



# Initial Reports of the Deep Sea Drilling Project

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A Project Planned by and Carried Out With the Advice of the  
JOINT OCEANOGRAPHIC INSTITUTIONS FOR DEEP EARTH SAMPLING (JOIDES)

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## Volume IV

covering Leg 4 of the cruises of the Drilling Vessel "*Glomar Challenger*"  
Rio de Janeiro, Brazil to San Cristobal, Panama  
February-March, 1969

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### PARTICIPATING SCIENTISTS

Richard G. Bader, Robert D. Gerard, William E. Benson, Hans M. Bolli,  
William W. Hay, W. Thomas Rothwell, Jr., Michael H. Ruef,  
William R. Riedel, Fred L. Sayles.

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By the  
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Scripps Institution of Oceanography  
Prime Contractor for the Project

*References to this Volume*

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# Foreword

Drilling and coring operations of the Deep Sea Drilling Project were started in August of 1968. The achievements leading to the scientific discoveries to date have elicited expressions of strong commendation for the Project from many quarters. It has excited not only the more than three hundred scientists of this country who have been involved in the project's planning and execution, but many others throughout the United States and abroad who are following the progress of this national program. The Project comprises the first wide-ranging, systematic effort aimed at the recovery of cored samples taken completely through the sedimentary layer of the deep ocean basins. A first, preliminary, examination of the material recovered already has led to a significant advance in our knowledge of the constitution and history of the earth. Further significant advances will result from in-depth laboratory studies. In years to come research on the core materials will contribute to the interest and enthusiasm of research scientists and graduate students. In addition, industry also should benefit greatly from the Project, both through the technological advances that are being made and through the information on natural resources that is being produced.

The Deep Sea Drilling Project is being undertaken within the context of the National Science Foundation's Ocean Sediment Coring Program. The Foundation is funding the project by means of a contract with the Scripps Institution of Oceanography of the University of California. The University has, in turn, subcontracted with Global Marine Incorporated, for the services of the drilling ship, *GLOMAR CHALLENGER*. Scientific planning, both of the detailed drilling itinerary and of the preliminary analyses leading to these Initial Re-

ports, has been conducted under the auspices of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). The JOIDES consortium has convened several panels for that purpose, consisting of a large number of distinguished scientists from academic institutions, government agencies, and private industry. In addition, technological advice has been given freely by many individuals, engineers and operations executives, from the petroleum and other industry. Altogether, the project has afforded a point of focus to involve the active interest and participation of the Nation's leading scientists and technologists.

The initial contract period of drilling operations consisted of an eighteen-month reconnaissance survey of the Atlantic and Pacific Oceans. With the positive confirmation of the technological feasibility and scientific value of the work, a decision was made to continue the activities for 30 months beyond the initial period. The proposed extension will include a broader geographic range of operations as well as more detailed work upon continental margins and other features of planetary significance. The ultimate goal is a fundamental advancement of our knowledge of the earth that should lead to enhanced capabilities to predict and control its processes and to exploit intelligently its natural resources.



William D. McElroy

Washington, D. C.  
December, 1969



## Preface

Recognizing the need in the oceanographic community for scientific planning of a program to obtain deep sedimentary cores from the ocean bottoms, four of the major oceanographic institutions that had strong interests and programs in the fields of marine geology and geophysics, formed in May 1964, the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). This group, Lamont-Doherty Geological Observatory; the Institute of Marine Sciences, University of Miami; the Scripps Institution of Oceanography, University of California at San Diego; and the Woods Hole Oceanographic Institution, expressed an interest in undertaking scientific planning and guidance of the sedimentary drilling program. It was the purpose of this group to foster programs to investigate the sediments and rocks beneath the deep oceans by drilling and coring. The membership of this original group was later enlarged in 1968 when the University of Washington became a member.

Through discussions sponsored by the JOIDES organization, with support from the National Science Foundation the Lamont-Doherty Geological Observatory operated a drilling program with Dr. J. Lamar Worzel as Principal Investigator. This successful drilling effort early in the summer of 1965, on the Blake Plateau region off Jacksonville, Florida, used the drilling vessel, *Caldrill I*.

With this success in hand, planning began for a more extensive deep sea effort. This resulted in the award of a contract by the National Science Foundation to the Scripps Institution of Oceanography for an eighteen-month drilling program in the Atlantic and Pacific Oceans, termed the Deep Sea Drilling Project. Operations at sea began in August 1968.

The goal of the Deep Sea Drilling Project is to gather scientific information that will help determine the age and processes of development of the ocean basins. The primary strategy is to drill deep holes into the ocean floor, relying largely on technology developed by the petroleum industry.

Through the efforts of these five principal organizations and of the panel members which were drawn from a large cross section of leading earth scientists and associates, a scientific program was developed.

Cores recovered from deep beneath the ocean floor will provide reference material for a multitude of future studies in fields such as biostratigraphy, physical stratigraphy, and paleomagnetism, that will afford a new scope for studies of the physical and chemical aspects of sediment provenance, transportation, deposition, and diagenesis. In-hole measurements, as feasible, should provide petrophysical data to permit inference of lithology of intervals from which no cores were recovered.

A report, describing the core materials and information obtained both at sea and in laboratories on shore, is published as soon as possible after the completion of each cruise. These reports are a cooperative effort of the scientists participating in the cruise and are intended primarily to be a compilation of results which, it is hoped, will be the starting point for many future new and exciting research programs. Preliminary interpretations of the data and observations taken at sea, are also included.

Following publication of each report, the core materials and data collected on the cruise will be made available to qualified scientists through the Curator of the Deep Sea Drilling

Project, following policies approved by the National Science Foundation.

The advent of *Glomar Challenger*, with its deep-water drilling ability, is exceedingly timely. It has come when geophysical investigation of the oceans has matured through 20 to 30 years of vigorous growth to the point where we have some knowledge about much of the formerly unknown oceanic areas of our planet. About one million miles of traverses had been made which tell us much about the global pattern of gravity, magnetic and thermal anomalies, and about the composition, thickness and stratification of the sedimentary cover of the deep-sea and continental margin. The coverage with such data has enabled the site selection panels to pick choice locations for drilling. The knowledge gained from each hole can be extended into the surrounding area. Detailed geophysical surveys were made for most of the selected locations prior to drilling.

The earth sciences have recently matured from an empirical status to one in which substantial theories and hypotheses about major tectonic processes are flourishing. Theories about the origin of magnetic fields and magnetic reversals, about ocean floor spreading and continental drift, and about the thermal history of our planet, have led to specific predictions that could be tested best by an enlightened program of sampling of deep-sea and continental margin sediments and underlying rocks.

The members of JOIDES and the scientists from all interested organizations who have served on the various advisory panels are proud to have been of service to the Nation and believe that the information and core materials that have been obtained will be of value to students of earth sciences and all humanity for many years to come.

# Deep Sea Drilling Project

## **MEMBER ORGANIZATIONS OF THE JOINT OCEANOGRAPHIC INSTITUTIONS FOR DEEP EARTH SAMPLING (JOIDES):**

Lamont-Doherty Geological Observatory, Columbia  
University

Institute of Marine Science, University of Miami

Scripps Institution of Oceanography, University of  
California

University of Washington

Woods Hole Oceanographic Institution

## **OPERATING INSTITUTION:**

Scripps Institution of Oceanography  
University of California at San Diego  
La Jolla, California

Principal Investigator:  
W. A. Nierenberg

Project Manager:  
K. E. Brunot

Project Chief Scientist:  
M. N. A. Peterson

# Participants Aboard

## GLOMAR CHALLENGER for Leg Four

Dr. Richard G. Bader  
Co-Chief Scientist  
*Institute of Marine and Atmospheric Sciences  
University of Miami, Miami, Florida*

Mr. Robert D. Gerard  
Co-Chief Scientist  
*Lamont-Doherty Geological Observatory  
Palisades, New York*

Mr. W. Thomas Rothwell, Jr.  
Geologist  
*Atlantic Richfield Company  
Dallas, Texas*

Dr. Michael R. Ruef  
Geologist  
*Woods Hole Oceanographic Institution  
Woods Hole, Massachusetts*

Dr. Fred L. Sayles  
Geologist  
*Woods Hole Oceanographic Institution  
Woods Hole, Massachusetts*

Mr. William R. Riedel  
Paleontologist  
*Scripps Institution of Oceanography  
La Jolla, California*

Dr. William W. Hay  
Paleontologist  
*Institute of Marine and Atmospheric Sciences  
University of Miami, Miami, Florida*

Dr. Hans M. Bolli  
Paleontologist  
*Swiss Federal Institute of Technology  
Zurich, Switzerland*

Mr. Jack Hurst  
Well Logging Engineer  
*Schlumberger  
Houston, Texas*

Mr. Francis M. Purcell  
Well Logging Engineer  
*Grice Ocean Engineering, Incorporated  
Houston, Texas*

Mr. Dan R. Bullard, Jr.  
Operations Manager  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. A. R. McLerran  
National Science Foundation Representative  
*National Science Foundation  
Washington, D. C.*

Mr. William Goad  
Coring Technician  
*Hycalog  
Shreveport, Louisiana*

Mr. Richard Bowen  
Meteorologist  
*Environmental Science Services Administration  
Washington, D. C.*

Captain J. A. Clarke  
Captain of Drilling Vessel  
*Global Marine Inc.  
Los Angeles, California*

Mr. I. N. Carter  
Drilling Superintendent  
*Global Marine Inc.  
Los Angeles, California*

Mr. J. A. Ruddell  
Tool Pusher  
*Global Marine Inc.  
Los Angeles, California*

Mr. Robert Iuliucci  
Laboratory Officer  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. Carl Wells  
Electronics Technician  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. Larry Lauve  
Photographer  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. Walter Schneider  
Marine Technician  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. Chris Ross  
Marine Technician  
*Scripps Institution of Oceanography  
La Jolla, California*

Mr. John Hardy  
Marine Technician  
*Scripps Institution of Oceanography*  
*La Jolla, California*

Mr. Walter Charm  
Marine Technician  
*Scripps Institution of Oceanography*  
*La Jolla, California*

## Senior Project Personnel

Mr. Kenneth E. Brunot  
Project Manager

Mr. Darrell L. Sims  
Project Engineer

Mr. William R. Jack  
Contracts Officer

Mr. Thomas B. Hurtt  
Business Officer

Dr. Melvin N. A. Peterson  
Chief Scientist

Dr. N. Terence Edgar  
Coordinating Staff Geologist

Dr. Elizabeth L. Gealy  
Executive Staff Geologist

Dr. Thomas A. Davies  
General Editor and Scientific Information Officer

Mr. William R. Riedel  
Curator

Dr. Anthony C. Pimm  
Geologist/Manager, East Coast Repository

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Mr. Robert Gilkey  
Logistics Officer

Mr. Thomas J. Wiley  
Public Information Officer

Dr. Robert W. Rex  
Head of X-Ray Mineralogy Laboratory

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*Scripps Institution of Oceanography*
- Mr. Jess H. Stanbrough, Jr., Executive Secretary  
*Woods Hole Oceanographic Institution*

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### *Present Members*

- Dr. J. Lamar Worzel  
*Lamont-Doherty Geological Observatory*
- Dr. Mahlon M. Ball  
*Institute of Marine Sciences*
- Mr. W. R. Riedel/Dr. M. N. A. Peterson  
*Scripps Institution of Oceanography*
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*Scripps Institution of Oceanography*

\*Deceased August 1969.

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- Capt. David D. Scott  
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 (Original Panel)**

Dr. R. Wright Barker  
*Bellaire, Texas*  
 Dr. William A. Berggren  
*Woods Hole Oceanographic Institution*  
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*Woking, England*  
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*Present Members*

Dr. R. Wright Barker  
*Bellaire, Texas*

\*Deceased August 1969.

Dr. William A. Berggren  
*Woods Hole Oceanographic Institution*  
 Dr. F. E. Eames  
*Woking, England*  
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*Scripps Institution of Oceanography*  
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 Dr. William G. Melson  
*United States National Museum*

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*Princeton University*

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*Institute of Marine Sciences*  
Dr. Pierre Biscaye  
*Lamont-Doherty Geological Observatory*  
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*Scripps Institution of Oceanography*  
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*Mobil Oil Company*  
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*Shell Development Company*  
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*Chevron Oil Field Research Company*  
Dr. Alan Reilly  
*Chevron Oil Field Research Company*



Mr. Kenneth Roberts  
*British Petroleum Company*  
Dr. R. Dana Russell  
*Marathon Research Center*  
Dr. William Walton  
*Pan American Petroleum Company*

**Project Technical Assistance Panel or Alternates**

Mr. William F. Allinder  
*Texaco, Incorporated*  
Mr. T. C. Bangs  
*Union Oil Company*  
Mr. W. F. Bates  
*Shell Oil Company*  
Mr. Edward L. Downing  
*Mobil Oil Company*  
Dr. Ralph Gilchrist  
*Tenneco Oil Company*  
Mr. R. P. Knapp  
*Esso Production Research Company*  
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*Pan American Petroleum Company*  
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*Texaco, Incorporated*  
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*Atlantic Richfield Company*  
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*Phillips Petroleum Company*  
Mr. John O. Rundle  
*Gulf Oil Company*  
Mr. J. P. Schmaltz  
*Tenneco Oil Company*

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*Present Members*  
Dr. N. Terence Edgar  
Dr. A. E. J. Engel

Mr. Jeffrey D. Frautschy  
Dr. Edward G. Goldberg  
Dr. Henry W. Menard  
Dr. William A. Nierenberg  
Mr. William R. Riedel  
Dr. George G. Shor  
Mr. Hugh Slawson, Student Member  
Dr. Edward L. Winterer  
Mr. Kenneth E. Brunot, Ex-Officio  
Dr. M. N. A. Peterson, Ex-Officio  
*Past Member*  
Dr. Tj. H. van Andel

**Science Advisors—Scripps Institution of Oceanography**

Mr. William R. Riedel  
Dr. Tj. H. van Andel

**Proposal and Contract Affairs**

Mr. Jeffrey D. Frautschy  
*Scripps Institution of Oceanography*  
Mr. Warren Levin  
*University of California*  
Mr. W. Burgeson  
*University of California at San Diego*

**Atlantic Site Surveys**

Lamont-Doherty Geological Observatory

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Scripps Institution of Oceanography

**Support Vessel M/V EUREKA During Sea Trials**

Dr. Donald Tobin  
*Shell Development Company*  
Dr. Peter Lehner  
*Shell Development Company*

# Deep Sea Drilling Project

## SAMPLE DISTRIBUTION POLICY

1. Requests for samples should be addressed to: Curator, Deep Sea Drilling Project; Scripps Institution of Oceanography, University of California at San Diego; La Jolla, California 92037. The requests should specify the quantities and intervals in the core required, a statement of the proposed research, the possibility of returning residue to the Curator, the estimated time required to complete and publish the results, and the availability or need of funding and availability of equipment and space foreseen for the research. Initial core description should normally serve as a basis for these sample requests. In order to ensure that early requests for highly desirable but limited samples can all be honored, distribution of samples will not be made until at least one month after the date of publication of each issue of the initial core description. The only exceptions to this policy will be for samples leading to the initial core description, or for specific instances involving ephemeral properties.

Requests for samples from researchers in industrial laboratories will be handled in the same manner as those from academic organizations, and there will be the same obligation to publish results promptly. Requests from foreign scientists or organizations will also be considered.

2. The Deep Sea Drilling Project's Curator has the responsibility for distributing samples, controlling quality of samples, and preserving core material. He also has the responsibility for maintaining a record of requests for samples that have been processed and filled, indicating the investigator and subjects to be studied. This record will be available to investigators.

The distribution of samples will be made directly from the two repositories at Lamont-Doherty Geological Observatory and Scripps Institution of Oceanography, by the Curator or his designated representative.

3. The National Science Foundation will establish a Sample Distribution Panel to advise on the distribution of core material, which will be chosen in accordance with its usual practices, in a manner which will assure advice in the various disciplines leading to a complete and adequate study of the core and related materials. The Curator and the Chief Scientist of the Deep Sea Drilling Project will meet with the Panel.

4. (a) Samples up to 3 cc/meter of core length can be automatically distributed by the Curator, Deep Sea Drilling Project or his authorized representative to any qualified investigator who requests them. The Curator will refrain from making automatic distribution of any parts of the cores which appear to be in particularly high demand and any requests for these parts of the cores will be referred to the Sample Distribution Panel for review. Requests for samples from thin layers or important stratigraphic boundaries will generally require Panel review.

(b) All requests for samples in excess of 4(a) above will be referred to the Sample Distribution Panel.

(c) If, in the opinion of scientific investigators, certain properties they wish to study may deteriorate prior to the normal availability of the samples, such investigators may request that the normal waiting period not apply. All such requests must be approved by the Sample Distribution Panel.

5. Samples will not be provided prior to the assurance that funding for sample studies either exists or is not needed. Provision of samples will not imply any associated commitment to fund the proposed or additional research. If a sample request is dependent, either wholly or in part, on proposed funding, the Curator will provide to the organization to whom the funding proposal has been submitted any information on the availability of samples that they may request, but will wait for final assurance that the funds are available before distributing the requested samples.

6. Investigators receiving samples are charged with:

- i) the responsibility of promptly publishing worthwhile results;
- ii) acknowledging, in publications, that the National Science Foundation supplied the samples;
- iii) submitting three copies of all reprints of published results to the Deep Sea Drilling Project; Scripps Institution of Oceanography, University of California at San Diego; La Jolla, California 92037; and
- iv) notifying the Curator of any additional work done on the sample that was not

- stated in the original request for which the samples were made available; and
- v) returning, in good shape, remainder of samples after termination of research, if so requested by the Curator.
7. Cores will be made available at repositories for investigators to examine and specify exact samples, in such instances as this may be necessary for the scientific purposes of the sampling, subject to the limitations of 4(a), (b), (c), and 5 above, and with the specific permission of the Curator or his delegate.
  8. Cores of igneous and metamorphic rocks will also remain at the repositories where they will be available for observation and description, and where selected samples may be taken for thin-section preparation and other work.
  9. Within the context of sample distribution, there also falls the category of raw data and information. Examples of this information would be the magnetic tapes from the X-Ray diffraction studies, the X-Ray radiographs of the cores, and logging records. Such information would be available, after publication of the initial descriptions, to any qualified investigators, and could be reproduced by those prepared to defray the costs.
  10. This policy has the approval of the National Science Foundation and is incorporated in the Program Plan for the Deep Sea Drilling Project. It is now in effect.

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