDES panel members, to individuals who have assisted in planning a particular cruise by contributing knowledge and expertise, and to others with special involvement in ODP activities.

C. Press Release - Cruise-related press conferences are held only if a cruise produces information which is of outstanding public interest; however, a press release is prepared which briefly outlines the essence of the cruise objectives, accomplishments, and results in lay language. Contents and wording of the release are subject to the approval of JOI and NSF. This press release is supplied to local area news media before the ship docks, if time permits, and is released by ODP soon after the cruise ends.

D. Geotimes and Nature Articles - The Geotimes and Nature articles represent press releases to the scientific community. The journals ask that the articles not be too technical because their entire readership will be interested in reading this information. Article lengths are limited to two printed pages in Geotimes and to one printed page in Nature. Both articles are authored by the entire shipboard scientific party. They are published within two or three months of the end of the cruise.

POST-CRUISE REPORTS

A. General Geological Article - The publication of such an article is entirely at the discretion of the shipboard party. The party is encouraged to prepare a technical article discussing cruise scientific results for a major journal, such as Science or Bulletin of the Geological Society of America, as soon as possible after the cruise ends. Again, authorship is the full scientific party.

B. Proceedings of the Ocean Drilling Program - The Proceedings of the Ocean Drilling Program is a two-part volume, composed of an Initial Report and a Final Report. The Proceedings volume serves two purposes: first, it details inventories of materials and data recovered by each cruise and provides the scientific community at large with the basis for selecting samples and data for detailed studies; and second, it provides the shipboard and shore-based scientists with an opportunity to publish an integrated report of their preliminary results.

Papers submitted to the Proceedings are expected to contain research of the same quality as those which would be submitted to other major scientific journals. However, due to its very specialized nature, the Proceedings can be sympathetic to papers which contain high quality data not yet ready for final interpretation.

1. Initial Report - The Initial Report is published approximately one year (12-14 months) after the cruise ends. Contents are the site chapters and core barrel sheets revised at the post-cruise meeting and such other reports as are ready for publication.

2. Final Report - The Final Report is published approximately three years after the cruise, allowing time for the shipboard and shore-based cruise participants to complete their preliminary studies. Contributions to this publication are the results of up to one and one-half years of research, and may be authored by individual participants or by consortia. All manuscripts are peer-reviewed under the guidance of the ODP staff scientist who acts as science editor for the Final Report.

MISCELLANEOUS REPORTS

ODP/TAMU will produce other publications as occasional series.

A. Cruise Prospectus - A scientific prospectus for each leg will be published in a Scientific Prospectus series approximately two months pre-cruise. This prospectus is prepared by the co-chief scientists and the ODP staff scientist and contains a synopsis of the scientific problems to be addressed together with brief descriptions of approved sites and technical specifications of the drilling.

B. Technical Reports - A series of technical reports will be produced by ODP/TAMU covering a variety of issues including preliminary time estimates for coring operations.

2. OTHER PUBLICATIONS

WIRELINE LOGGING SERVICES

The Borehole Research Group at Lamont-Doherty Geological Observatory publishes a manual of wireline logging facilities. Logging results from drilling operations will be included in the Proceedings of the Ocean Drilling Program.

JOIDES JOURNAL

The JOIDES Journal is published tri-annually by the JOIDES Office. It serves as a means of communication among the JOIDES committees and advisory panels, the National Science Foundation and non-U.S. participating organizations, the Ocean Drilling Program, and interested earth scientists. The JOIDES Journal provides information on JOIDES committees and panels, cruise schedules, science summaries, and meetings schedules. Occasional issues are produced on specialist subjects such as pollution prevention and safety.

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DATA DISTRIBUTION POLICY

Samples and Geophysical Data

Distribution of Ocean Drilling Program and of Deep Sea Drilling Project samples is undertaken in order to (1) provide support to shipboard scientists in achieving the scientific objectives of their cruise and to support shorebased investigators who are preparing contributions to ODP reports; (2) provide individual investigators with materials to conduct detailed studies beyond the scope of ODP reports; (3) provide paleontological reference centers with samples for reference and comparison purposes; and (4) provide educators with samples for teaching purposes.

Funding for sample-related activities must be secured by the investigator independently of requesting the samples.

The Ocean Drilling Program Curator is responsible for distributing samples and for preserving and conserving core material. The Curator, who may accept advice from chairmen of the appropriate JOIDES advisory panels, is responsible for enforcing the provisions of this sample distribution policy. He is responsible for maintaining a record of all samples that have been distributed, both onboard ship and subsequently from the repositories, indicating the recipients and the nature of investigations proposed. This information is available to interested investigators on request.

Every sample distributed from the ship or from a repository is labeled with a standard identifier, which includes leg number, hole number, core and section numbers, and interval within the section from which the sample was removed. It is imperative that this standard identifier be associated with all data reported in the literature, and that residues of the sample remain labeled throughout their lives, so that later workers can relate the data to the cores.

Distribution of sample materials is made directly from the repositories (Lamont-Doherty Geological Observatory, Scripps Institution of Oceanography, or Texas A&M University) by the Curator or his designated representative.

1. Distribution of Samples for Research Leading to Contributions to ODP Reports

Any investigator who wishes to contribute to the reports of a scheduled cruise may write to the Curator, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA, in order to request samples from that cruise. Requests for a specific cruise must be received by the Curator at least TWO MONTHS in advance of the departure of that cruise, in order to allow time for review of the request in conjunction with other requests, so that a suitable shipboard sampling program can be assembled. The request should include a statement of the nature of the proposed research, size and approximate number of samples required to complete the study, and any particular sampling technique or equipment which may be required. Requests will be reviewed by the staff representative and co-chief scientists of the cruise and by the Curator. Approval/disapproval will be based upon the scientific requirements of the cruise as determined by the appropriate JOIDES advisory panel(s). The scope of a request must be such that samples can be processed, that proposed research can be completed, and that the paper can be written in time for submission to the relevant ODP cruise report.

Except for rare, specific instances involving ties, the total volume of samples removed during a cruise-related sampling program will not exceed one-quarter of the volume of core recovered, and no coring interval will be completely depleted. One-half of all recovered materials will be retained in the archives in as pristine a condition as is practicable. Investigators requesting shipboard samples of igneous materials may receive a maximum of 100 igneous samples per cruise.

Because many sample requests are received for shipboard work and because the time of the shipboard party is at a premium, co-chief scientists are strongly urged to limit shipboard sampling to the minimum necessary to accomplish the cruise objectives. Shorebased investigators whose requests for cruise-related samples are approved should expect that they will receive the samples after the cores are returned to the repository, and should schedule research activities accordingly.

Co-chief scientists may invite investigators who are not cruise participants to perform special studies of selected core samples in direct support of shipboard activities. If this occurs, the names and addresses of these investigators and details of all samples loaned or distributed to them must be forwarded to the Curator, via the ODP Staff Representative to that cruise, immediately after the cruise. These investigators are expected to contribute to the cruise reports as though they had been cruise participants. All requirements of the Sample Distribution Policy apply.

Any publication of results other than in ODP reports within twelve (12) months of completion of the cruise must be approved and authored by the whole shipboard party and, where appropriate, shorebased investigators. After twelve months, individual investigators may submit related papers for open publication provided they have already submitted and had accepted their contributions to the ODP reports. Investigations which are not completed in time for inclusion in the ODP reports for a specific cruise may be published in a later edition of the ODP reports; however, they may not appear in another journal until the report for which they were intended has been published.

2. Distribution of Samples for Research Leading to Publication Outside of the ODP Reports

A. Researchers who wish to use samples for studies beyond the scope of the ODP reports should obtain sample request forms from the Curator, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA. Requestors are required to specify the quantities and intervals of core required, to make a clear statement of the nature of the proposed research, to state the time which will be required to complete the work and to submit results for publication, and to specify funding status and the availability of equipment and space for the research.

Additionally, if the requestor has received samples from ODP or from DSDP previously, he/she will be required to account for the disposition of those samples by citing published works, six (6) copies of which must be sent to the Curator. If no report has been published, this requirement can be fulfilled by sending a brief (two or three page) report of the status of the research. Unused and residual samples should be returned and data should be sent to the Curator if the project has terminated. Paleontological materials may be returned either to the Curator at ODP or to one of the designated paleontological reference centers. If material is returned to a reference center, notify the Curator when it is sent.

Requests for samples from researchers in industrial laboratories will be honored in the same manner as those from academic organizations. Industrial investigators have the same obligations as other investigators to publish all results promptly in the open literature and to provide the Curator with copies of all reports published and of all data acquired in their research.

In order to ensure that all requests for highly desirable but limited samples can be considered together, approval of requests and distribution of samples will be delayed until twelve (12) months after completion of the cruise or two (2) months after official publication of the core descriptions, whichever occurs earlier. The only exceptions to this policy will be made for specific requests involving ephemeral properties. Requests for samples may be based on core descriptions published in ODP reports produced by the shipboard party, copies of which are on file at various institutions throughout the world. Copies of original core logs and data are kept on open file at ODP, and at the repositories at Lamont-Doherty Geological Observatory and at Scripps Institution of Oceanography.

B. Most investigations can be accomplished handily with sample volumes of 10 ml or less. Investigators must provide explicit justification of requests for larger sample sizes or for frequent intervals within a core. Requests which exceed reasonable size or frequency limits will require more time to process, and are unlikely to be granted in their entirety.

Requests for samples from thin layers, from stratigraphically-important boundaries or from sections which are badly depleted or in unusually high demand may be delayed in order to coordinate requests from several investigators or while the Curator seeks advice from the community. Investigators who submit such requests may expect to receive suggestions for alternative sampling programs or that they join a research consortium which will share the samples. In any event, such exceptional requests will require more time for processing than will more routine requests.

Investigators who wish to study ephemeral properties may request a waiver of the twelve-month waiting period; however, such requests will be referred automatically to the relevant co-chiefs. If approved, the investigator will join the shore-based contributors to the shipboard science effort, and will incur the obligations thereof (see Section 1).

C. Samples will not be provided until the requestor assures the Curator that funding for the proposed research is available or unnecessary. If a sample request is dependent in any way upon proposed funding, the Curator is prepared to provide the proposed funding organization with information on the availability (or potential availability) of suitable samples.

D. Investigators who receive samples incur the following obligations:

1) To publish significant results promptly: however, no contribution may be submitted for publication prior to twelve (12) months following the termination of the relevant leg unless it is approved and authored by the entire shipboard party.

2) To acknowledge in all publications that the samples were supplied through the assistance of the international Ocean Drilling Program and others as appropriate.

3) To submit six (6) copies of reprints of all published works to the Curator, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA. These reprints will be distributed to the repositories, to the ship, to the National Science Foundation, and to the Curator's reprint file. All reprints received will be logged in an on-line bibliographic data base.

4) To submit all final analytical data obtained from the samples to Data Base Manager, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA. Please consult announcements in the JOIDES Journal or call (409)845-2673 for information on acceptable data formats. Investigators should be aware that they may have other data obligations under NSF's Ocean Science Data Policy or under relevant policies of other funding agencies which require submission of data to national data centers.

5) To return all unused or residual samples, in good conditions and with a detailed explanation of

any processing they may have experienced, upon termination of the proposed research. In particular, all thin sections and smear slides manufactured onboard the vessel or in the repositories are to be returned to the Curator. Paleontological materials may be returned either to the Curator at ODP or to one of the designated paleontological reference centers.
Failure to honor these obligations will prejudice future applications for samples.

E. Cores are available for examination by interested parties at the repositories. Investigators are welcome to visit the repositories in order to inspect cores and to specify sample locations when that is required for their research; however, time and space in the workrooms are limited, so advance appointments are required. Occasionally, the space may be fully booked several weeks in advance, so investigators are urged to call for appointments well ahead in order to avoid disappointment. Only the Curator or his delegate may actually remove samples from the cores.

F. A reference library of thin sections, smear slides and archive photographs is maintained in the repositories for the use of visiting investigators. All thin sections and smear slides produced onboard the ship or in the repositories belong to this library.

3. Distribution of Samples to Paleontological Reference Centers

As a separate and special category of repository activity, selected samples are being distributed to paleontological reference centers, where the prepared material may be studied by visitors. Foraminifera and calcareous nannofossils can be viewed; radiolaria and diatoms will be prepared in the future. The present centers are Scripps Institution of Oceanography, La Jolla, CA (W.R. Riedel, tel: 619-452-4386); Basel Natural History Museum, Switzerland (J.B. Saunders, tel: 061-25.82.82); and New Zealand Geological Survey, Lower Hutt, New Zealand (A.R. Edwards, tel: 699.059). Future centers are likely to include Texas A&M University, College Station, TX (S. Gartner, tel: 409-845-8479); Smithsonian Institution, Washington, DC; Lamont-Doherty Geological Observatory, Palisades, NY; and an as yet undesignated center in Japan.

Further details concerning the paleontological reference centers are reported periodically in the JOIDES Journal.

4. Distribution of Samples for Educational Purposes

Samples may be available in limited quantities to college-level educators for teaching purposes. Interested educators should request application forms from the Curator, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA. Requestors are required to specify preferred sample size and location, to make a very clear statement of the nature of the coursework in which the samples will be used, to explain how the samples will be prepared and how they will be used in the classroom, to explain in detail why they cannot use similar materials derived from outcrops or dredge hauls (It is NOT acceptable to argue that it requires less effort for the requestor to obtain samples from ODP than to assemble them from other sources!), and to certify that funds are available to prepare the materials for classroom use. In general, only samples of materials which are abundant in the collection and which are in little demand for research purposes should be requested for educational purposes. The Curator will not approve requests for materials which are limited in supply or for which demand (real or potential) is great, including most paleontological materials.

5. Distribution of Data

The Deep Sea Drilling Project and the Ocean Drilling Program routinely capture much of the data generated onboard ship and published in Program reports. Additionally, data supplied by investigators who have received samples are incorporated into the data bases, so data sets which are larger than can be published are available to investigators. Magnetics, downhole logging, seismic reflection, bathymetric data, and other data collected by the drilling vessel become available for distribution to investigators at the same time as core samples.

Requests for ODP data should be addressed to the Data Base Manager, Ocean Drilling Program, P.O. Drawer GK, College Station, TX 77841, USA. Many varieties of DSDP data will be included in ODP data bases. Information on sources of DSDP data will be available from the ODP Data Base Manager.

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Logging Data

1. All logging data acquired on each leg of the Ocean Drilling Program is available to each member of the scientific party onboard ship. Practical limits to data distribution onboard ship are such that some time is required to process, correct, and display the data in a form appropriate for preliminary science. Contractually, Schlumberger supplies six copies of each run. These go to:

   1. L-DGO logging representative
   2. Logging scientists
   3. Co-chiefs (2)
   4. TAMU staff (for TAMU Prime Data Copy)
   5. Permanent archives at L-DGO (logging database)

These copies are made on a simple-to-use ozalid machine onboard ship and Schlumberger will provide for interested scientists to make copies themselves. This copying procedure is coordinated through the L-DGO logging representative. It is anticipated that no interested scientist will leave the ship without copies of the logs.

2. All field-edit tapes and archive copies of the logs are hand-carried by the L-DGO logging representative to L-DGO where further processing produces corrected logs within approximately one month. Paper copies of these corrected logs are mailed by the L-DGO log analyst to individuals on a list compiled by the L-DGO logging representative onboard the ship. Tapes are supplied to members of the shipboard party (if requested in writing) in either LIS or ANSI format as soon as they can be duplicated back at L-DGO.

3. Schlumberger full waveform tapes must be processed by Schlumberger back on shore before they are sent to Lamont. This takes between one and two months, after which time an SEG-Y format data tape and paper records are available upon request.

4. L-DGO multichannel sonic tapes are returned to L-DGO for processing. A data tape in SEG-Y format plus paper copies are available about one month after the leg.

5. As per ODP data distribution policy the rest of the scientific community has access to the logging data from each leg beginning one year from the sailing date of that leg.

6. Certain other data distributions occur after one year. United States Geological Survey receives data tapes from each leg; ODP/L-DGO in return receives tapes of logs of all offshore wells archived by the U.S.G.S. Logging tapes are deposited with the appropriate agencies in JOIDES non-U.S. member countries upon request.

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GUIDELINES FOR PROPOSAL SUBMISSION

A. GENERAL INFORMATION

JOIDES accepts input by individuals or groups into the Ocean Drilling Program as:

1. Preliminary Proposals - (ideas/suggestions) for scientific ocean drilling. Examples are objectives (a specific process), drilling targets, downhole and other experiments, etc. Such input generally lacks either geographic specificity, site survey data, or both.

2. Mature Drilling Proposals - (Minimum requirements are detailed in Section C.)

Preliminary and mature proposals will be reviewed and prioritized by one or more JOIDES advisory panels. Only mature proposals are ultimately considered and prioritized by the Planning Committee, which plans the actual drilling. Thus ideas which become part of the drilling program do so either by evolving into a mature proposal, or by incorporation into an existing proposal with multiple objectives. Proposals are considered mature when accompanied by a specific set of minimum data listed in Section C and provided by the proponents or JOIDES (certain technical data may not be readily available to proponents). It follows that the time required for an idea or proposal to be processed by the JOIDES science advisory structure and become part of the drilling plan will depend on the completeness of the required data at the time of submission. Proponents are therefore urged to submit as complete a package as possible. Lead time requirements are given in Section D. Preliminary proposals should be sent in triplicate to the JOIDES Office. Six copies of mature proposals should be submitted to the JOIDES Office.

B. REVIEW PROCESS

Proposals should be submitted to the JOIDES Office which forwards the material to the appropriate advisory panel(s) for review. The JOIDES panels review and prioritize the proposals and advise the Planning Committee of their recommendations. The panels may request additional information from the proponents and may suggest that the proposal be modified to enhance its scientific merit. Some proposals of limited scope may be incorporated by the advisory panels into a proposal of broader scope.

Thematic Panels are primarily concerned with the process aspects of the science. Regional Panels and Working Groups review the proposal within the context of a particular geographic region (e.g. additional "sites of opportunity" may be recommended for drilling, to maximize the scientific payoff of drilling in that particular region). As the proposal matures and proceeds through the advisory system, service panels make recommendations regarding technical aspects of the proposed drilling (e.g. site survey review, safety review, engineering and technology review, downhole measurements review, etc.).

The Planning Committee monitors and directs the proposal review process, reviews the recommendations of the advisory panels, decides the fate of proposals, and ultimately integrates the approved proposals into a detailed drilling plan and ship track. Figure 14 is a diagrammatic representation of the review process.

C. MINIMUM REQUIREMENTS

1. Minimum Requirements for Mature Proposals (6 copies) - The following items should be discussed in the proposal:

a) Specific scientific objectives with priorities

b) Proposed site locations and alternative sites

c) Background information, including regional and local geological

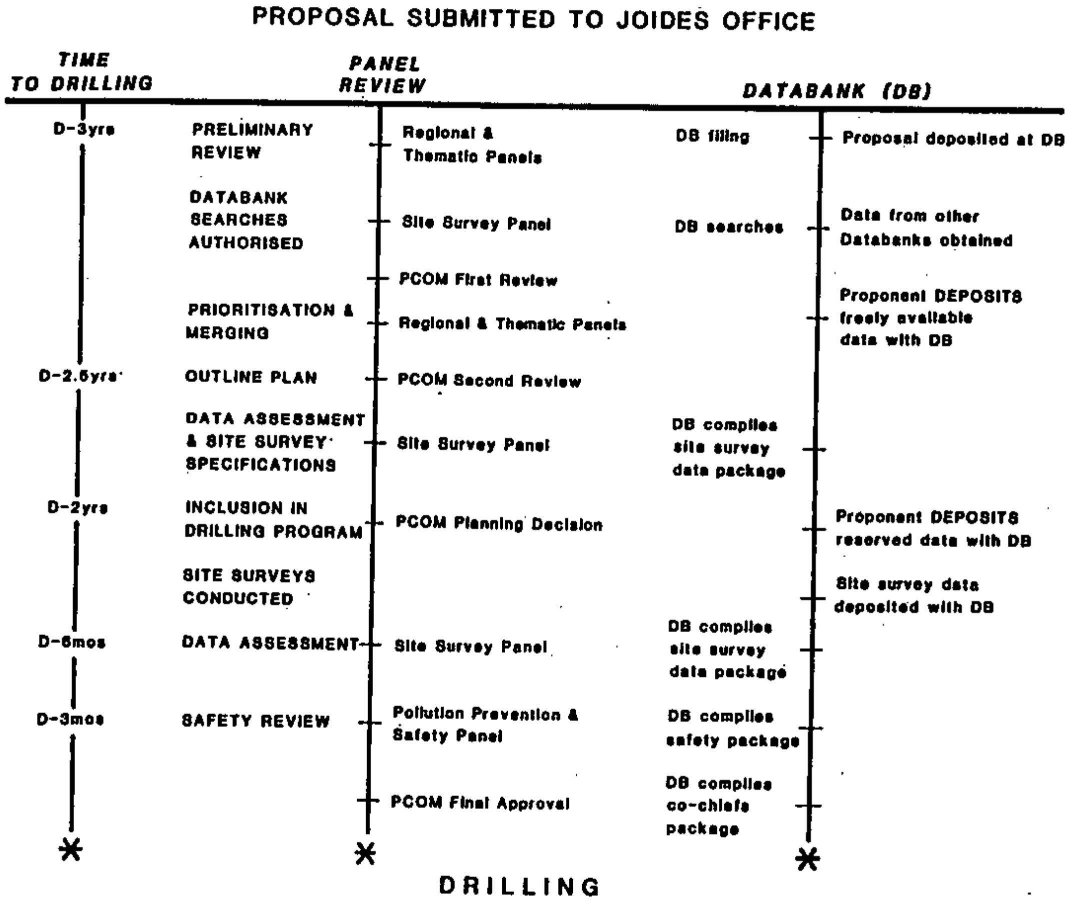

Figure 14: Proposal review process

setting and identification of existing geophysical/geological data base

d) Drilling requirements for each objective (e.g. estimated drilling time, steaming time, water depth, drill string length, reentry, etc.) N.B.: Information on estimated drilling times may be found in "Preliminary Time Estimates for Coring Operations" (ODP Technical Note No. 1, December 1984). Proponents are advised to contact ODP/TAMU for advice in preparing time estimates.

e) Logging, downhole experiments and other supplementary programs (estimated time, specialized tools and requirements, etc.)

f) Known deficiencies in data required for:
1) location of drill sites (site surveys)
2) interpretation and extrapolation of drilling results (regional geophysics)

ODP has established standards for site survey data which are given in Table 5. This outlines the techniques to be used in the various environments which may be encountered.

g) Statement of potential safety problems in implementing proposed drilling.

h) Other potential problems (weather window, territorial jurisdiction, etc.).

i) The name and address of an individual assigned as a proponent for each site who will serve as a contact for JOIDES when additional information is required.

Proponents are also required to submit a Site Proposal Summary Form for each proposed drilling site.

2. Data Availability and Deposition - Proponents are asked to identify available data in three categories:

a) The primary data necessary and sufficient to support the scientific proposal. The ODP Databank is authorized to duplicate and distribute these data as needed for ODP evaluation and planning procedure.

b) Other data relevant to the proposal which may be obtained from publicly accessible data bases in the U.S. and elsewhere.

c) Data which will eventually be available for public access but has release clauses imposed by the data holder (proponent). These data are not normally considered as part of the evaluation of the scientific merit of the related proposal.

It is emphasized that supporting data for a proposal in the above categories must be deposited with the ODP Databank to ensure that a proposal is considered mature. Please categorize data with a, b, or c in the site summary form. Table 6 summarizes the guidelines for submission of data to the ODP Databank.

3. Submission of Preliminary Proposals (Ideas/Suggestions)-3 copies - Preliminary proposals (ideas and suggestions) for ocean drilling should be submitted to the JOIDES Office by letter in triplicate, preferably with as much background information as possible.

4. Letters of Intent to Submit - These may be sent to the JOIDES Office at any time.

D. LEAD TIME

As a general rule a minimum of at least 36 months lead time is required from the time of proposal submission to actual drilling. Exceptionally, a shorter lead time may be acceptable in those cases where site surveys are not required.

E. ALL SUBMISSIONS SHOULD BE SENT (WITH THE APPROPRIATE NUMBER OF COPIES) TO THE JOIDES OFFICE.

The JOIDES Office is always available to discuss and advise proponents of proposal requirements.

Table 5

Site Survey Data Standards

ENVIRONMENTS	A	B	C	D	E	F	G	H
X = Vital (X) = Desirable (X)*= Desirable but may be required in some cases e.g. presence of bottom simulating reflectors	PELAGIC (shallow penetration)	SMALL BASIN/OPEN OCEAN (shallow penetration)	PASSIVE MARGIN (single bit)	PASSIVE MARGIN (re-entry)	ACTIVE MARGIN	SPREADING RIDGE (zero/thin sed. cover)	OCEAN CRUST (thick sediment cover)	HIGH TEMPERATURE ENVIRONMENT
1.Air Gun SCS	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
2.Water Gun SCS (or other high resolution system	X	X	X	(X)	X		X or 5	X or 5
3.3.5KHz.	X	X	X	(X)	(X)		(X)	
4.Chirp Sonar	(X)					(X)		
5.MCS		(X)	X	X	X		X or 2	X or 2
6.Seismic Velocity Determination			X	X	X	X	X	
7.Side Scan Sonar	(X)	X	(X) or 8	(X) or 8	(X) or 8			
8.Seabeam Bathymetry	(X)		(X) or 7	(X) or 7	(X) or 7	X		
9.Piston Cores	X	X	(X)*	(X)	(X)	(X)	(X)	X
10.Heat Flow			(X)*	(X)*	(X)*	(X)	(X)	X
11.Magnetics & Gravity			(X)	(X)		X	X	X
12.Dredging &/or Bare-rock Drilling						X		
13.Photography						X		(X)*
14.Submersible						(X)		(X)*
15.Current Meter (for bottom shear)			(X)*	(X)*	(X)			

Table 6

ODP DATABANK GUIDELINES FOR THE SUBMISSION OF REGIONAL GEOPHYSICAL AND SITE SPECIFIC SURVEY DATA

Data should be submitted in the following forms:

1) A digital magnetic tape of underway geophysical data values (topography, magnetics, gravity) merged with smoothed final navigation. The preferred format is MGD77, which expects a "header" record as well as data records.

2) A cruise report describing in detail the results of surveys.

3) Large high quality reproductions (suitable for xeroxing), or photographic negatives, of single-channel seismic reflection profiles.

4) Large high quality reproductions, or 35 mm negatives, of 3.5 kHz records.

5) Large sepia copies (suitable for ozalid reproduction) of the processed multi-channel seismic reflection profiles.

6) Large photographic negatives of any side scan sonar data (GLORIA, SeaMARC I or II) collected.

7) Large sepia copies (suitable for ozalid reproduction) of any SEABEAM data, presented at a contour interval deemed appropriate.

8) Identification, location and description of results of geological sampling (and, if applicable, heat flow measurements) in the area of proposed drilling.

9) Large sepia copies (suitable for ozalid reproduction) of any "specialized" data sets (such as sediment thickness maps, bathymetry/magnetic contour charts, velocity analyses, etc.) that have been developed in the course of a cruise report. The format and nature of the presentation of these data will be variable and will be dependent upon the nature of specific interest at each site.

Data should be deposited at:

ODP Databank
Lamont-Doherty Geological Observatory
Palisades, New York 10964
USA
Telephone: (914)359-2900

ODP SITE PROPOSAL SUMMARY FORM

(Submit 6 copies of mature proposals, 3 copies of preliminary proposals)

Proposed Site: General Area: Position: Alternate Site:	General Objective: Thematic Panel interest: Regional Panel interest:

Specific Objectives:

Background Information (indicate status of data as outlined in the Guidelines):

Regional Geophysical Data:

Seismic profiles:

Other data:

Site Specific Survey Data:

Seismic profiles:

Other Data:

Operational Considerations:

Water Depth: (m) _________ Sed. Thickness: (m) ________ Tot. penetration: (m) _______

HPC _____ Double HPC _____ Rotary Drill _____ Single Bit _____ Reentry _____

Nature of sediments/rock anticipated:

Weather conditions/window:

Territorial jurisdiction:

Other:

Special Requirements (staffing, instrumentation, etc.):

Proponent: Address & phone number:	FOR OFFICE USE: Date received: Classification no.: Panel allocation:

(Sample Proposal Form)

PROCEDURES FOR SPECIAL ONBOARD SAMPLING

In addition to the sampling procedures outlined under Sample Distribution Policy, provision has been made for whole round core sampling onboard the drillship.

The Ocean Drilling Program is continuing the routine whole round core sampling of soft sediments begun during the Deep Sea Drilling Project, for two major analytical programs: Interstitial (Pore) Water and Organic Geochemistry. In addition, occasional whole round core sampling for consolidation testing will be allowed in special circumstances. To avoid depletion of the core by whole round sampling, the specific policy stated below will apply; exceptions must take the form of proposals for designing the leg and be submitted through the JOIDES Office.

The routine interstitial water (IW) sample consists of a segment of core 5-10 cm long, depending on the amount of pore water in the sediments, taken every 50 m downhole. Additional material may be taken from the shipboard portion of the working half at the discretion of the co-chief scientists. An IW sample is cleaned and squeezed in a Carver hydraulic press in the chemistry lab. Part of the resultant pore water is analyzed immediately and the rest is put into glass vials or plastic tubes and sealed for return to an ODP repository. The pressed cake of sediment is bagged and refrigerated for eventual storage at a repository.

A 30-cm section of whole round core for organic geochemical (OG) analysis on shore is routinely taken every 30 m downhole. It is capped; sealed with plastic wrap, a cap, and electrical tape; labeled; and frozen. These frozen samples are stored onboard until a frozen shipment can be sent to the repository from a port.

Whole round samples may be requested for consolidation testing. These consist of a maximum of one 8-10 cm section per lithologic unit of unlithified sediment from core sections expected to have no coring disturbance. If this frequency of sampling will excessively deplete the core in the judgment of the co-chief scientists, sampling must then be done from a duplicate core at the site.

Sampling of whole round cores for triaxial testing is an exception to this policy and must be reviewed by the JOIDES scientific advisory structure.

All whole round samples must be retained intact until the shipboard scientists have determined that stratigraphically critical intervals will not be destroyed.

Proposals for special sampling programs (6 copies) should be sent to the JOIDES Office.

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PRELIMINARY TIME ESTIMATES FOR CORING AND LOGGING OPERATIONS

Guidelines have been prepared by both the Science Operator and the Wireline Logging Services Contractor for estimating coring and logging times. Where possible, estimates of times to complete holes should be based on data from existing holes (if available) in the areas of interest in order to have a realistic assessment of drilling rates in the various lithologies likely to be encountered. Typical time curves for coring and logging are illustrated in Figures 15 and 16.

The time curves are to assist proponents in developing realistic proposals for drilling. It should be emphasized that, after final site selection, the TAMU Operations and Engineering staff will prepare an independent time estimate for each site and will identify any operational constraints on coring. Similar exercises will be undertaken by L-DGO staff for logging requirements.

Proponents requiring further information on estimating coring times should obtain the following publication from ODP, Texas A&M University, College Station, TX 77843, U.S.A.:

> Preliminary Time Estimates for Coring Operations, ODP Technical Note 1 (December 1984).

Proponents may also wish to discuss their requirements in terms of time estimates with either or both the Science Operator and the Wireline Logging Services Contractor.

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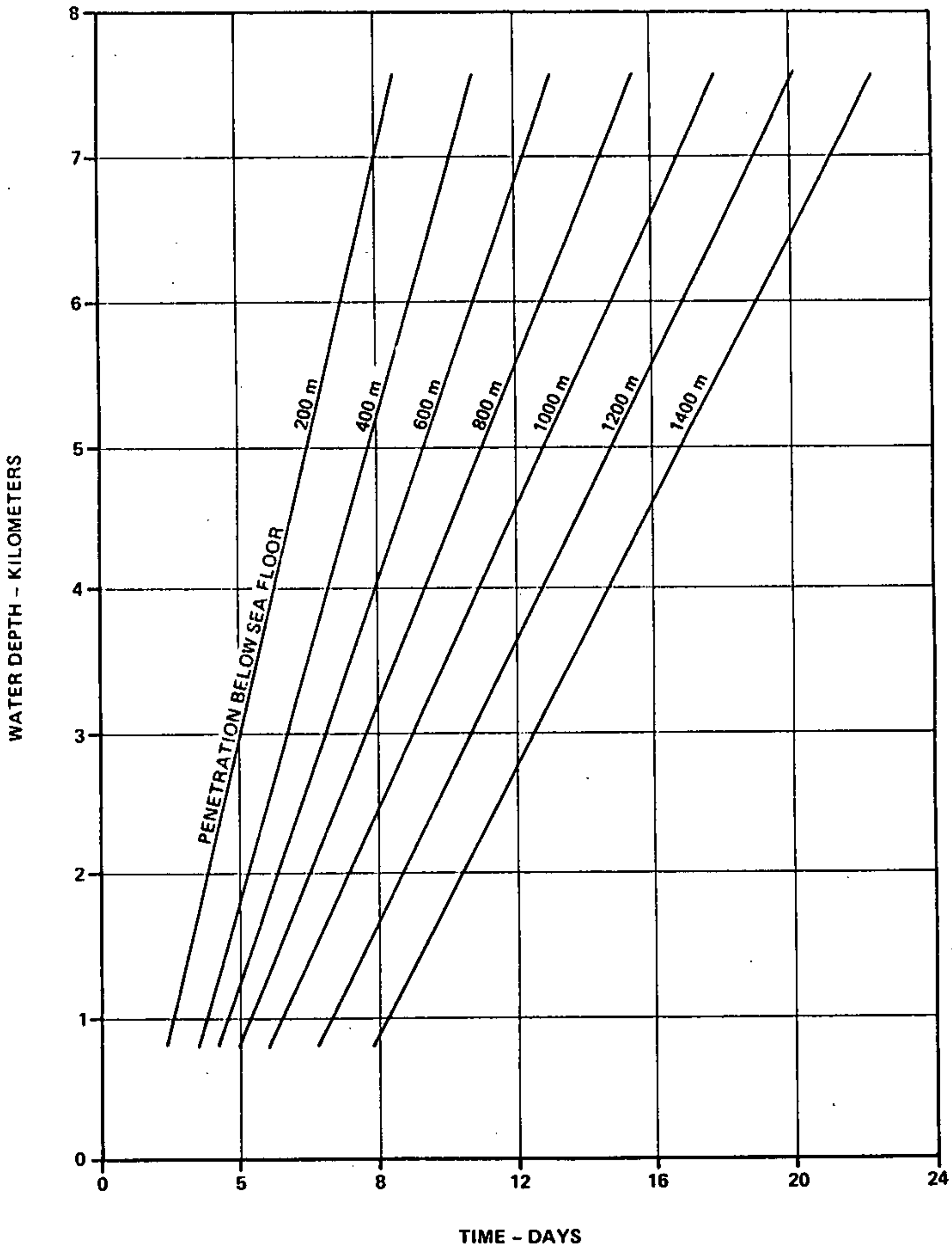

Figure 15: Typical time curve for coring—Estimated site time for a single bit hole combining 200m advanced piston coring (APC) followed by rotary drilling to 200m and drilling/coring thereafter with logging. Actual drilling rates vary greatly depending on the lithologies encountered.

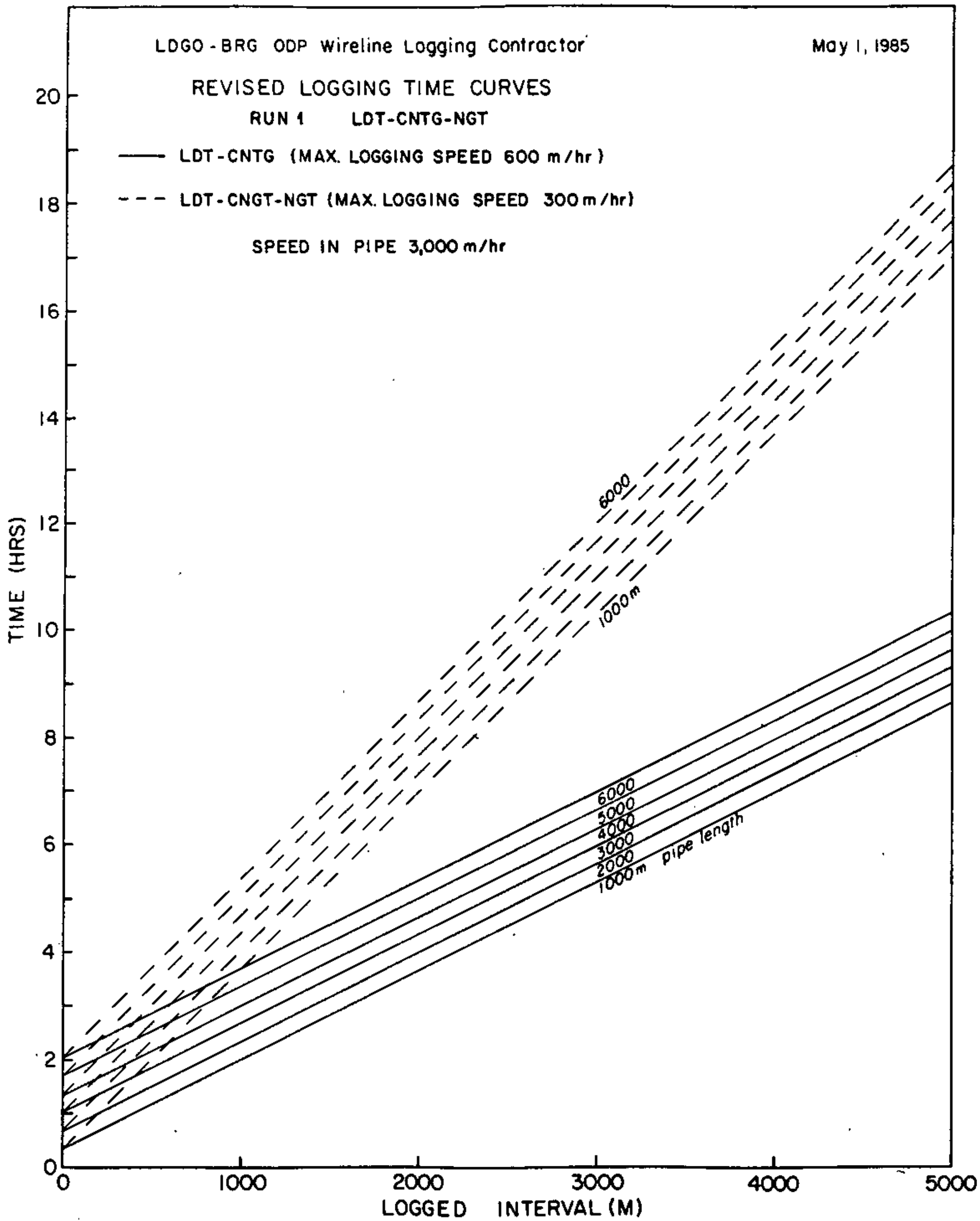

Figure 16: Typical time curve for logging

GUIDELINES FOR SAFETY REVIEWS

Safety reviews are a critical element in the process of planning a drilling leg. In addition to the JOIDES Pollution Prevention and Safety Panel, the Science Operator (Texas A&M University) has its own group of safety advisors. The advice and recommendations of both groups are incorporated into the final decision as to whether a proposed site will be drilled.

The principal geological safety and pollution hazard in ocean drilling is the possible release of substantial quantities of hydrocarbons from a subsurface reservoir. In most deep sea regions, the risk of hydrocarbon release can be reduced or eliminated by careful planning and proper site surveys. Additionally, safety problems may arise in drilling hot hydrothermal systems for lithospheric targets.

Documentation of drill sites for Safety Panel review is a complex procedure which varies from leg to leg. These notes serve only as a guide to the overall scope of the review.

Preparation for Safety Panel review entails two levels of geological documentation. One level, less complete in its scope, is the material mailed out to members of the JOIDES Safety Panel and the TAMU advisors approximately (but no less than) two weeks prior to a formal review meeting. It contains enough information to acquaint them with the location, elements of structure and stratigraphy, and any safety problems which may exist at each site. It further allows individual panel members time to research their own files and/or the literature on possible hydrocarbon or other hazards for the various drill sites.

The second level of documentation is that prepared for the formal safety reviews. At this level no effort is spared in compiling data of all possible significance. The panels have been reluctant in the past to approve a site where data, in their opinion, has been insufficient to support a safety evaluation. Avoiding reference to negative data can be a greater deterrent to panel approval than bringing such data in the open where its merits can be judged relative to the overall safety aspects of a site.

The two Safety Panels meet separately and each prepare their own safety evaluations. Present practice is to hold these meetings consecutively and at the same place when possible.

The time constraints for scheduling a safety review are quite rigid and require it to be held at least three months before a leg begins. However, if feasible, it is advisable to have the review at an earlier time. Then it becomes possible to relocate a site or even, if really necessary, to obtain new geophysical data if a site is rejected by the safety review.

If those documenting a site anticipate that the safety reviewers may have serious concerns about safety, they are urged to request a "Safety Preview." This could entail submission of initial reconnaissance information and would allow an assessment to be made before all the data is finalized. Such a preliminary review would be made at a scheduled safety review or might even be accomplished by a mailout canvassing of the JOIDES Safety Panel members. Before this approach is considered it should be discussed with the JOIDES Safety Panel Chairman.

Much of the data required for the safety review is also required to support the submission of a formal "mature" proposal to JOIDES. The Guidelines for Submission of Proposals give details of the data for various geological environments which should be submitted to the ODP Databank and of the requirements for data format needed by the Databank.

It should be borne in mind that proposals to drill on structural highs will generally result in the relocation of the drill site.

Similarly, the Panels are likely to relocate drill sites to cross-points of seismic refraction lines, especially on continental margins and where structure may be a factor.

DOCUMENTATION FOR MAILOUT TO SAFETY PANEL MEMBERS

I. Required Items

A. Cross-tie seismic reflection lines. Should be of sufficient length and detail to define all possible elements of closure. The following annotations should appear on these lines:

1. Site number and its location
2. Direction of traverse
3. Horizontal scale in kilometers
4. Vertical scale in seconds (unless depth section)
5. Major course corrections
6. Important reflectors and their identification
7. Intersection point of cross-tie lines

B. Track chart showing track lines and location of proposed site. The specific lines or segments of lines submitted for review should be indicated on this chart.

C. Small scale regional map showing bathymetry, nearest land area and location of proposed site. One map may serve for all sites.

D. Completed safety check list prepared by the ODP Databank.

The seismic events on the profiler lines should be legible at least down to the depth of penetration proposed for the drill site. Keeping this qualification in mind, these data can sometimes be presented on photographic prints. When such prints are used, suitable negatives together with annotation instruments should be sent to the Databank (see Databank requirements for the submission of a proposal).

For the sake of consistency, all measurements in the documents for the safety review should be in the metric system.

DOCUMENTATION FOR FORMAL SAFETY PANEL REVIEW

I. Required Items (necessary for all sites)

A. Reflection Profiler Data - All such seismic lines as may be thought necessary to defend a site will be brought to the review meetings by the co-chief scientists and/or the site proponent. In the event either Panel recommends moving a site location, it is useful to have sufficient additional seismic data to support the new location. Documentation should also be provided for any alternate locations that could conceivably be drilled. Whatever sites are submitted, the Panels cannot be expected to approve a depth of drilling penetration below the depth of resolution of geological structure on the profiler records.

B. Seismic Refraction, Gravity, and Magnetic Data - Velocity data (when available) should always be provided. Gravity and magnetic data, as regional properties, are also of relevance and should be included in the documentation of the proposed sites.

C. Bathymetric Data - As much bathymetric data as is available should be provided for the review.

II. Desirable Items (at times essential for active and passive margin sites)

A. Regional Geologic Map or Cross-sections - For sites whose anticipated stratigraphic sequence can be compared with nearby onshore or other drilled sequences, a surface geologic map and/or cross-section would be useful in evaluating a site. Where available, source or reservoir rock data should be included.

B. Hydrocarbon Occurrences - Occurrences of hydrocarbons or lack thereof at nearby boreholes should be tabulated where oil companies are willing to release such data.

C. International Jurisdiction and Extent of Nearby Oil Leases - Self explanatory.

D. Other Site Survey Data - Lithlogic descriptions of piston core or dredge samples recovered near the drill site, and bottom water and sediment analyses for the presence of hydrocarbons should be provided. At times these can be collected from piston cores.

E. Other Maps - Structure contour maps can be extremely useful. Of further value are isopach, depth to basement, and depth to clathrate layer maps. For critical sites such maps are a requirement.

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A complete Safety Manual will be published as Special Issue No. 5 of the JOIDES Journal. Copies may be obtained from JOI Inc., 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036 (Tel: 202-232-3900).

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DEEP SEA DRILLING PROJECT DATA SOURCES

During the fifteen years of the Deep Sea Drilling Project, large amounts of data have been accumulated which provide a valuable resource for synthesis studies as well as providing important background information for participants in the Ocean Drilling Program.

The primary source for information regarding DSDP legs together with a scientific interpretation of the data is the Initial Reports series of DSDP. These volumes may be obtained from national sources in non-U.S. partner nations, from reference libraries, or may be ordered from: Superintendent of Documents, Government Printing Office, Washington, DC 20402. A list of available volumes together with costs may be obtained from the Government Printing Office.

Errata for Volumes 1-44 of the Initial Reports of the Deep Sea Drilling Project, either by single volume or by complete set, are available without charge. Also available for these same volumes are microfilm at $8.25/vol. or $360.00/complete set and microfiche at $3.50/vol. or $150.00/complete set. Send requests to: Science Services, Deep Sea Drilling Project, A-031, Scripps Institution of Oceanography, La Jolla, CA 92093.

For copies of the DSDP map "Topography of the Oceans with Deep Sea Drilling Sites Through Leg 96" contact: Barbara Long, DSDP, A-031, Scripps Institution of Oceanography, La Jolla, CA 92093.

A series of technical reports has also been produced and these reports are available from: National Technical Information Service, Department of Commerce, 5259 Port Royal Road, Springfield, VA 22151.

A compilation of sedimentology, physical properties, and geochemistry for DSDP up to and including Leg 44 is available from the World Data Center A for Marine Geology and Geophysics. The reference to this volume is: Report MGG-1 - Sedimentology, physical properties and geochemistry in the Initial Reports of the Deep Sea Drilling Project Volumes 1-44: An Overview, edited by G. Ross Heath. It may be obtained from the National Geophysical Data Center, Boulder, CO 80303.

DATA SERVICES

The responsibility for data services is currently shared by DSDP and the National Geophysical Data Center (NGDC) in Boulder, Colorado. During the phase out of DSDP all data service responsibility will gradually shift to NGDC. Several major databases have already been transferred to NGDC. Researchers are encouraged to make NGDC their primary contact for DSDP data, since NGDC may be able to provide correlative data from other sources. NGDC will forward any requests requiring special treatment to DSDP for prompt attention. DSDP is concentrating most of its available resources on completing all databases prior to phase out and will only process data requests requiring special treatment and those requests relating to Initial Report preparation.

All prime data collected as part of Deep Sea Drilling operations and some special files compiled by the DSDP Information Handling Group are available for distribution to researchers. Table 7 summarizes and categorizes the types of data available. The data files listed under Special Files represent compilations and ancillary data which may be of particular assistance to researchers.

Data files can be provided in their entirety or the researcher may request subsets of the data based on research criteria. Databases can be searched on most data items using simple or complex search expressions. Using linked searches all databases can be searched on common drill site summary data and paleontological age unit assignments. Records selected from one database can be correlated with records from others. DSDP search software also contains internal tables which assign all sites to appropriate geographical (ocean, sea) locations.

The preferred medium for providing the results of data requests is magnetic tape. Printed listings can also be provided for small volume data requests. Modest sized data files may also be available on floppy disks. On experimental basis DSDP can also provide direct transfer of data via the UNIX UUCP Network and remote log-in via guest accounts on the DSDP computer.

DATA TRANSFER TO NGDC

As DSDP databases are completed they are being transferred to the National Geophysical Data Center in Boulder, Colorado. Transferred databases are marked with an asterisk in Table 8. All DSDP data files will be transferred to NGDC prior to the end of DSDP data service operations in early 1987. Reports on the progress of database transfers will be given in the regular issues of the JOIDES Journal. Investigators may also request personal copies of Table 8 from DSDP. Requests for data services for transferred databases will, in general, be referred to NGDC. DSDP will continue to provide service for investigators preparing DSDP publication contributions and for requests NGDC cannot service.

DATA REQUEST PROCEDURE

Data requests can be submitted in writing or by telephone. When writing include a brief description of your research project so that DSDP can best determine which data sets would be most helpful. When requesting data on magnetic tape be sure to include your preferred tape specifications. Tapes can be provided at 800 or 1600 bpi, odd parity, EBCDIC or ASCII character set, labelled or unlabelled, single or multiple files per reel. State any block (physical record) size limitations required by your host system. A charge will be made to recover expenses (computer time and other direct costs) in excess of $50.00 incurred in fulfilling individual requests.

Please address your requests for information and data to:

Data Manager
Deep Sea Drilling Project (A-031)
Scripps Institution of
Oceanography
La Jolla, CA 92093
(619) 452-3526 and FTS 895-5496

-Mail via UUCP use:
@ihnp4,akgua,decvax,dcdwest,
ucbvax(!sdccvax!sdcc6!peterw

or directly to NGDC:

Marine Geology and Geophysics
Division
National Geophysical Data Center
NOAA E/GC3
325 Broadway
Boulder, CO 80803
(303) 497-6338 or
FTS 320-6338 Data Orders
(303) 497-6339 or
FTS 320-6339 Technical Info.

* * * * * * *

Table 7

AVAILABLE DSDP DATA

Data file: legs available	Data source	Description	Comments
Part 1. Lithologic and stratigraphic data		* - indicates that the database is complete and transferred to NGDC.	
Paleontology: 1-73	*Initial Reports*	Data for 26 fossil groups. Code names, abundance and preservation data for all Tertiary fossils found thus far in DSDP material. The fossil dictionary comprises more than 10,000 fossil names and codes.	Does not include Mesozoic fossils.
Smear Slide: 1-96	Shipboard data	Information about the nature and abundance of sediment components.	No data for Leg 83 (hard rock cores only).
Thin Sections: 6-83	Shipboard Data *Initial Reports*	Petrographic descriptions of igneous and metamorphic rocks. Includes information on mineralogy, texture, alteration, vesicles, etc.	Legs 31-83 are keypunched and awaiting final checks. Available by Sept. 1985. No data for Legs 8-12, 15, 19-21, 23-24, 27, 36, 40-41, 42B, 44, 47-48, 50, 56-57, 71-72, 75-76, 78, 80, 95, 96.
Visual Core Descriptions: 1-96	Shipboard data	Created from shipboard descriptions of the core sections. Information about core color, sedimentary structures, disturbance, etc.	
Visual Core Descriptions - igneous rocks: 37-94	Shipboard data	Igneous and metamorphic rock lithology, texture, structure, mineralogy, alteration, etc.	No data for Legs 40, 42B, 44, 47-48, 50, 56-57, 95, 96.
SCREEN: 1-67, 84-92	Processed data	Computer generated lithologic classifications. Basic composition data, average density, and age of layer.	
Part 2. Physical properties and quantitative analytic core data			
Carbon-carbonate 1-96	Shore Laboratory Shipboard, carbonate bomb data	Percent by weight of the total carbon, organic carbon and carbon carbonate content of a sample. Bomb data has carbonate only.	No data for Legs 46, 83, 88, 91, 92.
Grain Size 1-76	Shore laboratory	Sand-silt-clay content of sample.	No data collected for Leg 16, 64 and 65.
GRAPE (gamma ray attenuation porosity evaluator): 1-96	Shipboard data	Continuous core density measurements.	No data for Leg 46.
Hard-rock major element analyses: 13-82	Shore-based and shipboard analyses	Major-element chemical analyses of igneous, metamorphic and some sedimentary rocks composed of volcanic material.	No data for Legs 20, 21, 31, 40, 42B, 44, 47, 48, 50, 56, 57, 71.

Table 7 (Cont.)

Part 2. Physical properties and quantitative analytic core data. (Cont.)

Hard-rock minor element analyses: 13-82	Shore-based and shipboard analyses	Minor-element chemical analyses of igneous, metamorphic and some sedimentary rocks composed of volcanic material.	No data for Legs 20, 21, 27, 35, 40, 42B, 44, 47, 48, 50, 56, 57, 66, 67, 71.
Hard-rock paleomagnetics: 14-77	Shore-based and shipboard	Paleomagnetic and rock magnetic measurements of igneous and metamorphic rocks and a few sedimentary rocks composed of volcanic material.	No data for Legs 1-13, 17, 18, 20-22, 24, 30, 31, 35, 36, 39, 40, 47, 48, 50, 56, 57, 67, 68, 74.
Long-core spinner magnetometer sediment paleomagnetics: 68, 70-72, 75	Shipboard analyses	Paleomagnetic measurements: declination and intensity of magnetization. Data from hydraulic piston cores only.	Should be used with reservation since the cores were later discovered to be rust-contaminated and disturbed. Quality of the data for each core clarified by documentation.
Discrete sediment sample magnetics: 1-96	Shipboard laboratory	Paleomagnetic measurements: declination, inclination, and intensity of magnetization. NRM measurements and AFD measurements when available.	Rotary cores: 64-96 encoded. HPC cores: 71-96.
Alternating field demagnetization: 4-96	Shipboard laboratory	Paleomagnetic measurements of sediments on which alternating field demagnetization is carried out.	Rotary cores: 51-96 encoded. HPC cores: 71-96.
Sonic velocity: 3-95	Shipboard analyses	Hamilton frame and 'ear muff' methods.	
Vane Shear: 61-94	Shipboard data	Sediment shear strength measurements using Wykeham Farrance 2350 and Torvane instruments.	No data for Legs 62, 65-67, 70, 77, 79-84, 88, 89, 91-93. Additional unprocessed data may exist prior to Leg 61.
Analytic water content, porosity, and density: 1-96	Shipboard laboratory	Measurements by syringe method from known volumes of sediment.	No data for Leg 41.
Well Logs: 6-96	Shipboard data	Analog charts and magnetic tapes produced by Gearhart-Owen and Schlumberger.	*Schlumberger LIS tapes: 48, 50, 51, 57, 80-84, 87, 89, 95, 96. Gearhart-Owen tapes: 60, 61, 63-65, 67, 68, 70, 71, 74-76, 78. Analog data only: 6, 8, 46, 66, 69.
X-ray mineralogy: 1-37	Shore laboratory	X-ray diffraction	Data for Legs after 37 not available in digital form.

Table 7 (Cont.)

Part 3. Underway geophysics

*Bathymetry: 7-96	Shipboard data	Analog record of water-depth profile.	Available as digital data and 35mm continuous microfilm. No data for Legs 10-12, 57-60.
*Magnetics: 7-96	Shipboard data	Analog record produced on the Varian magnetometer in gammas. Digitized at 5-min. intervals on an OSCAR X-Y digitizer.	No data for Legs 10, 11.
*Navigation: 3-96	Shipboard data	Satellite fixes and course and speed changes that have been run through a navigation smoothing program, edited on the basis of reasonable ship and drift velocities and later merged with the depth and magnetic data.	
*Seismic: 1-96	Shipboard data	Sub-bottom profiles recorded on Edo Western Graphic Model 550. Digital data for Legs 89-96 in SEG-Y tape format.	Both Bolt and Kronlite filters available on board. Fast and slow sweeps available on microfilm and photographs.

Part 4. Special reference files

*Site Summary: 1-96	Initial Core Descriptions	Information on general hole characteristics (i.e., location, water depth, sediment nature, basement nature, etc.).	
DSDP Guide to Core Material: 1-76	*Initial Reports* Prime data files	Summary data for each core: depth of core, general paleontology, sediment type and structures, carbonate, grain size, x-ray, etc.	
AGEPROFILE: 1-96	*Initial Reports* Hole summaries	Definition of age layers downhole.	
COREDEPTH: 1-96	Shipboard summaries	Depth of each core. Allows determination of precise depth (in m) of a particular sample.	

Table 7 (Cont.)

Part 5. Aids to research

DATAWINDOW	An on-line search and retrieval program to access many DSDP files; also used for data base maintenance. An account can be arranged at the University of California computer center to allow remote access to data files compatible with DATAWINDOW.
MUDPAK	A plotting program; handles multiple parameter data (e.g., plots of well logs, plots of physical properties).
DASI	A file of DSDP-affiliated scientists and institutions. Can be cross-referenced and is searchable.
KEYWORD INDEX	A computer searchable bibliography of DSDP related papers and studies in progress.
SAMPLE RECORDS	Inventory of all shipboard samples taken.
DSDP Site Map	DSDP site positions on a world map of ocean topography.

NATIONAL ODP STRUCTURES

Canada

In December 1984, Canada announced its intention to join the Ocean Drilling Program, and in April of 1985 a Memorandum of Understanding between Canada and the United States was signed. Canada's Department of Energy, Mines and Resources (EMR) was named as the official adhering body with responsibility for fiscal aspects of the program in Canada. Funding comes from a number of government agencies, including the Department of Energy, Mines and Resources, Department of Fisheries and Oceans, Department of External Affairs, Department of Regional Industrial Expansion, and the Natural Sciences and Engineering Research Council.

Currently, Canadian participation in the Ocean Drilling Program is coordinated by the Department of Energy, Mines and Resources and the Canadian Geoscience Council (CGC) through an ad hoc executive committee. Dr. W.W. Hutchison (alternate Dr. M.J. Keen) of EMR represents Canada on the ODP JOIDES Executive Committee. A Canadian ODP secretariat has been established at the Centre for Marine Geology, Dalhousie University, Halifax, Nova Scotia, and a permanent organization for Canadian participation in the ODP which consists of the Canadian ODP Council, the Canadian National Committee-ODP, and the Canadian ODP secretariat has been formed.

The Canadian ODP Council is responsible to EMR which has overall accountability to the Government of Canada. It handles government-to-government negotiations and acts on matters of finance and policy. The Council is composed of ten members: one from each funding agency, the President of the Canadian Geoscience Council, the Chairman of the Canadian National Committee for ODP, and three members from industry, universities, and the Provinces appointed by the Canadian Geoscience Council.

The Canadian National Committee for the ODP (CNC/ODP) oversees the scientific and technological planning and coordinates participation in Canada. It represents Canada in institution-to-institution discussions, maintains accounts of all aspects of the program, and establishes subcommittees and working groups as required. The CNC/ODP is accountable to the Canadian Geoscience Council and is made up of both voting and non-voting members. Voting members include one member from the Natural Sciences and Engineering Research Council, one member appointed by Energy, Mines and Resources to represent all other Federal agencies, and twelve members appointed by the CGC. Non-voting members include the Director of the Secretariat, chairpersons of subcommittees and working groups, and one member from the Department of Regional Industrial Expansion. Dr. Paul T. Robinson (Dalhousie University) is the Chairman of the CNC/ODP and serves as Director of the Secretariat.

The secretariat supports the ODP Council, CNC/ODP, subcommittees, and working groups; coordinates and solicits proposals for scientific and technological participation; maintains records of all aspects of Canadian participation; and informs the scientific community and general public of all ODP operations.

CANADIAN NATIONAL ODP COMMITTEE MEMBERS

P.T.Robinson (Chairman)
S.Dutoit
F.Gradstein
J.Halliwell
R.Hyndman
M.J.Keen
J.Malpas
M.Salisbury
S.O.Scott
R.Smyth
A.E.Soregaroli
A.Tankard
R.E.Wyman

* * * * * * *

Federal Republic of Germany

The Federal Republic of Germany has been involved in scientific ocean drilling since 1975 when FRG became a regular member of IPOD. The Federal Republic of Germany was the first non-U.S. country to sign a full Memorandum of Understanding with NSF for participation in ODP in March 1984.

Finances for the contribution for the drilling program come through the Deutsche Forschungsgemeinschaft (DFG), the German equivalent of NSF. Fifty percent of the contribution comes from DFG sources with the other 50% being provided by the Bundesministerium fur Forschung und Technologie (BMFT), the federal ministry concerned with research and technology. The DFG represents the Federal Republic at the ODP Council.

The Bundesanstalt fur Geowissenschaften und Rohstoffe (BGR), the Federal Institute for Geosciences and Natural Resources, coordinates the German activities within ODP, provides managerial assistance, and provides the representation at the JOIDES Executive and Planning Committees.

DFG has established a major research program, "Schwerpunktprogramm DSDP/ODP," providing grants totalling approximately DM2m to back up the ODP within the Federal Republic. Participants are individuals from universities, government agencies and industry. This research includes ODP-related surveys, investigation of core samples, and other borehole data as well as field investigations on land that are closely related to offshore drilling targets.

For offshore surveys related to ODP, the Federal Republic has two large research vessels, the POLARSTERN and the SONNE, the former having ice-breaking capabilities. Both ships are equipped with modern navigational aids, SEABEAM, and conventional geological and geophysical gear. A third vessel, replacing the METEOR, is expected to enter service in about 1987.

Although the FRG has a worldwide involvement in ODP, some concentration of activities in the Antarctic, SE Asian, and SW Pacific areas is inevitable.

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ODP Council: Dr. F. Maronde (DFG)

Executive Committee: Dr. F. Bender (BRG); alternate Dr. H. Durbaum (BGR)

Planning Committee: Dr. H. Beiersdorf (BGR); alternate Dr. U. von Rad (BGR)

Dr. H. Beiersdorf runs what is unofficially known as the German ODP Office.

* * * * * * *

France

France has been a full member of IPOD since 1975 and has a similar organization for ODP to that established for IPOD/DSDP. This consists of an Executive Committee chaired by M. Yves Sillard, President et Directeur-General, IFREMER, and composed of representatives of various French organizations and ministerial delegates: M. Andre Berroir (Institut National des Sciences de l'Univers), M. Claude Salle (Comite d'Etudes Petrolieres Marines), M. Jean Noel Gony (Ministere de la Recherche et de la Technologie), M. Jean-Paul Cadet (Chairman of the ODP Scientific Committee and PCOM representative), and M. Bernard Biju-Duval (IFREMER and EXCOM representative) who is the Executive Secretary.

An ODP Scientific Committee meets three or four times a year and is chaired by M. Jean-Paul Cadet. Members are the French representatives on the JOIDES panels and other French scientists selected for their expertise.

In addition, there are working groups corresponding to the JOIDES panels; they consist of six to eight people chosen for their competence in the appropriate theme or region.

IFREMER is the agency which represents France in the Ocean Drilling Program. The ODP budget at IFREMER covers the ODP subscription, travel funds (both domestic and international), and other support for the Program. The ship operations are another budgetary item within IFREMER; many cruises are devoted to regional surveys useful for ODP such as the circumnavigation of the R/V JEAN-CHARCOT. In addition, IFREMER has agreed to allocate ship time each year for MCS surveys relevant to ODP depending on the quality of proposals. The review of these proposals is conducted by the Scientific Committee of IFREMER (with representatives of the different scientific French organizations). The ODP Scientific Committee can give advice to this national committee concerning the priority of relevant ODP proposals.

French science especially devoted to ODP is supported by CNRS (an "Action Thematique Programme") and this amounts to approximately FFr 1.5m per annum. Specific support is also provided by the French Petroleum Committee of Marine Studies which can select sample studies and site surveys to be funded.

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Japan

Japan has been a full member of IPOD since 1975 and has been a candidate member of ODP during its planning phase. Japan is a full member of ODP as from 1 October 1985.

The decision to join ODP was made following the recommendation by the Geodetic Council, an advisory board for the Cabinet organized by Monbusho, which assigned a feasibility exploration task to its subcommittee, the Special Committee for the Deep Ocean Floor Investigation.

The Monbusho (the Ministry of Education, Science, and Culture) is the government agency which provides the finance for the ODP program in Japan. The Ocean Research Institute (ORI), University of Tokyo is responsible for the scientific operation of the program. The various scientific planning decisions are made by the Japanese National Committee for ODP which is composed of scientists from ORI as well as other universities and institutions.

Participation in ODP is open to all members of the scientific community in Japan. Information is sent by ORI in such forms as an ODP Newsletter and short communication notes to about 400 names within the scientific community. Publications from JOIDES and ODP such as the JOIDES Journal and Proceedings of the ODP are distributed by ORI mainly to institutions' libraries as well as to a few key people. ORI is in charge of site survey plans using the R/V TANSEI MARU and the R/V HAKUHO MARU and of workshops in Japan relevant to ODP which lead to the formulation of Japanese proposal books. ORI is now promoting the construction of some downhole instruments such as a heat-resistant downhole magnetometer. It also plans to assist Japanese scientists participating in shore-based studies in its role as an open utility institution.

JAPANESE NATIONAL COMMITTEE MEMBERS

Shohei Banno	
Toshitsugu Fujii	LITHP
Yoshikazu Hasegawa	
Akihiko Hattori*	EXCOM
Keiji Higuchi	
Masuo Iida	
Hideo Kagami	WPAC
Katsutada Kaminuma	SOP
Hajimu Kinoshita	DMP
Kazuo Kobayashi	EXCOM
Ikuo Kushiro	
Kazuaki Nakamura	TECP, WPAC
Hakuyu Okada	CEPAC
Minoru Ozima	
Hitoshi Sakai	
Hideki Shimamura	
Yoshihiko Shimazaki	
Kiyoshi Suehiro	SSP
Asahiko Taira	PCOM
Akio Takagi	
Yokichi Takayanagi	SOHP
Seiya Uyeda	
Hiroshi Wakita	

*Chairman

* * * * * * *

U.S.A.

DRILLING SCIENCE SUPPORT: JOI

Augmenting the drilling effort is a program of support designed to stimulate and encourage the widest possible U.S. community involvement in scientific ocean drilling. The program, which is managed by the Joint Oceanographic Institutions Incorporated (JOI) under a contract from the National Science Foundation and with the guidance of JOI's U.S. Science Advisory Committee for ODP (JOI-USSAC), provides funds for U.S. scientists to conduct planning activities, participate in cruises, and carry out both pre- and post-cruise studies. These activities are intended to complement other drilling-related research funded directly by the National Science Foundation as described below.

Program Elements - The JOI Science Support Program will consist of the following components:

-Support for U.S. scientists participating in ODP and for necessary follow-up studies related to initial publication of drilling results

-Planning activities, such as workshops, to define concepts and develop problem-related drilling programs, including U.S. participation in Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES)

In addition, requests for proposals (RFPs) may be issued for other surveys, regional and topical syntheses of existing data, and development of downhole tools and instrumentation, as these tasks are identified.

The JOI Science Support Program complements the activities of JOIDES and ODP by encouraging and supporting the participation of members of the U.S. scientific community. Drilling proposals formulated by U.S. scientists or groups of scientists as a result of activities supported by the JOI Science Support Program will be presented by their originators to JOIDES for review and consideration. Similarly, the incorporation of innovative downhole tools or experiments into the drilling program is subject to the prioritization of JOIDES. Conversely, when JOIDES has identified specific ODP programmatic needs, for example, for site surveys or for particular downhole instruments or systems, the JOI Science Support Program can aid in supporting members of the U.S. scientific community who respond to the identified need.

The JOI U.S. Science Advisory Committee (JOI-USSAC), appointed by the JOI Board of Governors, has members drawn from academia, government, and industry. JOI-USSAC will act as the Science Support Program planning committee and will be responsible for the overall long-term scientific direction of the program.

Science support for ODP participants from the U.S. is of the highest priority. Therefore, the JOI Science Support Program is designed to provide the opportunity for participants to obtain both salary while at sea and salary and support for post-cruise studies. This funding is administered following guidelines established by JOI and approved by the National Science Foundation.

Other specific tasks deemed necessary by JOI-USSAC, e.g. site surveys, regional and topical syntheses, and development of downhole tools and instrumentation, are carried out by individuals or groups under contract to JOI. Contractors will be selected on the basis of responses to RFPs which will describe the work to be done and the basis upon which the selection will be made. JOI-USSAC is responsible for assisting JOI in developing appropriate work statements for inclusion in RFPs and in evaluating proposals received. Solicitations will be advertised and routinely mailed to a list of appropriate organizations. In the evaluation process JOI-USSAC may invite comment from qualified scientists from government, industrial, and academic organizations. To maintain impartiality, JOI-USSAC members from institutions which have submitted proposals are excluded from the review and evaluation process.

Terms of Reference for the U.S. Science Advisory Committee -

1. The U.S. Science Advisory Committee shall formulate scientific and policy recommendations for JOI, Inc. with respect to the U.S. Science Program associated with the Ocean Drilling Program. It shall formulate the U.S. Science Program Plan as well as evaluate and assess the Program accomplishments compared to established long-term goals and objectives. The Committee shall stimulate and coordinate a wide participation by the earth science community in the U.S. science program by carrying out the following functions:

-Recommend support for shipboard scientists

-Sponsor and monitor workshop and syntheses programs

-Encourage and provide support for (a) innovative downhole measurements and experiments, (b) innovative science and technique development, and (c) the formulation of long-term integrated studies

-Review use of U.S. ODP science funds

-Consult with NSF on ODP-related programs

-Coordinate USSAC activities with other large science programs (continental drilling, COCORP, IRIS, etc.)

-Monitor progress of regional field studies and site surveys and their relationships to workshop and synthesis results in developing potential drill sites.

2. The members of the Committee shall be from U.S. universities, research institutions, government, or industry organizations.

3. The Committee shall consist of 15 members including representatives from JOI institutions and industry, government and academic organizations. The members of the Committee will be appointed by the JOI Board of Governors.

4. Terms of office of members of the Committee will be limited to three years and will be staggered so that one-third of the membership is replaced each year. The first rotation will be in October 1986. Immediate reappointment of an individual will be made only in exceptional circumstances. Terms of office will normally begin in October of each year. Appointments are to be such that over a period of 3 years all JOI institutions will have been represented on the Committee.

5. The JOI Board of Governors will select a chairman from among the members of the JOI-USSAC who shall serve for a period of two years and may not be reappointed to a consecutive term of office. An executive committee will be established by the full Committee.

6. Any action requiring a vote by the full Committee requires an affirmative vote of a majority of all members.

Invitation for Workshop Proposals - An important element of the JOI Program is the encouragement and development of long-term planning and innovative problem definition in matters related to ocean drilling and the stimulation of input from the U.S. science community at large. Therefore, funds have been made available to support U.S. planning activities which will produce explicit programs for drilling-related research. To these ends, JOI-USSAC invites proposals from the U.S. community for workshops that will result in the outlining of issues to be addressed and the identification of specific approaches to be taken. Acceptable themes may include, but are not restricted to, the broadly based scientific objectives outlined in the 1981 COSOD Report. It is expected that most of the costs of these workshops will consist of travel for participants and report preparation. A comprehensive report on the accomplishments of each workshop, with specific recommendations for further research, will be required upon its completion. Proposals or inquiries should be addressed to JOI, 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036 (Telephone: 202-232-3900).

DRILLING SCIENCE SUPPORT: NSF

The National Science Foundation's Ocean Drilling Program (ODP) accepts proposals from U.S. scientists and institutions for scientific and technological activities related to ocean drilling. Support focuses on the following topics:

-Investigations of potential drilling regions, especially by means of regional geophysical field studies

-The feasibility and initial development of downhole instruments and techniques

-Downhole geophysical experiments

In addition, NSF will consider proposals from U.S. scientists and institutions for studies leading to long-range definition of future drilling objectives.

To be considered for support, proposed projects should be clearly relevant to the drilling plans of the international drilling community and focus on pre-drilling or activities concurrent with drilling. Post-cruise studies should generally be submitted through other appropriate NSF programs in Oceanography, Earth Sciences, Polar Programs, etc., but close coordination at the Foundation will ensure that proposals are considered by the appropriate program regardless of where they are sent.

Target dates for proposals are 1 January and 1 July of each year. Proposals should be addressed to the ODP Office at the National Science Foundation, 1800 G Street, NW, Washington, DC 20550 (Telephone: 202-357-9849).

JOI-USSAC MEMBERSHIP

R. Bennett, Naval Oceanographers
R. Carlson, Texas A&M University
T. Davies, University of Texas, Austin
J. Delaney, University of Washington
F. Duennebier, Hawaii Institute of Geophysics
M. Horn, Cities Services Oil & Gas Cooperation
R. Kay, Cornell University
K. Kvenvolden, U.S. Geological Survey
M. Langseth, Lamont-Doherty Geological Observatory
R. Merkel, Anaconda Minerals Company
T. Moore, EXXON Production Research Company
J. Orcutt, Scripps Institution of Oceanography
D. Rea, University of Michigan
S. Schlanger, Northwestern University
M. Talwani, Gulf Oil Research & Development Company

* * * * * * *

DIRECTORY

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Telephone: (202) 357-9859

Ocean Drilling Program
Telephone: (202) 357-9849
Telex: (RCA) 257653 (NSFO UR UD)
Telemail: NSF.OCE.ODP

Director: E. Bloch
Deputy Assistant Director (and acting Assistant Director), Astronomy, Atmospheric, Earth and Ocean Sciences (AAEO): A. Bridgewater
Director, Ocean Sciences (OCE): G. Gross
Head, Oceanographic Centers and Facilities Section (OFS): D. Heinrichs
ODP Program Director: G. Brass

Joint Oceanographic Institutions Inc.

1755 Massachusetts Avenue, NW
Suite 800
Washington, DC 20036
Telephone: (202) 232-3900

President: J. Baker
Vice-President & General Manager: J. Clotworthy
Program Manager: D. Hunt

Chairman, JOI Board of Governors: A. Maxwell
Institute for Geophysics
University of Texas
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Austin, TX 78751
Telephone: (512) 471-6156

Constituent Members:

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La Jolla, CA 92093
Telephone: (619) 452-2826
Representative: W. Nierenberg

Lamont-Doherty Geological Observatory (L-DGO)
Columbia University
Palisades, NY 10964
Telephone: (914) 359-2900
Representative: B. Raleigh

Hawaii Institute of Geophysics (HIG)
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Telephone: (808) 948-8760
Representative: C. Helsley

Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149
Telephone: (305) 361-4000
Representative: A. Berman

College of Oceanography (OSU)
Oregon State University
Corvallis, OR 97331
Telephone: (503) 754-4763
Representative: D. Caldwell

Graduate School of Oceanography (URI)
University of Rhode Island
Narragansett, RI 02882
Telephone: (401) 792-6222
Representative: J. Knauss

Department of Oceanography (TAMU)
Texas A&M University
College Station, TX 77843
Telephone: (409) 845-3651
Representative: W. Merrell

Institute for Geophysics (UTA)
University of Texas
4920 North I.H. 35
Austin, TX 78751
Tel: (512) 451-6156
Representative: A. Maxwell

College of Ocean and Fishery Sciences (UW)
University of Washington
Seattle, WA 98195
Telephone: (206) 543-6605
Representative: R. Heath

Woods Hole Oceanographic Institution (WHOI)
Woods Hole, MA 02543
Telephone: (617) 548-1400
Representative: J. Steele

JOIDES

In addition to members of JOI Inc., the JOIDES organization includes representatives from:

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