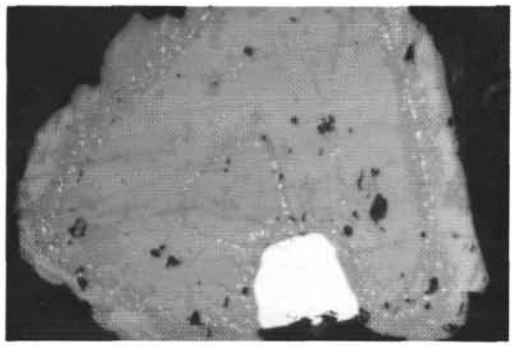
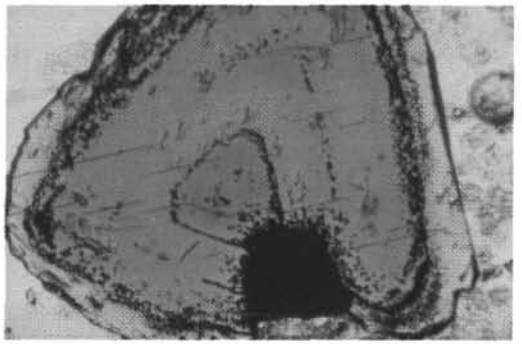
1A. Grain of sphalerite with zone distribution of fine chalcopyrite blebs; large body of chalcopyrite (cream color) located on one side of the sphalerite grain. Color shades in sphalerite are due to compositional variations: bluish gray is related with chalcopyrite blebs; brownish gray is chalcopyrite-free sphalerite (Sample 504B-70-1, 110–111 cm, reflected light). 1B. Same as 1A (transmitted light). Notice colorless sphalerite overgrowth surrounding most of the grain, except on chalcopyrite. 2A. Detail of an aggregate of sphalerite with fine chalcopyrite blebs along the edges and cutting across grains of sphalerite (Sample 504B-80-2, 63–67 cm, reflected light). 2B. Same as 2A (transmitted light). Notice colorless sphalerite filling cracks and spaces between grains. 3. Grains of sphalerite (yellow brown) with large bodies of chalcopyrite (black); blebs of chalcopyrite are concentrated at the grain boundaries and cracks and along the large bodies of chalcopyrite (Sample 504B-80-1, 106–111 cm, transmitted light). 4. Grain of sphalerite (gray) with chalcopyrite blebs (cream) concentrated toward the grain boundaries. The size of the blebs increases toward the center of the sphalerite grain. Pyrite (almost white) overgrowth occurs between grains of sphalerite (Sample 504B-80-2, 63–67 cm, reflected light). 5. Chalcopyrite (yellow) with sphalerite stars (see 4) and sphalerite (gray) with chalcopyrite blebs (Samples 504B-80-1, 34–38 cm, reflected light). 6. Sphalerite stars (gray) in a grain of chalcopyrite (yellow) (Sample 504B-80-1, 34–38 cm, reflected light). This material is further discussed in Honnorez et al., this volume.



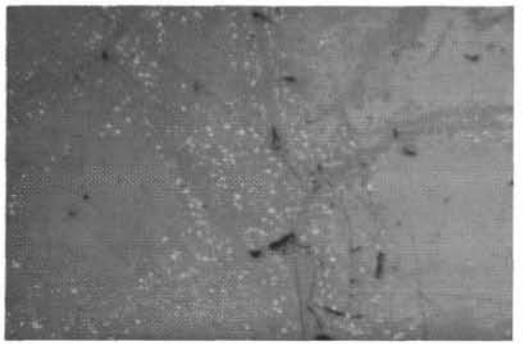
1A

180 μm



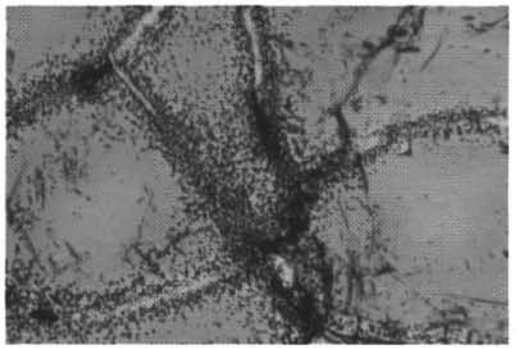
1B

180 μm



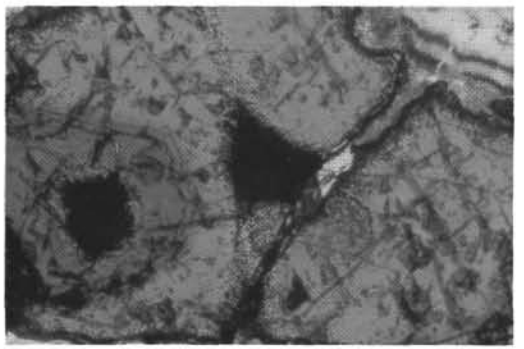
2A

270 μm



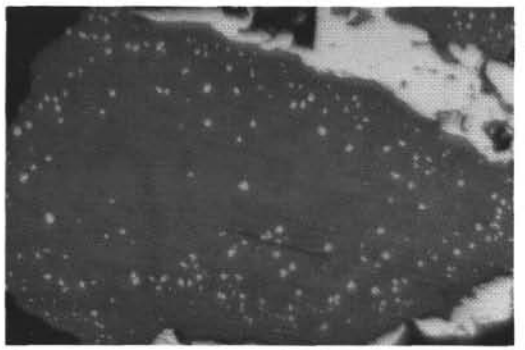
2B

270 μm



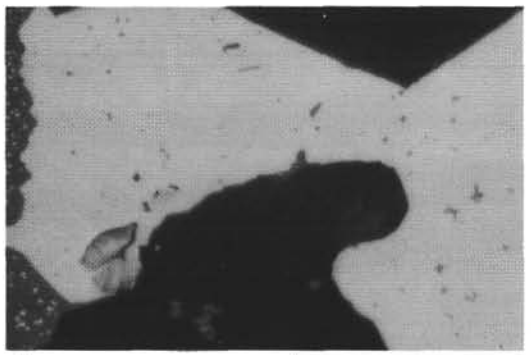
3

480 μm



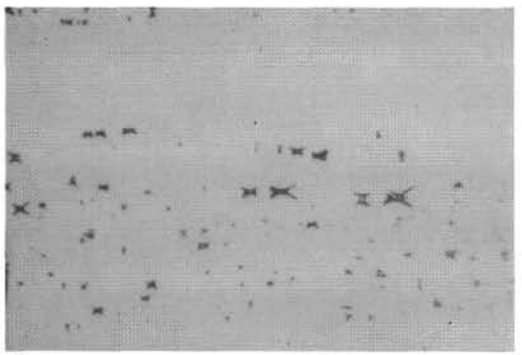
4

80 μm



5

80 μm



6

80 μm

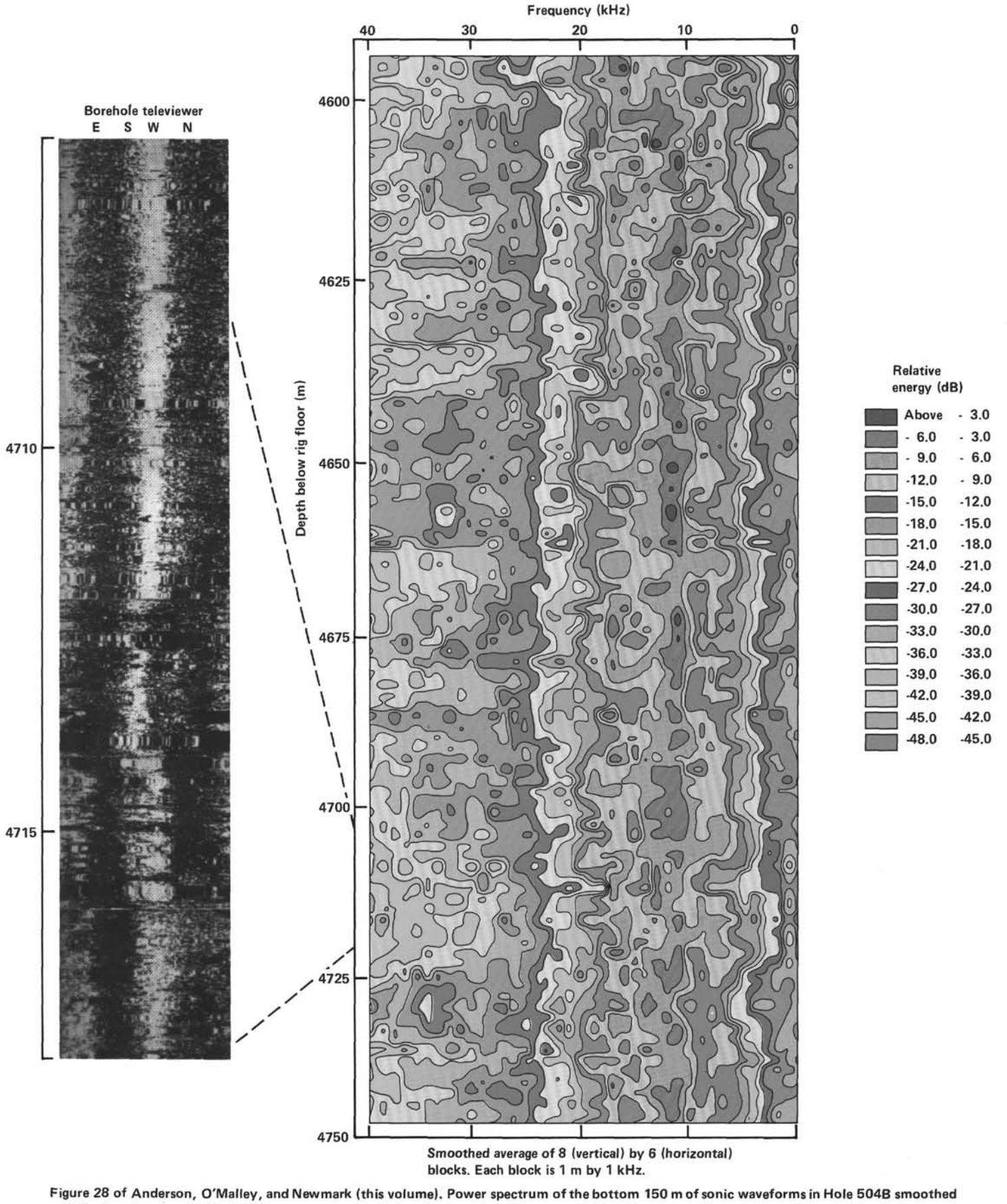


Figure 28 of Anderson, O'Malley, and Newmark (this volume). Power spectrum of the bottom 150 m of sonic waveforms in Hole 504B smoothed and displayed against a BHTV reflectivity image of 10 m of the borehole. Power (in dB) is relative to the highest value within the interval. The horizontal fractures at 4715 m cause the energy drop in 30–40 kHz normal-mode energy observed in the spectrum (yellow colors). See Newmark, Anderson, et al. (this volume) for a description of the televiewer records.

Initial Reports of the Deep Sea Drilling Project

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

VOLUME LXXXIII

covering Leg 83 of the cruises of the Drilling Vessel *Glomar Challenger*
Balboa, Panama, to Balboa, Panama
November 1981–January 1982

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Foreword

The world's first major oceanographic expedition took place between 1872 and 1876. This expedition, aboard the H.M.S. *Challenger* covering nearly 70,000 nautical miles and gathering oceanographic data from 362 stations, expanded our knowledge of the ocean and provided a solid foundation for future studies in marine geology. A century later, another vessel also named *Challenger* continued to expand our knowledge of the world's ocean and helped revolutionize our concepts of how the seafloor and the continents form and change. The drilling vessel *Glomar Challenger* sailed the same waters as its historic counterpart, seeking answers to new questions concerning the history of our planet and the life it supports. The continued advancement of knowledge about the fundamental processes and dynamics of the earth is leading to a greater understanding of our planet and more intelligent use of its resources.

Since 1968, the Deep Sea Drilling Project (DSDP) has been supported by the National Science Foundation, primarily through a contract with the University of California which, in turn, subcontracted to Global Marine Incorporated for the services of the D/V *Glomar Challenger*.

Through contracts with Joint Oceanographic Institutions, Inc. (JOI, Inc.), the National Science Foundation supported the scientific advisory structure for the project and funded predrilling geophysical site surveys. Scientific planning was conducted under the auspices of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). The JOIDES advisory group consisted of over 250 members who made up 24 committees, panels, and working groups. The members were distinguished scientists from academic institutions, government agencies, and private industry all over the world.

In 1975, the International Phase of Ocean Drilling (IPOD) began. The IPOD member nations, Federal Republic of Germany, Japan, United Kingdom, Soviet Union, and France, partially supported the project. Each member nation actively participated in the scientific planning of the project through membership in JOIDES. Scientists from these countries also took part in the field work aboard the D/V *Glomar Challenger* and postcruise scientific studies.

The first ocean coring operations for the Deep Sea Drilling Project began on August 11, 1968. During the ensuing years of drilling operations in the Atlantic, Pacific, and Indian oceans, the Gulf of Mexico, Caribbean Sea, Mediterranean Sea, and Antarctic waters, the scientific objectives that had been proposed were successfully accomplished. Primarily, the age of the ocean basins and their processes of development were determined. The validity of the hypothesis of seafloor spreading was firmly demonstrated and its dynamics studied. Emphasis was placed on broad reconnaissance and testing the involvement of mid-oceanic ridge systems in the development of the ocean basin. Later legs of the *Challenger's* voyages concentrated on the nature of the oceanic crust, the sedimentary history of the passive ocean margins, sediment dynamics along active ocean margins, and other areas of interest. The accumulated results of this project have led to major new interpretations of the pattern of sedimentation and the physical and chemical characteristics of the ancient oceans.

Technological advances have provided new tools which in turn have opened new dimensions of scientific discovery. The introduction of the Hydraulic Piston Corer in 1979 permitted virtually undisturbed cores of soft sediment layers to be obtained. This technological advance has greatly enhanced the ability of scientists to study ancient ocean environments, as recorded by sediment characteristics and flora and fauna preserved in these deposits.

A second major advance has been the use of the hole after drilling. The project routinely logged holes and performed geophysical and geochemical studies before, during, and after drilling. Long-term downhole geophysical seismic monitoring devices have been implanted successfully in DSDP holes. These new listening devices and geophysical studies have provided valuable information about the origin and nature of the dynamic processes of plate tectonics.

These reports contain the results of the initial studies of the recovered core material and the associated geophysical information. All the world's people benefit either directly or indirectly from this fundamental research. Knowledge about past and present conditions and processes are the foundations for future predictions and developments. Both short- and long-term benefits are obtained by advances in drilling technology and instrumentation. Information is being obtained about the origin and geographic distribution of natural resources. Just as the H.M.S. *Challenger* had a profound impact on scientific thought for over a century, this second *Challenger* expedition has given a greater understanding of the oceans and the processes that form and shape the earth.

Erich Bloch,
Director

Washington, D.C.

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 Institututions for Deep Earth Sampling (JOIDES). This group—Lamont-Doherty Geological Observatory; Rosenstiel School of Marine and Atmospheric Science, 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 the original group was later enlarged, in 1968, when the University of Washington became a member and again in 1975 when University of Hawaii Institute of Geophysics, the Oregon State University School of Oceanography, the University of Rhode Island Graduate School of Oceanography, and Texas A&M University Department of Oceanography became members. In accordance with international agreements, institutions of participating nations became members of JOIDES. Thus, during 1974 to 1976, the Bundesanstalt für Geowissenschaften und Rohstoffe of the Federal Republic of Germany, the Centre National pour l'Exploitation des Océans of France, the National Environmental Research Council of the United Kingdom, the University of Tokyo of Japan, and the Academy of Sciences of the USSR became JOIDES members.

Through discussions sponsored by the JOIDES organization, with support from the National Science Foundation, Columbia University's Lamont-Doherty Geological Observatory operated a drilling program in the summer of 1965 on the Blake Plateau region off Jacksonville, Florida.

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, University of California at San Diego for an eighteen-month drilling program in the Atlantic and Pacific oceans, termed the Deep Sea Drilling Project (DSDP). Operations at sea began in August 1968, using the now-famous drilling vessel, the *Glomar Challenger*.

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 the principal organizations and of the panel members, who 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 provide reference material for a multitude of studies in fields such as biostratigraphy, physical stratigraphy, and paleomagnetism that afford a new scope for investigating the physical and chemical aspects of sediment provenance, transportation, deposition, and diagenesis. In-hole measurements, as feasible, 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 onshore, is published after the completion of each cruise. These reports are a cooperative effort of shipboard and shore-based scientists 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.

Core materials and data collected on each cruise will be made available to qualified scientists through the Curator of the Deep Sea Drilling Project, following a Sample Distribution Policy (p. xvii) approved by the National Science Foundation.

The advent of *Glomar Challenger*, with its deep-water drilling capability, 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 have been made which tell us much about the global pattern of gravity, magnetic and thermal anomalies, and about the composition, thickness, and stratigraphy 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.

In October 1975, the International Phase of Ocean Drilling (IPOD) began. This international interest, and the true participation of both the scientists and governments of a number of nations, are eloquent testimony to the importance of the work being done by the Deep Sea Drilling Project.

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

Deep Sea Drilling Project

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Bundesanstalt für Geowissenschaften und Rohstoffe, Federal Republic of Germany

University of California at San Diego, Scripps Institution of Oceanography

Centre National pour l'Exploitation des Océans, Paris

Columbia University, Lamont-Doherty Geological Observatory

University of Hawaii, Hawaii Institute of Geophysics

University of Miami, Rosenstiel School of Marine and Atmospheric Science

Natural Environment Research Council, London

Oregon State University, School of Oceanography

University of Rhode Island, Graduate School of Oceanography

Texas A&M University, Department of Oceanography

University of Tokyo, Ocean Research Institute

University of Washington, Department of Oceanography

U.S.S.R. Academy of Sciences[2]

Woods Hole Oceanographic Institution

[1] Includes member organizations during time of cruise.
[2] This institution and its committees and panel members were noncontributing members of JOIDES at time of cruise.

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SAMPLE DISTRIBUTION POLICY *

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 support shorebased investigators who are preparing contributions to DSDP and 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, Texas A&M University, College Station, Texas 77843-3469, U.S.A., 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 the 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 ephemeral properties, 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 interval will be 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

* Revised October 1984.

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 their contributions to ODP reports. Investigations which are not completed in time for inclusion in ODP reports for a specific cruise may be published in a later edition of ODP reports; however, they may not appear in another journal until the ODP report for which they were intended has been published.

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

   A. Researchers who wish to use samples for studies beyond the scope of the DSDP or ODP reports should obtain sample request forms from the Curator, Ocean Drilling Program, Texas A&M University, College Station, Texas 77843-3469, U.S.A. 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 explicit justifications and more time to process, and are unlikely to be granted in their entirety.

      Requests for samples from thin layers, from stratigraphically important boundaries, 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 waiting period; however, such requests will be referred automatically to the relevant co-chiefs. If approved, the investigator will join the shorebased 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, Texas A&M University, College Station, Texas 77843-3469, U.S.A. These reprints will be distributed to the repositories, to the ship, to the National Science Foundation, and to the Curator's reprint file.

(4) To submit all final analytical data obtained from the samples to Data Base Manager, Ocean Drilling Program, Texas A&M University, College Station, Texas 77843-3469, U.S.A. Please consult recent issues of 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 condition 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 visting 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. As of this writing (mid-1984), Foraminifera and Calcareous Nannofossils can be viewed; Radiolaria and Diatoms will be prepared in the future. The present centers are Scripps Institution of Oceanography, California (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, Texas (S. Gartner, tel. 409-845-8479); Smithsonian Institution, Washington, D.C.; Lamont-Doherty Geological Observatory, Palisades, New York; 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, Texas A&M University, College Station, Texas 77843-3469, U.S.A. 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 core 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 ap-

prove 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.

At least through mid-1986, DSDP data will continue to be distributed by the Data Base Manager, Deep Sea Drilling Project, A-031, University of California, San Diego, California 92093, U.S.A. A charge will be made to recover expenses in excess of $50.00 incurred in filling individual requests. If required, estimates of charges can be furnished before the work is performed. As DSDP phases down, DSDP data will be available primarily from the National Geophysical Data Center, Boulder, Colorado.

Requests for ODP data should be addressed to the Data Base Manager, Ocean Drilling Program, Texas A&M University, College Station, Texas 77843-3469, U.S.A. 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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ACKNOWLEDGMENTS

Leg 83 of the Deep Sea Drilling Project (DSDP) was devoted entirely to coring and experiments in Hole 504B, the deepest borehole to date into the oceanic crust. Hole 504B now extends over a kilometer into basement, nearly twice as far as any other DSDP hole, and it is the only DSDP hole to have clearly penetrated into the intrusive sheeted dikes that underlie the extrusive pillow lavas of the upper oceanic crust.

At Hole 504B, Leg 83 continued an ongoing DSDP effort that began during Legs 68, 69, and 70 in 1979, and also included part of Leg 92 in 1983. The Leg 83 scientific party thank Captain L. Dill and the crew and technical staff of the *Glomar Challenger* for their enthusiasm and expertise, without which our successes would have been impossible. In particular, we thank the guest Cruise Operations Manager, G. Norrie of Chevron, the Drilling Superintendent, A. C. (Jr.) Wheeler, and the entire drilling crew, who saved Hole 504B from near-disaster on several occasions, leaving it open for future reentry and deeper drilling during the Ocean Drilling Program.

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