THIRD

PERFORMANCE EVALUATION

FOR THE

OCEAN DRILLING PROGRAM

Report of the
JOI Performance Evaluation Committee (III)
and
Response of Subcontractors, JOIDES, and JOI

May 1992

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Foreword

This report is the third in a series of performance evaluations of the Ocean Drilling Program. The evaluations, primarily aimed at the management of the program and the performance of the subcontractors, are called for in the contract between Joint Oceanographic Institutions and the National Science Foundation. The evaluations have been three years apart since the beginning of the program: the first took place in 1985, and the report was available in September 1986. The second took place in 1988, and the report was available in May 1989. PEC III made its site visits and met during 1991, and this report presented in May 1992 includes both the report of the committee and the responses of the subcontractors.

As with earlier reviews, we have been fortunate in finding experts who were both familiar with the program and not currently involved in any formal substantial way. We were pleased that Dr. John Maxwell agreed to chair the group and that the membership represented the international and private industry makeup of ocean drilling participation. Dr. William E. Benson, a long-time participant in ocean drilling activities, provided staff support for the group as he had with the second evaluation.

PEC III ranged over a wide variety of topics, and those specifically related to operations are answered in the responses from the subcontractors. JOI will monitor the responses to ensure that steps are taken to improve the situations that the PEC noted. PEC III also considered some program-wide issues of planning, selection of proposals, achievement of the goals outlined in the first and second Conferences on Scientic Ocean Drilling (COSODs), and publication policy. Since these do not relate directly to subcontractor performance, but rather to overall program management, I will discuss these briefly here. All of these broader issues will have to be seriously considered by EXCOM and PCOM as they look at the program for the future. As part of this consideration, EXCOM has agreed to establish an Advisory Structure Review Committee that will meet during 1992 to consider the effectiveness of the current advisory structure.

The broader issues considered by PEC III include the planning and proposal process, the site survey funding mechanisms, the openness of the scientific, planning, and operation structures, and conflict of interest issues. PEC III suggested that ODP planning might consider a somewhat more "top-down" approach to complement the current proposal-driven process. That is, they felt that the JOIDES thematic panels should more actively strive to accomplish chosen scientific objectives. PEC III recommended that larger groups should be formed to generate proposals, believing that these consensus proposals would have a better chance of getting support both for site surveys and for drilling legs. PEC III also believed that the PCOM must be prepared to focus the program in order to address the best science, even if some parts of the broader community are not included. All these points must be discussed by EXCOM and PCOM.

PEC III noted that the membership of PCOM should be broadened to include members from non-JOI institutions in the U.S. This would help broaden the institutional support and might make it easier to work through conflict of interest issues. This is an issue that must be considered by the JOI Board of Governors.

PEC III also suggested, as some earlier groups have, that the per-leg Scientific Results volume be discontinued. The overall publications policy of ODP has been a subject of much discussion over the years without a clear resolution. It is clear that the debate will continue.

One important new task undertaken by PEC III was the assessment of how ODP achievements have related to goals. Five different scientific areas were chosen, and a selected group of legs reviewed to assess how well the COSOD II objectives were being met. The details are provided in the report and its appendices. From this review, the committee found that a certain meaure of success was achieved in each of the areas. Problem areas include the continuing lack of sample recovery in difficult and hostile areas such as bare, hot, fractured or stressed rocks; the general inability to respond to unforeseen contingencies such as the need to drill additional sites; and maintaining a balance between the five major COSOD themes. These are all issues that must be addressed by the advisory structure and the subcontractors.

Finally, a note about communications and public relations. PEC III noted that large segments of the public and the world's scientific community are unaware of the contributions of ODP to our knowledge of the Earth. A stronger public relations program was recommended. There is no question that such an improvement in communications would be beneficial, but as Dr. Pyle noted in his response from JOI, there are already many pressures on the budget. The decision to establish a stronger public relations effort will have to be debated and decided by EXCOM and PCOM.

ODP will be constantly reviewed in 1992 and 1993. PEC III started the process; the U.S. National Research Council has just finished a review of the Long Range Plan. Other national reviews have taken place in several partner countries. In addition to its newly established Advisory Structure Review Committee; the EXCOM has started a process of soliciting informal interest in subcontracting from all partner countries; that process is in itself a review, because it reveals where various groups think they might be able to do better. The results and recommendations of all of these reviews will be taken into account as ODP prepares for renewal.

Since the current contract for the program ends in 1993, PEC III will be the final PEC under this contract. We want to thank all those who participated in all the PEC reviews: the three chairmen, William Hay, Charles Drake, and John Maxwell, the PEC members, all the scientists, engineers, and staff of the program, and all others who have been involved. Reviews take time and energy, but are essential elements of a healthy and efficient program.

D. James Baker
President
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REPORT

PERFORMANCE EVALUATION COMMITTEE III

December 20, 1991

Prologue

The Ocean Drilling Program (ODP) is widely acclaimed as one of the best (if not the best) international programs that have ever been attempted.[1] Its scientific accomplishments are well-known and need not be rehearsed in detail here. Suffice to say that without the deep-sea-drilling activities the knowledge of our planet would be very much more fragmentary. The history of continents and oceans, of climate, and of biologic evolution, have all been revised by ODP discoveries, and the interactions between the air-ocean-lithosphere system, geochemical cycles and exchange of energies will be better understood as a result of the studies of ODP scientists.

ODP's management structure has allowed and fostered multi-national participation with a minimum of bureaucratic complications. It is justifiably regarded by many as a model for future cooperative scientific undertakings, within or without the geological sciences.

The present committee (PEC III) appreciates and agrees with the commendations given to ODP and concurs with the judgement that ODP can continue to be a valuable project for years to come. Such critical comments as we make, therefore, are in the spirit of improving a good project and helping it avoid future pitfalls.

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[1]We include here not only the present ODP but also its earlier incarnations, the Deep Sea Drilling Project (DSDP) and the International Program of Ocean Drilling (IPOD).

Introduction

The charge to the Performance Evaluation Committee III is to evaluate the Management of the Ocean Drilling Program and the performance of its subcontractors. In preparation for this task we met initially at JOIDES headquarters in Austin, Texas; visited the Science Operation at Texas A&M University; the Borehole Research Group, Site Survey Data Bank, and Core Storage and Curation facilities at the Lamont Doherty Geological Observatory; the JOIDES Resolution; and ended the visits with one day at JOI headquarters in Washington, D.C. The committee spent four days at ODP-TAMU, including a day with the Co-Chief scientists at their annual meeting; two days at LDGO, and two one-day visits to the ship during port calls in San Diego and Victoria.

In addition to these officially scheduled visits, PEC III members were privileged to attend two meetings at the Scripps Institution of Oceanography: a one day seminar addressing the future of ocean drilling, and a two day joint meeting of the ODP Council and EXCOM, which focused, in part on the future of the ODP. In addition, four committee members separately attended parts of three PCOM meetings and one participated in a panel meeting. Further details of the PEC III schedule are given in the appendix.

From the visits and meetings described above, coupled with our own views and experiences, PEC III arrived at two principal conclusions: 1) operations to date have gone well and in many instances have achieved excellent scientific results; drilling, sampling and logging accomplishments continue to equal or exceed reasonable expectations. 2) Future operations, however, will demand deeper penetration, longer drilling times at some locations, and more sophisticated logging and sampling tools; the use of additional drilling platforms is already being planned.

PEC III senses a growing concern that present planning and management may not be structured to cope adequately with anticipated future demands. This opinion seems to be shared by members of EXCOM. We warmly endorse EXCOM's appointment of Dr. James Briden to initiate inquiries into such critical issues as "directed" vs. "responsive' scientific studies; "unitary" vs "dispersed" management; and broadening the involvement of the scientific community while maintaining a focused, well-managed program.

ODP-TAMU

The Ocean Drilling Program at Texas A&M University is the subcontractor for ODP operations other than wire line logging. PEC III visited ODP-TAMU May 27-31, 1991, the last day being devoted to the annual meeting of the Co-Chief scientists.

Overall Impressions

PEC II concluded that ODP at TAMU was functioning very well and that the few identifiable flaws were largely externally imposed. We concur and note that the whole operation seems smoother and more effective than in 1988. Many of the flaws perceived by the earlier PECs have been effectively addressed, and the management is obviously open to constructive criticism and determined to improve wherever possible.

We were especially impressed by the evident communication and cooperation among the departments and between departments and top management. The general atmosphere is upbeat, and reflects a satisfaction in doing a good job. This sort of atmosphere always comes from the top down and we must conclude that Dr. Rabinowitz is an effective leader.

To be sure, nothing is ever ideal, but most of the problems seem minor and typical of a complex operation. One notable exception is the continuing effect of the budget cut of FY'88. This occasioned cuts in both the number of staff scientists and the number of marine technicians, straining the capacity of both groups to fulfill their roles. Some relief seems to have been achieved, but both groups are still stressed. We are especially concerned by seemingly increasing unhappiness among the technicians, as detailed in the section devoted to the JOIDES Resolution. The advent of new monies from the USSR may provide the opportunity to redress these deficiencies.

Science Operations

The staff scientists appear to be enthusiastic, hard-working, and over-worked. By the time a staff scientist has been with ODP for three years, he(she) is working on three cruise legs simultaneously, planning, going, and coordinating the publications. At sea, the staff scientist must handle scientific logistics, and at the same time be aide-de-camp for the Co-Chiefs, while performing a share of the scientific work. Judging from comments at the annual Co-Chiefs meeting, the staff scientists handle their responsibilities very well. We note, in passing, that Co-Chiefs of two legs expressed irritation at episodes of "micromanagement" by PCOM during the cruise, though apparently there were no bad consequences.

TAMU encourages (and apparently even pushes) the staff scientists to pursue their own research, and, when appropriate, to continue their education (although most now seem to have their PhDs). This policy undoubtably boosts morale and helps to retain good people.

On the down side, the staff is too small and over-worked. The cut of three staff scientist positions during the FY88 budget crunch has strained their ability to handle all the tasks. The Co-Chiefs, at their TAMU meeting, recommended that the technical staff should number about 2.5 times the total technical complement per cruise, in order to improve the level of staff expertise, permit standdowns, allow technicians to become more involved in shore-based ODP projects, increase flexibility of technical staffing and improve overall technician morale. Most of these points were addressed during the ship visits, and are dealt with in greater detail in that section of this report. During the December, 1990, meeting of PCOM, K. Moran, chairman of the Shipboard Measurements Panel, reported that the ratio of technical to scientific staff aboard ship has decreased while the amount of technical equipment has increased. SMP recommends 4 extra technicians per leg to avoid cuts in shipboard measurements. It seems obvious to our committee that additional technicians are needed, not only to restore the cuts of 1988, but also to cope with increased technical responsibilities on shipboard.

Further complications arose when Part B of the cruise reports became a set of peer-reviewed papers and the staff scientists were made responsible for the process. The rationale for the staff cuts in FY88 was the creation of an Editorial Review Board, consisting of the two Co-Chiefs, the staff scientist, and an outside scientist, each responsible for one quarter of the volume. This revision of the procedures has not worked as well as anticipated. Unacceptable delays occur, the staff scientist still must shoulder a large part of the editorial burden, and the decentralization of responsibility has slowed the publication of some volumes. Later in this section we suggest a significant revision to Part B that would relieve the staff scientists of much of this editorial burden, perhaps to the point of obviating the need for restaffing all three of the previously eliminated positions.

Policy on Selecting Co-Chief Scientists

The committee was much impressed by the vigorous interaction between Co-Chiefs and TAMU staff during the annual Co-Chiefs' meeting. It was obvious that Audrey Meyer and her staff are keenly aware of the importance of the Co-Chiefs for the success of a cruise, from pre-cruise planning through final publication of results. Reports of this year's and earlier Co-Chiefs' meetings indicate that their advice and experience are valued and are incorporated into future procedures. Except in unusual circumstances, TAMU should continue to be entrusted with the appointment of Co-Chiefs. The scientific integrity of a drilling leg is obviously best preserved by Co-chiefs who have deep and well-thought-out commitments to its scientific objectives.

Engineering and Cruise Operations

It seems evident that the goal of achieving the scientific objectives mandated by JOIDES is the driving force at this facility. Considering that, if drilled by industry, a large proportion of holes would be classed as "rank wildcats" and that, in addition, the drilling is done without a riser, the success rate in drilling is as high as could be expected. Both the tools under development and the improvements to existing tools testify to the capability, imagination and determination of the small staff.

Two deficiencies were called to our attention:

1) The staff is too small and the budget too restricted to pursue all the suggested and desirable tool development. For example, to do the job right and with dispatch, development of the diamond coring system for deep hard-rock penetration would require one or two more people and would cost an estimated $ 2 million or more.

2) As a result of the pressures of drilling schedules and the lack of shore-based testing facilities, new gear has been sent out prematurely on the Resolution, causing delays at sea and wasting ship time on both the engineering and regular legs. A strong argument can be, and has been made for saving costly ship time ($ 2000/hr) by adding much needed funds and staff for development engineering. If new funding is not available, Engineering must set priorities for tool development; PCOM is to be complimented for establishing such priorities. Obviously these priorities may require reassessment as the program progresses.

Core Storage and Curation

The repository at TAMU is functioning well and is well run. Since the visit of PEC II, the repository has expanded its computer program and has a new data base for sample distribution. It also has direct links with repositories at Lamont. The TAMU repository will be filled by about Leg 149, and the TAMU staff is looking into various solutions to the space problem. The "geriatric core studies" started about three years ago are continuing, but will require another two years before any real conclusions can be reached. These studies should help decide how much and what kind of space will be needed to house and preserve the cores effectively and economically.

Publications

A number of groups, including PEC I and II, have urged faster communication of the drilling results to the scientific public, and TAMU has responded. A spate of volumes in 1990 reduced the backlog, and the volumes now are in nearly steady-state flow. Part A, the initial report, is getting close to the target completion time of one year, and Part B, the peer-reviewed science volume, is close to 30 months, but this may be unrealistic.

One impediment in the timely production of part "B" is the Editorial Review Board. Originally instituted as an economy measure in 1988, it has taken 75% of the authority for the review process from ODP-TAMU. This has occasioned some delays in getting the manuscripts ready for publication, and has apparently not gained greater acceptance of "B" as "white" literature. Nor has it relieved the load of staff scientists as much as had been hoped. The JOIDES Information Handling Panel has recommended that review control be returned to ODP-TAMU.

We suggest that the per-leg Scientific Results volume be discontinued and that participants be invited to submit freely to the open literature, provided they inform the Co-Chief scientists of their intent. The participants would be required to inform ODP/TAMU when an article had been accepted for publication, and to provide reprints once published. We suggest that ODP/TAMU implement a program of reprinting all the published articles in a special ODP publication which could still be called (for sake of continuity) ODP Scientific Results, but which would be based on a per-volume (perhaps 4 or 5 volumes per year) rather than per-leg schedule. In addition to reprinted articles, this publication could include some articles which are unlikely to be accepted or printed in full in standard journals because of special content (too many photographs or tables for example, that are nevertheless important for a full documentation of the leg).

The proposed system would have the following advantages:

1. Important ODP results would gain immediate access and visibility to the open literature and its prestigious journals.

2. Substandard articles would not be published and ODP would not contribute to grey literature.

3. Healthy competition would be fostered among the leg participants, and publication by active researchers would not be delayed because of late submission by colleagues to the per-leg SR volume.

4. Special articles which require extensive sets of photographs or tables could still be published and referenced in the new ODP SR volume system. The reprinted articles would better be referenced by their original acceptance dates.

5. The new ODP Scientific Results publication would provide a very useful means of keeping check on the total published ODP-related material, a very valuable research tool.

6. Although some per-leg coherence would be lost, we feel that this is now a less important concern because the thrust of the program should be on scientific themes. These themes would perhaps cover several legs and the new format would facilitate the preparation of synthetic thematic synthesis volumes more easily than the present format.

7. The burden of publications of ODP/TAMU would be reduced to a large extent, thus allowing the shifting of ODP-TAMU staff to key issues essential to the success of the drilling program (i.e. engineering development).

Computer Services

Computer operations on both ship and shore have been extensively revised in the past few years and seem to be functioning well considering the chaotic state of industry. The hardware is probably not all state of the art, but the field is changing so rapidly that state of the art is all but impractical. Aboard ship virtually all data handling is now by computer, and much of the work for Part "A" can be accomplished before landing. Co-chiefs have complained that requiring that Part A be in camera-ready form when it leaves the ship is unrealistic. Perhaps this final procedure could be handled at TAMU.

Administration (TAMRF)

As noted by PEC II, the administrative staff, who are employees of the Texas A&M Research Foundation, are highly competent and efficient. The relatively small staff handles all the fiscal matters, administrative services, and contracting (some $ 28 million of sub-contracts per year). The fact that they are housed in the ODP building undoubtedly helps the obvious cooperation between Administration and other divisions, but it is still most refreshing to encounter a service group which clearly recognizes that its job is to facilitate, not hinder, the science.

Columbia University is the operator for the ODP Wireline Logging Service, the East Coast core Depository and the Site Survey Data Bank, all located on the campus of the Lamont-Doherty Geological Observatory. The committee met there September 25 & 26, 1991, with representatives of those ODP-related units. The Data Bank and Core Depository are housed in a modern building complex, seemingly with adequate facilities for personnel. In contrast, the Borehole Research Group, which is responsible for wire line logging and sampling, occupies overcrowded quarters in an old frame building. The danger of catastrophic fire should be a matter of concern.

Borehole Research Group:

In spite of inadequate quarters, the BRG seems to have good morale and to operate efficiently and creatively. Challenges parallel those facing Science Operations and Engineering Research at TAMU, in that both are attempting to modify commerical logging or drilling tools and practices to meet the requirements of slim-hole, open-hole operations and the scientific objectives of ODP. Clearly the BRG staff has both a scientific interest in the logging data and a service function for interpreting the data. Both objectives are required to encourage the shipboard use of logging and to develop essential logging instruments and interpretative capability. It appears that BRG has met the recommendations of PEC II for improving both the acceptance of logging and the correlation between down-hole logging and core descriptions. The ability to compare logs and cores aboard ship and in real time is a major step forward.

The overall philosophy of the Borehole Group is that the logging should make a maximum contribution to the science. This has led them to adapt standard logging tools to the needs and problems of ODP and to pursue the development of tools not standard in the usual arsenal of oil-well logging. As a result the past three years has seen improvements in stratigraphic correlation between holes in some areas, the correlation of bulk densities with Pleistocene climatic cycles, and improvements in basement logging, including borehole imaging techniques, bottom hole seismic measurements, and in-hole determination of some chemical elements.

The only real question about the quality of logging results concerns the in-situ chemical determinations. The LDGO group uses Schlumberger algorithms, which were developed for other strata in other environments. Therefore the reliability of the geochemical logs needs significant further testing and documentation. For particular chemical elements or certain legs where BRG staff have devoted concerted effort to the problem, the retrieval of useful information may be relatively stratightfoward. On the whole, however, the logs of the various sites are not uniformly processed, documented nor understood, and dissemination of these data without caveats can lead to false conclusions.

The BRG Logging Service currently has analog data from 37 DSDP legs and digital data from 37 ODP legs. These data are being transferred to optical disks to establish a data base for general distribution. The data will later be deposited with the National Geophysical Data Center, Boulder, Colorado. Standard logs can be made available to scientists in 3 to 4 months for preparation of the Initial Reports volumes, and to other interested parties after about 1 1/2 years. To assess present and future needs for its services, BRG contacted 78 user institutions, and 48 responded. A wide range of interests and backgrounds in both data requirements and processing capabilities is indicated. We conclude that its present and anticipated services are much in demand and that BRG is doing its job very well. Two factors have contributed especially to BRG's success 1) the early contacts with the co-chiefs and attendance at pre-cruise meetings, and 2) the quality of the logging results. We strongly support continuing the pre-cruise education programs.

A bibliography of BRG publications, from the inception of ODP through mid 1991, lists over a hundred titles; most are from the ODP Scientific Results volumes, but more than a third are from a variety of scientific journals. The Journal of Geophysical Research is the favored journal outlet, but articles from 13 other journals, symposia volumes and proceedings are also cited. The list does not include post-cruise summaries and short articles published in EOS, GSA Today, Geotimes, and similar topical publications. Such summaries are of great importance for informing the scientific and engineering readership of the current accomplishments of ODP.

Costs of the logging program have risen faster than the budget, partly because of new tools coming on-line, partly because of new requests, and partly because of shipping costs. Of the approximately $3.5M in the LDGO budget, $1.87M goes to the Schlumberger contract, (charged about 1/3 of the usual commercial rate). Budget deficits for each of the past three years seem to be caused largely by unforseen events related to drilling and logging. It would be difficult to include realistic figures for such events in the rather modest ODP wireline logging budget. They have apparently been handled by JOI either from a contingency fund or by requesting a supplement from NSF.

Looking Ahead

We are pleased to learn that BCOM has approved the requested staff increase of FY 1992. Clearly the work load related to expanding wireline logging justifies this expansion.

A proposed innovation is the adoption of Schlumberger's MAXIS system, which would transmit on-line data in real time from the ship to LDGO and thence through Internet around the world. Whether ODP will try this is questionable, because it would violate the proprietary nature of ship-board data for a year. PEC III questions also whether this communication would be cost effective. It seems not to be vital to the operation.

Anderson noted that a COSOD II objective is not being met, i.e., deep penetration into hot rock. To help achieve this objective LDGO is working on the design of a temperature-resistant logging package, but they have neither enough money nor staff to complete the job. The report that one of the holes on leg 139 became a "black smoker" when the drill string was withdrawn lends urgency to their request for both!

The problem of balance between working on the documentation, support, interpretation and calibration of existing logs versus the efforts to advance new technologies and improve existing instrumentation becomes increasingly acute as manpower budgets are squeezed. For example, is it worth more to develop a slim-hole high temperature tool for situations which don't even exist yet, or to put the manpower into working on existing logs? BRG seems to do a fair job of balancing these two issues, but they are not always in a position to make their own choices; for example the development of particular technologies may be mandated by a JOIDES panel. The present system works because people talk to each other and sort things out. If/as the operation gets larger and more formal, this *modus operandi* could become dysfunctional.

Site Survey Data Bank, LDGO

The Site Survey Data Bank, initiated in 1975, is directed by Carl Brenner and funded separately at about $250K. It is the archival agent for the Site Survey Panel and the Safety Panel. The Data Bank, as a function of JOIDES, is available to users worldwide. Efforts are made by the SSP to determine the plans of oceanographic vessels whose observations may be useful for ODP proposals. The safety record of ODP suggests that the SSP and Data Bank are doing their jobs very well indeed.

We learned that ODP no longer funds site surveys directly; any needed survey must be funded by the proposer, who may request funds from other programs and agencies (e.g. MG&G at NSF, USSAC, etc.). Brenner recommended that site survey funds be restored to the ODP program, both to assure adequate data and to insure implementation of good proposals whose authors lack ready access to site survey funds or facilities. From our brief visit we judge that the Site Survey Data Bank is being run efficiently and effectively.

Core Storage Facility

The Committee visited the Core depository at LDGO only briefly. We understand that refrigerated storage is now full, but expansion space is available sufficient to accommodate about two years of drilling. Facilities are clean and obviously efficiently handled. We compliment the staff also on the care exhibited in ordering and cleaning older collections.

JOI

On September 27, following the visit to LDGO, PEC III members visited the headquarters of Joint Oceanographic Institutions, Inc., in Washington, D.C. The President of JOI, James Baker, Vice President Thomas Pyle, and Ellen Kappel of USSAC provided insight into the confusing array of organizations which interact to manage and support this highly successful international operation. The management of JOI, with both academic and government experience, obviously works effectively to serve the needs of ODP, and to interface with the National Science Foundation which provides the U.S. share of ODP funds.

In addition to funding responsibilities for day-to-day operations, JOI must also react to emergencies such as catastrophic equipment losses and volatile fuel costs. Publication of the JOIDES Journal, the Long Range Plan and brochures, and public relations are also important obligations of JOI, as are liaison with related ocean research projects such as RIDGE, and with the IGBP if possible.

JOI's obligations, in a very real sense, are world-wide, involving interaction with foreign as well as U. S. government agencies. PEC III strongly recommends that JOI also strengthen its communications public relations program to broaden public knowledge and support for ocean drilling. The addition of at least a part time, experienced science writer would probably be required to accomplish this objective.

As with any complex operation, JOI needs an adequate fund for contingencies and unallowable costs. We understand that the JOI contingency fund is made up of dues and contributions from the JOI institutions, a management fee for ODP from NSF, and other management fees. PEC III strongly recommends that these fees and contributions continue.

Visits to the R/V JOIDES *Resolution*

On Tuesday, July 9, 1991, PEC III members toured the Joides *Resolution* in San Diego harbor. A member of the scientific party for the upcoming Leg 139 led the tour of the science facilities and living quarters on the ship. Glen Foss, TAMU Operations Superintendent, then showed the PEC members the drilling facilities. Following the tour, we sampled the *Resolution*'s cuisine during lunch in the mess hall. On Wednesday and Thursday, September 11-12, 1991, a PEC III member visited the ship and conducted several "exit interviews" with the co-chief scientists and shipboard scientists coming off Leg 139. PEC III would like to emphasize that while this section principally derives from the ship visits, all of the positive and negative statements have a basis in onshore discussions at TAMU, LDGO, JOI, and various committee meetings as well.

Science Facilities

The science facilities contained what we considered to be good to excellent equipment for on-board analysis of core material and logging data. Computers are plentiful, and with the exception of the computer that records the logging data, are networked together for easy communication, and approximately equally divided between PC and Macintosh operating systems in order to accomodate both cultures. The logging computer should be replaced and networked with the others. In addition, some instrumentation is outdated, requiring scientists to do work, such as titrations, that could be easily automated.

The science laboratory space is divided up into a number of "theme" labs. The space appears to be designed for scientists to work in isolation or in small groups of 2 to 3 researchers. Some of the labs (notably the underway geophysical lab) are far removed from the others. There is no equivalent to the "main lab" on oceanographic research vessels where most of the data analysis and scientific exchange occurs.

The individual labs range from pleasant and roomy (e.g., micropaleontological lab) to crowded (e.g., chemistry lab). The physical properties and paleomagnetics labs were clearly designed to accommodate at most 1 or 2 people. The core lab seems to be the only work space where 4 or 5 scientists can work easily together.

Although the ship has several areas reserved for analysis of science data, none is appropriate for formal or informal gathering of a major subset of the scientific party. The science lounge appears to be mainly a video parlor (i.e., seats arranged in theater mode, no portholes, etc.) Science meetings must be scheduled for use of that space, and it barely accommodates the science party.

The library contains a good collection of reference books but is chopped up into small, individual cubicles. The chief scientists' office is too small for group meetings and too noisy on account of its location along the main corridor for an individual to work in peace. On the other hand, the Leg 139 co-chief scientists liked the layout of the offices, which they viewed as being key to the smooth operation of the ship because it maximizes communications among the various operations (ODP Operations Superintendent, SEDCO Chief, Co-Chief Scientists).

Drilling Facilities

ODP personnel and shipboard scientists were uniformly highly complimentary of the SEDCO personnel, who are professional, responsive, and talented, and who take great pride in their work.

Some important changes have been made to the ship to better support deep scientific drilling, such as adding a second brake for the drill string and providing a second winch for wireline operations. In general, the work spaces (e.g., core technician's lab) were open and spacious. Nevertheless, much of the physical plant for the drilling operations still reflects industry needs rather than those of ODP. For example, the rarely used facilities for mixing and storing drilling muds are quite extensive, whereas the space devoted to what is becoming an increasing large and sophisticated suite of wireline logging tools is minimal.

Other criticisms we heard of the SEDCO operations included not stocking a large enough supply of spare parts for ODP equipment maintained under contract and charging a rig rate for down time that is too favorable to SEDCO/FOREX.

Living Conditions

The science cabins are nothing more than places to sleep and change clothes. They are too cramped for working. What were originally designed as single cabins have been converted to doubles, and the doubles have been converted to four-man cabins. PEC members could readily sympathiize with shipboard scientists who complained about the necessity of sharing a room with 3 others and a small bath with 7 others.

The galley is noisy and off the beaten track. In order to seat the entire shipboard party for a meal, four sittings are required. It is hard to imagine that informal scientific discussions would spontaneously occur or continue in that environment. Most PEC members felt that the food was not of top quality, but we heard the comment that it could fluctuate from poor for the odd-numbered legs to good for the even-numbered legs. This impression was borne out by the Leg 139 personnel who liked the food and also commented on the pleasant and professional Catermar personnel.

The exercise room was difficult to evaluate because it was filled with boxes at the time of our visit. Our impression was that it is too small and contains too few exercise machines for a shipboard party of more than 100. Modest additions to this and other recreation facilities would be helpful - satellite TV was suggested, but the cost may be prohibitive.

Fifty-six days at sea (62 in the case of Leg 139) is too long in the opinion of the staff scientsts and technicians, as well as some of the co-chief scientists. Efficiency and productivity are reduced on long cruises, especially considering the fact that shifts are 12 hours, 7 days per week. Too short a cruise, however, results in too much down time during transits. Complaints against 56 day cruises were rare on the Glomar Challenger. Reducing the size of the scientific party on the JOIDES Resolution would relieve the extreme crowding and perhaps increase efficiency on long cruises.

Personnel

Two major and a few minor problems regarding shipboard personnel were identified as a result of the Leg 139 exit interviews of scientists. We emphasize that these should not be regarded as leg-specific problems, as they all were raised in some fashion in other discussions.

Far and away the most serious problem is that of technician morale. The core of the problem is that the technicians have the responsibilities of professionals (and behave as such according to the scientists) but are not so treated by ODP management. The technicians have been told that they are not expected to stay in the program very long, but the shipboard scientists are heavily dependent on them and their responsibilities are too great for temporary employees. The jobs require permanent professionals; many of the technicians see this as a career, and want to be treated as career professionals. Treating them otherwise is false economy.

When the technicians make recommendations, we were told, ODP either does not respond or does not credit them for the ideas. If the technicians show interest in getting experience or training to do their jobs better, they are discouraged. For example, a Leg 139 technician asked to stay in port while a company representative went over an instrument so that she could learn more about it. Her willingness to stay on after two months at sea indicates a high level of commitment to her work. However, her request was turned down. In the same vein, some of the technicians are inadequately trained or untrained; that is, they do not know how to run some of the instruments or do not know which chemicals are hazardous. Shipboard scientists emphasized that the technicians tried to be helpful, but that ODP had clearly not provided adequate training; in addition to wasting time on board ship, this situation reflects poorly on the U.S. and ODP and is doing "major damage" to ODP from the perspective of the member nations. In this context, it should be noted that even some scientists treat the technicians as "just" technicians. The technicians recognize that this is inevitable with some cultures and personalities, and have learned to cope with such people. This is not the source of their morale problem, which rather seems to stem from administrative practices. Furthermore, the time on board for the technicians is too long in comparison with the time off, particularly given the fact that they are required to spend their time off in College Station. This requirement is ostensibly to allow training and participation in the science, but we understand, in fact, that they are given unrelated tasks. Finally, their compensation was recalculated recently in a way that is most unfavorable. Shipboard time is considered by ODP as if it were so many days of normal 8-to-5 work.

In addition to the increase in the number of technicians in the pool, as recommended by the co-chief scientists, other actions would greatly improve morale at little or no cost to ODP. The technicians should be treated as permanent professionals and accorded the respect such positions command. They should be given the adequate training in their assigned tasks, as well as cross training, and their duties should be clarified. The staff scientists on board ship should, as a principal responsibility, inform the shipboard scientists at the outset that the technicians are key to shipboard operations, with specific duties, and should be treated with respect. One way to do this would be to organize and facilitate discussions in meeting between technicians and scientists at the beginning of each cruise.

Furthermore, the technicians should be allowed to live wherever they wish. Two months on board alternating with two months off (with perhaps a week at TAMU prior to each cruise) would be more acceptable. PEC III received some indication that if the pay were better for the time on, the technicians would find it acceptable for the time off to be without pay, as for SEDCO (and many oil rig) personnel. This could foster higher morale by allowing the technicians to take meaningful jobs during their time off and giving them more flexibility if they are in two-career partnerships. They sensed the lack of someone within ODP management willing to represent their interests.

The second major problem was one raised by the co-chief scientists, who must play a major role in choosing the shipboard scientists. They noted problems with member nations which did not nominate scientists in a timely fashion, thus delaying staffing. People that are nominated are commonly inappropriately experienced. The country committees need to pay closer attention to cruise objectives. The idea that if a cruise is close to a country, that country has the right to have more shipboard scientists is not automatically acceptable because it reduces flexibility for staffing the ship, fosters international rivalry in proposals, and encourages those country scientists to treat the data as proprietary. The last two problems are outgrowths of structural problems in ODP planning, and are addressed in Section IV of this report. In addition, concerns were raised by several parties about the high number of pre-Ph.D. scientists sent by both the U.S and non-U.S. members. Such participants are rarely qualified and experienced enough to bear their share of responsibilities.

Minor problems are that shipboard collaboration and cooperation, including even division of labor, do not happen naturally (see previous comments on the contribution of the physical facility to this problem). The staff scientist and co-chief scientsts should be coached in group dynamics and management of people. Furthermore, at present only one person from Schlumberger is available on each cruise, and during logging, that person has to work both 12 hour shifts. ODP should investigate whether Schlumberger could send two people on cruises requiring extensive logging time.

Overall Impressions

The *Resolution* is without a doubt an extremely large and impressive vessel. She appears to be very well maintained. Even the areas devoted to drilling operations were clean and freshly painted. The science facilities available to the scientists are state-of-the-art, or nearly so. Shipboard scientists praise TAMU's commitment to provide the finest equipment for the scientists on board so that they make very effective use of their time at sea.

Although the ship is well designed for technicians to make efficiently large suites of measurements on core rocks, it is far less than ideal for scientists to integrate and analyze the results of these measurements. The physical arrangement may be contributing to our impression that ODP scientists are working in small groups, with not enough sharing going on. Even manuscripts are now privately processed on the P.C.'s, such that no other members of the scientific party need ever see them, rather than being typed by a shared yeoperson. Given the international composition of the program, if the intellectual connections with the other members of the scientific party that lead to successful collaboration are not forged at sea, they are unlikely to happen afterward.

The living conditions may be contributing to the overall dissatisfaction with longer drilling legs. In fact, we were surprised that we did not receive more complaints at the co-chiefs' meeting concerning the living conditions on the ship. One obvious solution to the problem of overcrowding in the science cabins, labs, lounge, exercise room, and mess hall is to reduce the size of the scientific party. With the large number of ODP members, this would require new MOU's, preferably allowing just one shipboard participant from each member nation and a comparable downsizing of the U.S. contingent. (For some legs, the shipboard party size might be increased, based on the need for scientists with certain skills, not particular passports.) We do not feel that this reduction in scientific party will in any way compromise the scientific mission. Rather, we feel that it will lead to less competition and tension among the science party members.

Review of Success In Addressing COSOD Objectives

Introduction

PEC III sought to assess on two different levels how ODP achievements have so far related to goals. Overall achievements of legs addressed to the themes of high latitude drilling and evolution/extinction of organisms were compared to the goals of COSOD II, and a selected group of legs was chosen from hard rock, active margins and rifted margin legs and evaluated for achievement of the objectives as formulated in the pre-leg prospectus. In cases where goals were not achieved, efforts were made to identify the reasons (technological difficulties, overly ambitious or unrealistic goals, etc).

We present here a synopsis and offer some conclusions. The full reports are presented in the appendix.

Summary - Hard-rock Drilling

We selected four ODP legs (106, 109, 118, 125) which principally addressed hard rock drilling objectives. Two legs (106, 109) were devoted to zero-age crust on the Mid-Atlantic Ridge. Of the first leg only 33 metres were drilled, due largely to unstable hole conditions, even after over a month of technical preparation on site. The follow-up leg (109) deepened this hole by only 17 metres in over a month of effort. Chance had it that concurrent ALVIN work in the same area pointed to a possibly attractive target, an extensive outcrop of ultramafics. Successful, albeit unplanned, drilling of 86 m of peridotite was achieved at this serendipitous site.

One leg (118) was aimed at recovering a section of oceanic mantle in the Atlantis II fracture Zone. The only successful site was unplanned and occupied only during the last fortnight; here, a 500 m-thick section of gabbro was drilled with very good recovery. The fourth hard-rock leg (125) addressed the origin and evolution of forearc terrains and particularly serpentine domes. One hole, planned as an alternate, and drilled last in this leg achieved 720 m penetration into basement. Another hole drilled unexpected, young volcanics in the forearc. Six sites in the domes showed that they are made of serpentine and are probably diapirs.

Summary of "Evolution/Extinction" Objectives

COSOD's stated objectives here were strongly oriented toward patterns and processes of evolution and extinction, e.g. heterochrony, post-extinction recovery and selectivity, speciation. The objectives of understanding paleoclimatic/paleoceanographic processes was secondary (and fell principally under working group 1). Almost none of the evolution/extinction objectives were addressed directly in the ODP-publications, but instead, ODP has been generating prolific and exciting scientific results with respect to paleoclimatology/paleo-oceanography. It is important to note, however, that the "gestation" period for scientific results in evolution/extinction, once the data are available, is probably longer than the four years since the COSOD II report was issued. The legs that have generated exciting results in paleoclimatology/paleo- oceanography have also represented highly successful efforts toward establishment of global, high resolution biostratigraphies, explicitly identified in COSOD II as critical for the evolution/extinction studies.

Summary of Legs Addressing the "Rifting of Continental Lithosphere"

Five ODP legs (103, 104, 107, 122 and 123) addressed the question of rifting of continental lithosphere. Most of these had other objectives as well, largely related to paleoclimate and paleooceanography. The drill sites were carefully selected, because the depth to the base of the syn-rift sediment package for most margins is beyond the capabilities of the Joides Resolution. Even for those sites within reach, it was necessary to use an offset drilling strategy, taking advantage of tectonic exposures to sample the entire section. These legs, for the most part, can be considered succesful in that they contributed valuable new information to geophysically derived models of rifting history and margin architecture. Most of the inferred ages of rifting events were significantly revised, based on the recovered biostratigraphy, and the physical properties thought to be controlling the seismic character of prominent reflectors were almost always found to be incorrect. For at least 2 of the legs, the rifting objectives were severely compromised because the legs were composites of individual drilling proposals with common geography but vastly different objectives.

Summary of High Latitude Drilling

Six ODP-legs (104,105, 114 115, 119, 120) were devoted to high latitude drilling. One occurred after leg 120 when the Southern Ocean panel was disbanded. Data from the legs 104 and105 generally confirm that northern hemisphere glaciation started about 10 MY ago, but major sub-arctic ice cover was achieved only 4 MY ago. The northern hemisphere climatic evolution is an important scientific objective and should not be combined with tectonic objectives. The strategy of leg 104 which mixed the two objectives was detrimental to both.

The Sub-Antarctic drilling has demonstrated (1) the existence in early Oligocene of an Antarctic ice cap of continental proportion; this is the first evidence for warm saline deep water in the Paleogene ocean, implying that past ocean circulation may have worked fundamentally differently than today; (2) recovered a suite of oldest (lower Albian) siliceous microfossils, and (3) discovered that sudden changes in the bottom conditions, at the Paleocene/Eocene boundary were catastrophic. [redacted]

Summary of Active Margin Drilling

Nine ODP legs (110, 112, 125-128, 131, 134, 135) were devoted to three different types of drilling environments in active margins: accretionary prism, forearc slope and back-arc basin. In general, objectives that depend on sampling have been fairly successful, but objectives linked to in-site (downhole) measurements have been unsuccessful, especially in accretionary environments, partly because of lack of adequate tools and partly because of hole stability problems.
Most of the drilled targets in active margins have been shallow. There has not been a clear strategy in hole distribution. In order to bridge the gap between geology observed in orogenic belts and that of active margins it is essential to drill deeper into higher parts of the prism and forearc with penetration as much as 1500 - 3000 m. Penetration of the decollement was achieved at two sites: the lesser Antilles forearc and the Nankai Trough forearc. Although in-situ measurements were not achieved, very dense sampling compensated for this to some extent.

Conclusions:

Our review of achievements versus goals for past ODP legs can be summarized as follows:
- some measure of success has been achieved in all the reviewed topics.

- attainment of goals was hindered by poor sample recovery in difficult and hostile environments (bare, hot, fractured rock or stressed rocks in accretionary prisms) and by [redacted]

- [redacted] (for example the need to drill additional sites in high latitudes or to continue drilling in layer 3 material in the Atlantis II tracture Zone).

- balance between the five major COSOD II theme[redacted]

- [redacted] This is inevitable when thematic panels are only asked to "grade" competing proposals.

- the engineers should clearly explain the technological limitations to the scientists. Many of the attempted sites were established without clear knowledge of what is feasible or even possible with existing hardware. This has often resulted in poor, or no recovery.

Meeting Long Term Program Objectives - ODP

During our evaluation of the subcontractors, as discussed above, we frequently met issues which impacted the execution of ODP programs but which were not sub-contractor-related. Many of these were not specifically assigned as part of the purview of PEC III, but we have chosen to elaborate them here, because they affect operations. (This follows the precedents set by PEC I and PEC II.) While varied in nature, these issues concern the JOIDES planning structure and the interfaces between JOIDES, JOI and the subcontractors. We are sensitive to the fact that most of these issues have been previously identified and many have been exhaustively discussed over the ODP years. Our viewpoints may not be comprehensive nor historically complete, and our proposed solutions probably do not reflect all of the complexities of the issues involved. Nevertheless, we believe that strong and continued attention to these issues is important, as a natural part of the evolution of complex and multifaceted operation such as ODP. With this in mind, and because the JOIDES advisory structure has never been formally reviewed (as all of the other parts of the ODP have), we recommend that a panel be appointed to provide a comprehensive evaluation of the overall planning and advisory structure.

Some of the issues to be enumerated here include the planning and proposal processes, the site survey mechanisms, the "openness" of the scientific, planning, and operation structures, and conflict-of-interest issues.

The Proposal And Planning Process

Funding has been made available for ocean drilling to achieve long-term program objectives as defined by COSOD I and II. The JOIDES Executive Committee, the Planning Committee, the planning panels and the various detailed planning groups (DPG) are given the charge to design means to achieve the objectives. In this section we shall discuss the current procedures, critiques of the current procedure, and recommendations for a change in procedure.

The Current Procedure

Although JOIDES has a complex advisory structure, it has, de facto, operated as a facility from which individual P.I.'s request time on the drill vessel through submittal of proposals. Various efforts have been made to encourage maximal participation by earth scientists. The fact that only well-defined "mature" drill proposals have a chance of being assigned high priority by this advisory structure is discouraging to scientists with good ideas but not enough geophysical data to prepare drill proposals. The currently modified practice, in which "letters of intent" will be considered, is a step in the right direction to broaden the access of a wide segment of the scientific community to the drilling vessel. This change has, however, not yet been sufficiently publicized.

The current practice of planning is illustrated by the statement contained in a memo sent out by the chairman of JOIDES Planning Committee, instructing planning panels on "evaluating and/or ranking programs/proposals contained in the North Atlantic Prospectus: The goal is to choose from among these candidates a slate of drilling legs for FY 93, based upon re-reviewing and re-ranking by thematic panels of the proposals/programs found herein". The panel members were reminded that they "should not be allowed either to rank or to influence ranking (unduly) of proposals on which they are identified as proponents."

Critique of the Current Practice

ODP should operate as a science management structure entrusted with accomplishing certain scientific goals which go beyond the capabilities of individual P.I.'s or even nations.

Critiques of the current practice during the July 1991 JOIDES EXCOM meeting, as recorded in the minutes thereof, include statements by members of EXCOM that: a) ODP cannot implement the recommendations of COSOD II, because COSOD II "was not focussed, but provided something for everybody", and b) thematic panels (and PCOM) are locked into a bottom-up mode and should be "more pro-active and influence the proposals submitted".

The key issue, as discussed by EXCOM, is the "bottom-up" mode versus the "top-down" mode. While being responsive to the critiques of the scientific community, the so-called "bottom-up" philosophy may have led to the situation that the ODP planning has not always been optimal. One of the consequences of making the program "proposal-driven" is that individual PIs (and countries) are forced to compete against each other rather than encouraging them to pool their talents and cooperate.

Recommendations for Future

We recognize that the current system was devised to address the perception of DSDP as a closed community. However, the reform has created new problems. Our recommendations are an attempt to improve planning while maintaining openness.

PEC III feels that JOIDES thematic panels should not operate soley as passive bodies to evaluate or select proposals, but more as bodies actively striving to accomplish chosen scientific objectives; this mode of operation will be critical for addressing the exciting and fundamental questions facing ocean sciences in the next decade. PEC III endorses changes to move the program in this direction.

It should be recalled that the ocean-drilling program was not designed as a proposal-driven program. The past successes during DSDP and earlier years of ODP owed much to a management structure which encouraged team spirit, the spirit of cooperation in formulating coordinated sets of proposals for best science. It was not at all a "top down" procedure, but was a "bottom-up" practice with a much broader basis than the current practice of competing proposals.

Specifically, PEC III recommends that the philosophy of implementing COSOD goals should be modified. Thematic panels were constituted to include scientists who have contributed to COSOD I and II. Members of each panel were entrusted with the duty to formulate a proposal, to be presented by the panel to PCOM to implement the originally defined goals. Active participation in influencing the implementation of COSOD objectives is not a conflict of interest, if the "proposal" is prepared by the thematic panel.

In formulating a drilling program, we suggest that each thematic panel be charged with devising a drilling program consisting of one or more legs aimed at addressing one of the COSOD themes. This program would result from a series of one or more workshops open to an international group of scientists who volunteer their ideas, data, or other expertise relevant to the theme. PCOM would be entrusted with assigning drilling time to the various thematic panels based on the relative strength and justification of needed drilling time for their drilling programs.

PEC III believes that this procedure was followed during the planning for DSDP and some early IPOD legs. Such a procedure did not unduly favor those who could submit "mature proposals", and led to a drilling program which received widely based support. This openness encouraged the spirit of teamwork which contributed greatly to the successes of deep-sea drilling.

Site Surveys

The key element in proposal acceptance and scheduling seems to be its "maturity". The adequacy of the site survey to satisfy the SSP is the major element for determining maturity. We recognize the budgetary restraints, but also see the chilling effect such a requirement must have on potential proposals from investigators who do not have the requisite geophysical capability. After two decades of this restrictive factor, we wonder if new blood is being generated in sufficient quantity to keep the body growing.

For most, if not all of the ODP member nations there exists no separate mechanism for funding detailed site surveys to aid in locating drill holes. Geophysical surveys in support of drilling are judged by the same criteria applied to non-ODP related science. In the US, however, those funds, if granted, come from a separate fund for ODP-relevant work. Thus PI's and nations with better access to ship time are more likely to produce drilling proposals deemed to be "mature" by the present advisory structure. Even if nations set up separate accounts to fund site-surveys, not enough funding would exist to raise all proposals to the level of maturity. However, under a revised planning system in which drilling programs result from international community-planning and consensus, as recommended by PEC III in the preceding section, detailed site surveys could be undertaken efficiently, because funds would not be expended on sites with low probability of being drilled.

To date, the geophysical work has been funded by the science foundations of the member nations (depending upon the nationality of PI), not through comingled funds of the ODP. Under a system in which drilling programs are generated by a large, multinational constituency, it may be possible to fund site surveys in the same way, as individual contributors to the collaborative effort are still free to submit proposals to their funding agencies. However, the possibility of making available comingled funds would expedite the process of providing site survey information in a timely fashion. For example, the nearest ship of opportunity, regardless of nationality, could be chartered (or requested) for the survey, as was done during the DSDP days.

Breadth of "Constituency"

Concern for breadth of participation has been addressed extensively in earlier PEC reviews and many gains have been made. Over half of the members of the JOIDES panels , and nearly all of the chairmen, now come from non-JOIDES institutions. However, by "charter", USA membership in PCOM and EXCOM is confined to JOIDES institutions, and, during legs 101 to 137, two thirds of U.S. co-chiefs were from JOI institutions. In response to PEC II concerns, the JOI Board of Governors in 1988 agreed to allow two of the ten U.S. PCOM members to be drawn from non JOI- institutions. To date, no implementation of this "permissive" decision has occurred. In July 1991, the JOI Board of Governors reiterated the general principle that PCOM membership could be drawn from a community larger than JOI institutions, but instigation was left to the JOI institutions themselves! We feel this situation should not be left to chance. Perhaps it could be implemented by JOI on a rotating basis.

The advantages to be achieved by broadening the membership of PCOM include not only an influx of fresh talent into the planning structure, but also an enlargement of the marine constituency having a stake in ODP; a significant influence on attitudes toward priorities in the earth and ocean sciences could result. The problems of conflict-of -interest inherent in the present and slowly exchanging JOIDES "pool" would also be diminished. For example, at a recent PCOM meeting, during discussion of a particular drilling proposal package, five members of PCOM, including the chairman, excused themselves during the discussion. While giving the appearance of sensitivity toward conflict of interest, this action also disenfranchised the most knowledgeable group of proponents from the discussion of the proposals. With a large enough pool to draw from for PCOM, is it conceivable that the PCOM membership, or at least the chair, could be enjoined from being active proponents on drilling proposals?

Planning Committee's Function

The JOIDES PCOM was established mainly to insure that the scientific goals outlined in COSOD reports would be implemented through optimal planning. During the DSDP, IPOD, and the early years of ODP the mode of PCOM operations was to schedule drilling legs to investigate various themes such as ocean crust, ocean margins and ocean history. With the ship schedule as the boundary condition, panels formulated drilling proposals, which were approved or modified by PCOM and carried out by the project operations.

The present mode seems to be to wait for proposals, which, on receipt, are forwarded to the panels for evaluation and ranking before final selection is made by PCOM. In fact, PCOM is now also burdened with short-term planning and routine decisions in connection with ODP operations, restricting time and energy available for selection of scientific themes and for long term planning of ship employment to accomplish the required science. Members of the PCOM apparently are convinced that good proposals from "bottom-up" have been more than sufficient to drive the program.

PEC III suggests that numerous exciting geological themes, defined by COSOD reports, are of great current importance, but have not been given sufficient priority by the ODP. Those cited by members of our committee include: 1) global change: short-term climatic changes, natural catastrophes; 2) extinction events: environmental changes at time of biotic crisis, criteria for recognizing meteoric impact and/or explosive volcanism, mass extinction and evolution theories; 3) evolution of island arcs: origin of back-arc-basins, processes of arc-continent collision, recognition of ancient back-arc basins on land and their petroleum potential; and 4) mechanism of sea-floor spreading: origin of linear magnetic anomalies.

Our Committee, along with many people inside ODP and JOI, feel that the Ocean Drilling Program is approaching a critical juncture. The current mode of establishing scientific priorities and scheduling ship time, which served the program well in the past, may not be the optimum mode for the future. Some suggested scientific objectives, notably mantle/crust interactions and fluid circulation in the crust (COSOD II), are not, and possibly cannot, be addressed in the current drilling mode. Long-range planning that allows for longer legs or more continuous ship time for a particular objective will be required. PCOM will be faced with hard decisions and possibly risk the temporary disgruntlement of parts of the ODP constituency. However, such temporary dissatisfaction is preferable to permanent disenfrachisement of part of the constituency, and in any case is probably avoidable if the long-range plans represent clear commitments. There is a widespread perception that current objectives are for the most part "safe", and therefore boring. Thus, an element of the reconsideration of long-range planning should, in addition to finding a mechanism to allow the logistics to best address the science, also address the need to keep focussed on the most exciting science.

Communications and Public Relations

The ODP has been, is, and must continue to be a highly successful scientific research program. Discoveries and interpretations originating in this program impact not only the scientific community, but the world's burgeoning population as well. PEC III is concerned, however, that the general public and large segments of the world scientific community are unaware of the ODP and of its major contributions to our knowledge of the nature and functioning of this energetic earth. As illustrations we cite contributions to knowledge of climate change, ore body formation, and clathrate distribution and abundance, as noted in the appendix. Clearly, ODP urgently needs and merits a vigorous program of professional, top-quality communications and public relations. Such a program will also reach a broad spectrum of scientists and other professionals.

If implemented, the program should be directed from, and probably reside in, the JOI office in Washington, D.C. where there is ready access to influential print and electronic media, and to US agencies and representatives of their international equivalents.

Such a communications and public relations program can also address interested scientists and professionals. For example, at the end of each Leg JOI could determine whether the scientific findings were sufficiently exciting and valuable to warrant "packaging" for a formal press conference (T.V., radio, print), and, when appropriate, aimed at a broader audience.

Committee members also suggested the following approaches:

* special presentations to governmental and non-governmental agencies, and to appropriate industry groups.

* special presentations to prestigeous "think-tank" groups and conferences; i.e. Club of Rome; Aspen; Penrose, Dahlem; Chapman.

* encourage the publication of many more articles in leading popular journals such as National Geographic, Scientific American; Die Naturwissenschaften; Le Recherche.

* encourage authors to write books involving ODP results, regionally or world-wide (e.g., a book like Ken Hsu's on the Mediterranean).

Principal Recommendations

** Publications policy should be revised to better reflect the emphasis on thematic rather than site-specific research. PEC III favors the continuation of the Initial Reports volume. In place of the present Scientific Reports volume, we suggest encouraging prompt publication in scientific and engineering journals. Published articles, plus descriptive material not otherwise publishable, might be collected and republished periodically by ODP.

** ODP knows, but the public does not, that ocean drilling is contributing enormously to knowledge of earth dynamics, and discovering unsuspected phenomena, both beneficial and hazardous. ODP needs a professional, energetic public relations and information program to high-light its accomplishments.

** ODP should begin discussions to relieve the serious overcrowding of shipboard facilities for the scientific party.

** Over the next few years, fundamental changes in the international program of ocean drilling appear to be inevitable. For this reason, and because the JOIDES advisory structure has never been reviewed, PEC III strongly recommends the appointment of a panel to provide a comprehensive review and evaluation of the JOIDES planning and advisory structure.

** PEC III believes that achievement of COSOD thematic objectives can best be accomplished by changing the long range planning function toward a more focused and active formulation of the drilling program. We recommend that the thematic panels be given increased responsibility in this direction, rather than simply reacting to proposals.

* ODP-TAMU should address the problems of stress and low morale among technicians.

* Re-establish a mechanism for funding site surveys so that availability of such surveys is not the determining factor for acceptance of proposals.

* The funds now made available to JOI for contingencies and unallowable costs serve a vital need for carrying out diverse corporate functions. The committee urges the JOI institutions and the National Science Foundation to continue their contributions.

** - Strongly recommended
* - Recommended

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Jim Natland	132
Keith Watts	133 (scientist)
Gary Greene	134
Lindsay Parson	135 (U.K.)
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Christina Broglia
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Site Survey Data Bank
Carl Brenner

Atlantic Core Depository
Paula Weiss

Log Of Committee Activities

April 9, 1991. Organizational meeting of PEC III, and brief visit of JOIDES headquarters, Austin, Texas.

May 27-31, 1991. ODP-TAMU, College Station, Texas. Included annual meeting of Co-Chief scientists.

July 8, 1991. Symposium on the future of ocean drilling, Scripps Institution of Oceanography, La Jolla, California.

July 9, 1991. Visit by PEC III to R/V JOIDES Resolution, San Diego, California.

July 9-10, 1991. EXCOM-ODPC joint meeting, Scripps Institution of Oceanography.

September 11, 1991. Visit by Committee members to R/V Resolution, Vancouver, B.C.

September 25-26, 1991. Visit to Borehole Research Group, Site Survey Data Bank, and Core Storage and Curation facility, Lamont-Doherty Geological Observatory, Palisades, New York.

September 27, 1991. Visit to Joint Oceanographic Institution Headquarters, Washington, D.C.

November 13-16, 1991. Final PEC III meeting, to prepare draft of Committee Report to JOI, Samedan, Switzerland.

REPORT TO PEC III
"RIFTING OF CONTINENTAL LITHOSPHERE: GOALS VERSUS ACHIEVEMENTS FROM ODP OPERATIONS"

FROM M. MCNUTT

Relevant legs:

103	Galicia Bank	April-June, 1985
104	Norwegian Sea	June-August, 1985
107	Tyrrhenian Sea	December, 1986-February, 1987
122	Exmouth Plateau	June-August, 1988
123	Argo Abyssal Plain/Exmouth Plateau	August-November, 1988

Leg 103, Galicia Bank

Setting

The Galicia margin, northwest of the Iberian Peninsula, is a sediment starved passive margin. Because of the thin sediment cover, the entire post-, syn-, and pre-rift sediment package is accessible to ODP drilling, as is the igneous basement. The margin had been drilled previously during IPOD Leg 47B in 1976. The cores did not reach the base of the syn-rift section. The recovered post-rift/syn-rift transition showed the the rift/drift transition occurred at 110 Ma in this region of the Atlantic. A single lherzolite dredged from a ridge at the foot of the margin suggests that rifting exposed the upper mantle.

Goals

The strategy for the leg was to drill a transect of holes across the Galicia margin into continental basement. The cores and logs were to be used to constrain the history of rifting, subsidence, and sedimentation on this margin, which in turn would bear on the processes responsible for the initiation and opening of the North Atlantic and the evolution of the more thickly sedimented conjugate margin of North America. Specific objectives included:

(1) comparing crustal and lithospheric stretching models for the rifting of continental lithosphere;

(2) assessing the degree of hydrothermal alteration of upper mantle rocks at the beginning of oceanic accretion;

(3) determining whether diapirs at the foot of the margin are caused by evaporites or serpentinite activity;

(4) testing whether ophiolites consisting of serpentinites directly overlain by pelagic sediments might have originated in a rifted margin setting;

(5) evaluating the relative roles of eustasy and vertical tectonic motions in determining margin stratigraphy;

(6) calibrating the age and physical significance of key seismic reflectors as a guide to regional correlation.

A total of 5 drill sites were chosen. The second would be a re-entry hole cored to 1750 m. The 3rd and 4th sites were to be drilled only if time permitted. The 5th site was an alternate if the deep objectives were not met at the second site.

Achievements

Leg 103 drilled a total of 5 sites. Three of the sites extended the results from the IPOD drilling by coring a total of 1200 m of Lower Cretaceous to Upper Jurassic syn- and perhaps pre-rift sediments and drilling into the top of the basement on the deep western edge of the margin. Upper mantle peridotite was recovered at a site close to the continent-ocean boundary. Deep penetration proved impossible on account of the nature of the rocks. Individual sites were actually composites of short holes drilled through different stratigraphic levels exposed along fault blocks.

The principal findings were:

(1) Peridotite is indeed exposed at the foot of the margin. It is 90% serpentenized. During the process of rifting, the serpentinite ascended from 30 km depth where the temperature was 1250°C. Ascent was very episodic, favoring a tectonic unroofing model (in response to detachment faulting) as opposed to mantle diapirism.

(2) The typical stratigraphic section consists of a basal sandstone unit, overlain by a few meters of conglomerate, overlain by 400 m of Jurassic shallow carbonates, overlain by up to one kilometer of syn-rift sediments, overlain by post-rift sediments.

(3) The prominent "S" seismic reflector, thought to represent a detachment fault, lies within or beneath the continental crust. Subsequent *Nautile* dives showed that the fault is overlain by granite.

(4) The seismic reflector thought to represent the top of the Jurassic carbonate bank occurred actually well above the pre-rift sediments.

(5) The stratigraphic record was dominated by the tectonic signal. The sedimentary record did not have high enough resolution to reveal effects of eustasy.

The major unanswered questions included:

(1) The stratigraphy of the pre-rift sediment.

(2) The role of hydrothermal fluid rising along rift faults in the diagenesis of pre- and syn-rift sediments.

Comments

Drilling deep sections proved much more difficult than originally anticipated. The experienced co-chief scientists were able to salvage the leg and achieve many of the objectives through adoption of an offset drilling strategy.

Most of the major achievements of the leg appeared in regular published journal articles within a few years of the drilling. Detailed discussions of the petrographic, geochemical, stratigraphic, and geophysical results only appeared in the drilling volumes. Follow-up field work by the *Nautile* was instrumental in solving some new questions raised by the drilling and making full use of the drilling results.

Leg 104, Norwegian Sea

Setting

The Norwegian Sea is a young ocean basin formed within the past 56 Ma by seafloor spreading. The Vøring Plateau along its eastern passive margin consists of lower Eocene basalts underlain by well-developed wedges of seaward-dipping reflectors. Such reflectors have been identified on numerous other passive margins, but their relationship to continental rifting and seafloor spreading is enigmatic.

Objectives

One of the principal objectives of Leg 104 was to determine the significance of the seaward-dipping reflectors on the margin of the outer Vøring Plateau. Such structures are limited to the outer edges of ocean basins, generally under continental rise or lower slope sediments. They are also associated with the oldest mappable magnetic anomalies. Drilling was designed to test three different hypotheses for the origin and development of the dipping reflector sequences:

(1) The dipping reflectors are volcanic sequences erupted horizontally during the earliest stages of seafloor spreading along a sea-level spreading center. Loading by later units rotates the flows to their dipping configuration.

(2) The lavas are erupted as dikes along linear fault zones within the continental crust. Rotation again occurs due to loading.

(3) Same as (1), except that the oldest lavas are considered to overlie continental crust.

All three hypotheses are identical as to the subaerial eruption of the magma and the mechanism for rotation to a dipping structure. They differ only in nature of the basement underlying the reflectors and the relationship of the eruption to rifting and seafloor spreading.

The drilling strategy was to recover two cores in approximately 1300 m water depth, each of which was to sample 430 m of Cenozoic sediment and the dipping reflector sequence to 1000 m sub-bottom. One of the sites was expected to drill through a prominent seismic reflector thought to represent the base of the dipping reflector sequence.

The Norwegian Sea also represents the northernmost extension of the zonal Atlantic Ocean. An additional objective of the drilling here was to study the evolution of bottom water formation in the Atlantic using pelagic sediments.

Achievements

Site 642 on the flank of the outer Vøring Plateau drilled into and through the dipping reflector sequence. All important rock units were cored. Other sites were devoted to paleoceanographic objectives. Principal conclusions were

(1) The entire volcanic sequence is Eocene in age and consists of 121 individual flows. Upper and lower series are distinctive in lithology and morphology.

(2) The lower (lower Eocene) series was subaqueous while the upper (middle to upper Eocene) series was subaerial.

(3) The dipping reflectors are caused by alternating sequences of massive fine-grained and vesicular medium-grained tholeiitic flows.

(4) The seismic reflector thought tho represent the base of the unit originates from hydrothermal alteration of flows, dikes, and volcaniclastic sediments.

(5) Xenoliths show that continental crust must constitute the country rock nearby.

(6) The lower volcanic series probably represents the transition between rift and drift. The upper series is associated with a regional volcanic surge.

Comments

This was the first use of vertical seismic profiling. It greatly aided in correlating the drilling results with the regional seismic stratigraphy. The ship was not at that time equipped with the instruments necessary for chemical and petrological analyses of volcanic rocks, so the significance of the volcanic units could not be determined until later work was performed on shore.

Leg 107, Tyrrhenian Sea

Setting

The Tyrrhenian Sea is a young basin in the Mediterranean formed by stretching of continental crust in a back-arc setting. Seismic reflection profiles reveal a pre-rift sequence of uniformly tilted strata, a landward thickening and landward tilted syn-rift sequence, and an untilted post-rift sequence. Unlike the more mature passive margins that bound the Atlantic, in the Tyrrhenian Sea the sediments are thin enough to completely sample by ocean drilling, and the paleontological resolution for paleodepth and age during the interval of extension is very precise.

Objectives

A transect of holes was to be drilled on Leg 107 through the syn-rift sequences in the western Tyrrhenian crossing from the upper margin to the oceanic crust. Results from drilling would be used to test three different hypotheses for the timing of extension and subsidence in this basin:

(1) The whole basin was affected by an 18 Ma to 10 Ma rifting phase, with a later phase (10 Ma to 6 Ma) concentrated in the center.

(2) An early, aborted rifting phase occurred on the Sardinian margin, followed by extension concentrated in the central area.

(3) The entire basin was affected by two distinct, but superimposed, rifting phases.

A secondary objective related to continental rifting was to test whether mantle material rises close to the sea floor during the transition from rifting to drifting.

Achievements

Drilling clearly demonstrated that rifting and basin formation migrated southeast through time towards the subduction zone. The entire process began as recently as the 9 Ma and the youngest of the deep basins is less than 2 Ma old. The onset of rifting coincided with a change in Europe-Africa plate motion from nearly north-south to northwest-southeast, a direction more parallel to the dip of the downgoing slab. These results are compatible with an evolution controlled by east-dipping detachment faults which accompanied rollback of the hinge zone of the African plate.

Subsidence of the young ocean basins was faster than predicted by models that fit data from midocean ridge spreading centers. In addition, the rifting phase was completed faster than is the case for the Atlantic margins bordering a major ocean.

Mantle-derived peridotite lies near the surface in the axis of the Vavilov Basin. Its rise may be the result of unroofing along shallow-dipping detachment faults.

Comments

The success of hole 654 was the turning point for Leg 107. The hole was almost abandoned prematurely in alternating gypsum-rich, gypsum-poor layers that were extremely difficult to drill and whose thickness came dangerously close to the safety panel's limit. The hole was completely successfully, as a result of the patience and skill of the operations superintendent, and his commitment to the science objectives as communicated by the co-chief scientists. In this case, the co-chiefs had both been closely involved with the planning of the leg from the very beginning. Their dedication to the technologically difficult tectonic objectives, as well as their familiarity with the regional geophysics, contributed substantially to the success of this leg, despite the fact that neither had drilling experience.

Siting of the holes and the beacons was more difficult than it had to be for this leg because the drill ship lacked a real-time navigation plot for positioning the ship with respect to the site survey information.

Legs 122-123, Exmouth Plateau

Setting

The Exmouth Plateau off northwestern Australia is the oldest passive margin in the Indian Ocean, and one of the oldest in the world (155 Ma). Like the Galicia Margin, the plateau is sediment starved, and therefore the complete post-, syn-, and pre-rift sequences are accessible to ocean drilling. The plateau is typical of elsewhere along the Australian margin where the continent/ocean transition is extremely broad compared to the Atlantic and topographically consists of marginal plateaus.

Objectives

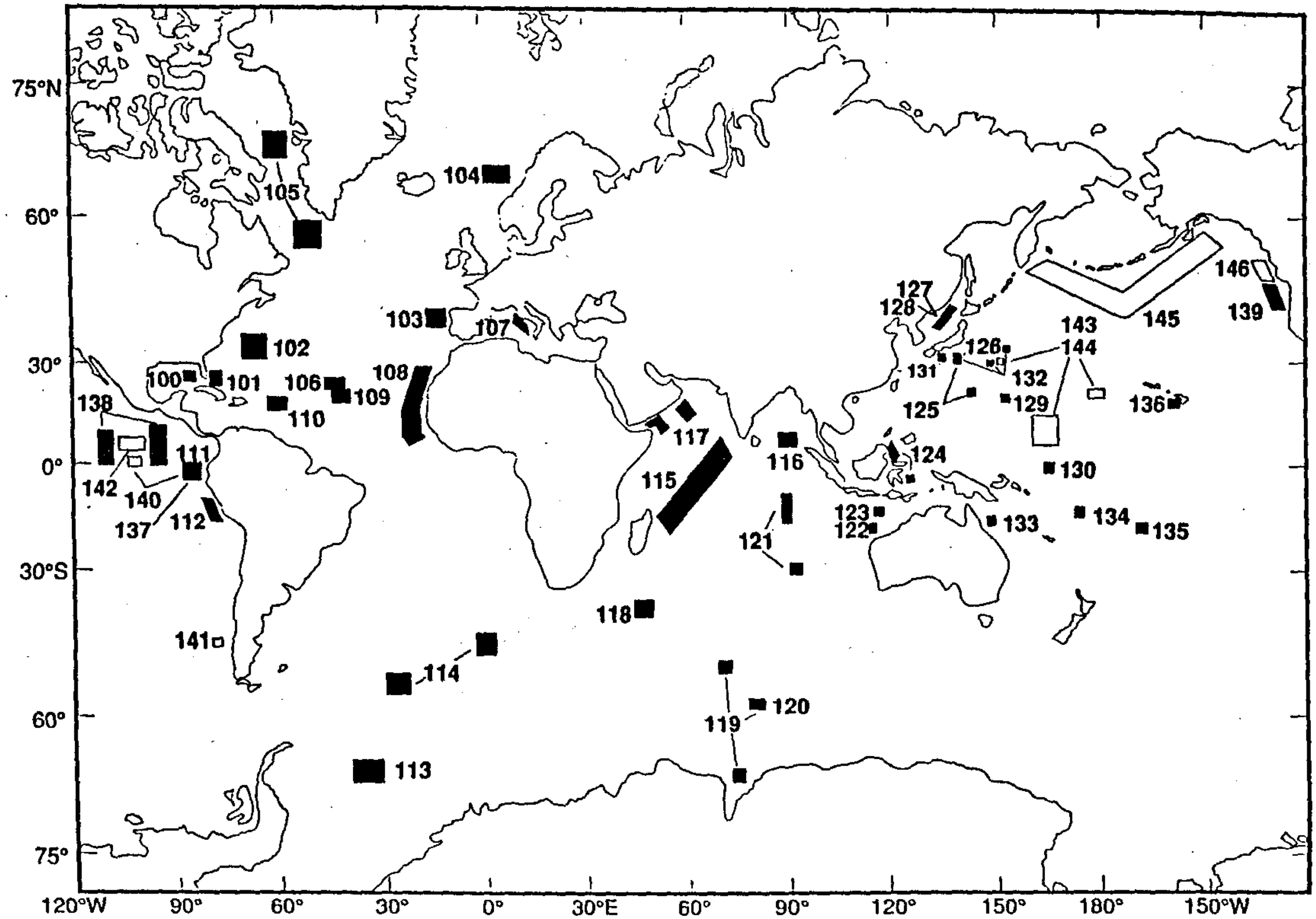
Drilling of a transect of this margin on legs 122 and 123 would allow a comparison of tectonic and seismic sequences with those drilled in the Atlantic. A sequence of 5 to 7 holes extending from the central Exmouth Plateau to the Argo Abyssal Plain would be used to understand the late Triassic-Jurassic pre- and syn-rift history and rift-drift transition in a starved passive margin setting. In addition, there were numerous other objectives for these drilling legs.

Achievements

The drilling results placed tighter constrains on the timing of continental break-up, and showed, quite surprisingly, that the basal sediments are almost 20 m.y. younger than previously proposed. Although rifting and block faulting began in the Jurassic, the Indian Ocean did not open as a seaway until the Cretaceous, not the Jurassic. This result will require that the tectonic evolution of the southern hemisphere be substantially revised.

Comments

These legs were a composite of the objectives from 5 different drilling proposals, that included tectonic (rifting of continental crust), geochemical (composition of Jurassic oceanic crust), paleoenvironmental, biostratigraphic, and sea level history objectives. The co-chief scientists for the two legs did not represent at least one proponent for each proposal. The results as reported in the Preliminary Reports and the Initial Reports reflect the scientific interests of the co-chiefs, and contain little discussion of the significance of the drilling for models of rifting of continental crust The Scientific Results volumes are not yet available.



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COSOD Working Group 5:

"Program EPOC: Evolutionary Processes In Oceanic Communities"

Ten legs (104, 105, 108, 113, 114, 117, 119, 120, 130, and 133) were identified by ODP/TAMU as addressing the objectives of COSOD II Working Group 5 (WG5).

The WG 5 report contains three principal objectives: Evolutionary global ocean drilling array; End Cretaceous extinctions and Early Cenozoic recovery; and Origins and early radiations of modern microfossil groups.

The WG 5 report very strongly emphasizes processes of evolution (speciation, radiation, heterochrony, etc.) and extinction (background extinctions, selectivity, recovery, etc.) and treats in a relatively cursory fashion other paleobiologic processes. Interpretations of climatic and oceanographic change were not addressed as objectives in themselves (and are under the purview of WG 1), but as processes controlling evolution and extinction.

In perusing the roughly 16,000 pages of documentation by which ODP's performance in addressing these COSOD objectives might be evaluated, we found no explicit treatment of the objectives. The term "extinction" is used rarely, mostly in reference to determining biostratigraphic boundaries. No discussions were found either in the prospectuses or in the scientific results volumes, of the patterns and processes of evolution and extinction. Nestled within the WG 5 report, however, was the statement that in order to accomplish these objectives, the community first needs high resolution biostratigraphy throughout the oceans.

Good biostratigraphies are vital to the understanding of evolutionary and extinction events. In this, ODP is succeeding. Substantial effort has been directed toward compiling new biostratigraphic time scales, particularly for high-latitude regions, and toward integrating them to approach globally calibrated biostratigraphies, critical to the understanding global climatic and oceanographic systems. These belong under the purview of COSOD II Working Group I. The less emphasized paleoecological objectives of WG 5 address that part of the long-range plan treating the evolution of the Earth's atmosphere and oceans. The investigation of these problems, by the ODP is succeeding very well. We point particularly to Legs 108 (NW African upwelling and monsoon), 113 (Weddell Sea) and 117 (Oman margin, SW monsoon and upwelling). Each of these legs produced and continues to produce exciting and vital information about the climate system, and they are in the best tradition of the most successful DSDP legs.

Thus, the principal objectives of WG 5 are not addressed in the ODP publications, but the secondary objectives are. Two things should be noted that soften this statement as a criticism of ODP. First, the study of patterns and processes of evolution and extinction requires a very large initial data base, which is being collected, and the exciting scientific results may still be in preparation and appearing in the open literature. The COSOD II report was published in 1987; the intervening four years is too short a time for the principal objectives to be addressed extensively. Also, the emphasis on paleoclimatic and paleoceanographic processes is understandable in the current scientific climate, particularly as the results have been so spectacular.

Despite the successes of Legs 108, 113, and 117, ODP does appear to be suffering from the lack of direction detected in our evaluation of ODP's performance on other COSOD objectives. Throughout the prospectuses, and particularly in the statements of cruise objectives, we noted two rather distressing trends. One was a distinct sameness of the statements, in that virtually the same phrase is used over and over (for example, "the X location is critical to the understanding of the oceanography of Y time, etc., etc., full stop). Rarely did the writers justify <u>why</u> such a time and place were so critical. In other words, the writers did not place the drilling objectives in any kind of larger context, for example, as hypotheses to test (there were some exceptions). To some extent, the uniformity of phrasing reflects trends in the community. We have all found "buzzwords" that seem particularly effective in penetrating the scientific political murk. The sameness is largely, however, symptomatic of a lack of larger objectives, as addressed elsewhere in this report. When we knew practically nothing about how the Earth's paleoclimatic /paleoceanographic system functioned as the single entity that it is, such narrow objectives were acceptable. But there are many new hypotheses about teleconnections and global-scale responses, for example, Broecker's idea about deep salty currents turning on and off and controlling heat distribution of the oceans. These are hypotheses that can be tested very effectively, using ODP data; we are concerned that they are rarely mentioned. As useful method for imparting more focus to the scientific objectives would be to assemble a group to consider some of the "global" hypotheses, and to generate proposals for testing them.

Despite the overall apparent lack of direction, the reports from some legs have addressed larger issues, particularly in retrospect. Again, we were particularly impressed with Legs 108, 113, and 117 (we reserve judgment on those for which scientific results volumes have not yet been published). For these legs, not only were the local paleoclimatic/ paleoceanographic issues addressed, but real attempts were made to tie together information from other legs in other parts of the world and to address global events and problems. Three legs out of six (that is, those for which the scientific results volumes were available) is not a bad record for excellent results.

ODP Hard Rock Drilling - Goals Versus Achievements

S. R. Hart, Reporter, June - Sept. 1991

Legs studied: 106, 109, 118, 125

Sources used: pre-cruise scientific prospectuses, preliminary leg reports, operations reports, Vol. A Proceedings, Vol. B Scientific Results (not available for leg 125), discussions with various cruise scientists.

LEG 106

PRIME OBJECTIVE:

Drill a single bare-rock re-entry hole in zero-age crust on the mid-Atlantic ridge, south of Kane F. Z.

SCIENTIFIC QUESTIONS:

- Origin, nature and evolution of oceanic crust at zero age on a slow spreading ridge
- Processes of magma generation and crustal accretion.

IDEAL PLAN:

New bare-rock guide base to be cemented to ocean floor, drilled and cased to 100 m, total drilling depth ≈ 330 meters. 3 possible sites identified.

BACK-UP PLAN:

If both guide bases are deployed and drilling fails, two back-up sites in the Kane Fracture Zone are available. Objective here is to sample oceanic crust within a fracture zone, and possibly drill into upper mantle.

ACTUAL OPERATION:

- 35 days spent deploying hard-rock guidebase, spudding-in on bare rock and drilling 33 meters of hole (19% recovery) at Site 648B. Unstable hole, sticking pipe and lack of operational drilling jars forced hole to be abandoned.
- Remainder of leg (6 days) spent drilling Site 649, 10 shallow holes (2-13 meters) in hydrothermal sediments and basalts close to an active hydrothermal vent area.

ACHIEVEMENTS:

- First deployment and spud-in using hard-rock guide base on zero-age crust.
- First holes ever drilled in an active hydrothermal area.

COMMENTARY:

- Pilot hole at 648A achieved hard rock spud-in and 4 m penetration without HRGB.
- Failure to drill a significant hole in young crust (33 m versus 330 m hoped for) due largely to unstable hole conditions. Had drilling jars been available, somewhat deeper penetration may have been possible, but unlikely to have made a major difference — considering the usual and oft-experienced difficulty of drilling in young crust, the expectations for this leg were highly unrealistic.
- The back-up plan was not invoked; instead an ad-hoc plan to drill a hydrothermal vent area was initiated. This was scientifically rewarding, but the same results could probably have been achieved with piston-coring from a conventional ship.

LEG 109

PRIME OBJECTIVE:

To e-enter and deepen hole 648B (left over from leg 106; see above).

SCIENTIFIC QUESTIONS:

See Leg 106 report above

IDEAL PLAN:

Deepen hole 648B from 33 m to 86 m, set another casing string, and drill ahead as far as possible (hopefully another 200 m).

BACK-UP PLAN:

- Log Site 395A (a 580 m hole just west of 648B).
- More drilling at Site 649 in hydrothermal field.
- Drilling on walls of Kane FZ.
- Drilling and logging of hole 418A (a 500 m hole in western Atlantic).

ACTUAL OPERATION:

- Site 468B reoccupied, 32 days spent trying to deepen hole, achieved only 17 m further penetration.
- Drilling jars were available but broke off because they were not in-hole and supported — much time spent fishing, unsticking pipe, cementing and redrilling, casing, etc.
- Drilled Site 669, gabbro outcrop on top of rift mountains. Only 4 m penetration. Not in back-up plan.
- Logging of hole 395A done as in back-up plan.
- Site 670A drilled 86 m of ultramafic rock on west wall of median valley near 648 (leg 106). Not a back-up site but invoked due to info coming from concurrent Alvin diving in area. Site spudded with PDCM and no guide base; re-entered without a cone!

ACHIEVEMENTS:

- Spud-in without hard rock-guide base
- Re-entry without cone (just with TV).
- Drilling of serpentine/ultramafic.
- Logging of Hole 395A..

COMMENTARY:

- The only real <u>science</u> achieved during Log 109 was the serpentine drilling, and this was ad-hoc, not planned.
- The projection made after Leg 106 that drilling jars and extended hole casing would cure the drilling problems at 648B proved to be completely unfounded..
- Ironically, the large engineering component of Legs 106 and 109 was to achieve bare rock spud-in using the new hard rock guidebase (HRGB) — site 670A achieved bare rock spud-in (actually 6 m of sediment) and re-entry without a HRGB or re-entry cone (and pilot hole 648A also achieved bare rock spud-in without a HRGB.

LEG 118

PRIME OBJECTIVE:

To drill a single deep (500^{+} m) hole in exposed upper mantle peridotite in AII Fracture Zone, and to do a major logging series on hole.

SCIENTIFIC QUESTIONS:

To recover a section of oceanic mantle, in order to study the mineralogy, petrology, alteration and deformation characteristics, and physical properties.

IDEAL PLAN:

To set a hard-rock guide base at the prime site (southern portion of median ridge in the AII transform), bare-rock spud-in and drilling and logging to a depth of 500^{+} meters. .

BACK-UP PLAN:

Three alternative sites were picked for deep drilling attempts (west wall of transform, active northern nodal basin, fossil nodal basin); one back-up site (floor of central basin) was selected for 4 to 5 shallow "pogo test holes" to sample basement across the transform valley.

ACTUAL OPERATION:

- 6 shallow holes (3 - 24 m) drilled at prime site — no basement reached, only unstable sand and gravel.
- 4 shallow holes (4 - 24 m) drilled at west wall back-up site; talus, no basement.
- 7 holes (8 - 57 m) on ad-hoc site on east wall; sediments only, no basement.
- ad-hoc site (735B) on shallow transverse ridge drilled and logged to 500 m.

ACHIEVEMENTS:

- First long hole in deep oceanic crust gabbro section.
- Excellent drilling rate (500 m in 18 days) and high core recovery (87%).
- Full logging and in-situ measurement completed.

COMMENTARY:

- Prospectus-wise, this leg was a complete flop because <u>no</u> mantle peridotite was recovered.
- A very exciting hole was nevertheless achieved at an unplanned site, more or less out of desperation (14 days and 17 abortive holes attempted prior to this!).

LEG 125

PRIME OBJECTIVE:

To drill a series of holes in the Mariana/Izu/Bonin forearc.

SCIENTIFIC QUESTIONS:

- Origin and evolution of forearc terrains.
- Origin of serpentine seamounts.
- Dewatering processes associated with subducted slab.

IDEAL PLAN:

- To drill 2 sites on forearc outer arc high, through sediments into basement.
- To drill 3 sites on two serpentine seamounts.

BACK-UP PLAN:

Two back up sites were identified on the outer arc high, where drilling through sediments into basement was an option.

ACTUAL OPERATION:

The accompanying table summarizes the actual drilling results, in comparison to the projected results. Basically, 6 sites were drilled on the serpentine seamounts (versus 3 planned), and 3 sites were drilled on the outer arc high (versus 2 planned plus 2 back-ups). Four holes achieved penetration close to or exceeding that projected, and five fell significantly short. Six holes were aborted due to poor hole conditions, three were stopped due to time limits. The last hole, planned as a 200 m alternate site, drilled a magnificent 720 m into basement.

ACHIEVEMENTS:

- Showed that serpentine seamounts are indeed made of serpentine, and are probably diapiric structures.
- Young forearc volcanism evidenced by a basalt sill drilled at Site 784.
- Basement of forearc high is composed of island arc volcanics and volcaniclastics, including pumice and boninite flows and hyaloclastites.
- Interstitial waters from serpentinite holes are high alkalinity, low chlorinity and may represent slab-derived fluids.

COMMENTARY:

- scientific goals mostly achieved, but much of the "good feeling" about this leg is a result of the final "alternate" hole which was drilled very deep into basement and logged successfully as well.

LEG 125

SITE NO.	TOTAL PENETRATION	BASEMENT PENETRATION	ON-SITE DAYS	LOGGING	REASON FOR TERMINATION
778 (MAR-3B)	108 (700)	108 (0)	3.3 (10)	No (Yes)	Abandoned (sticking)
779A (MAR-3B)	320 (700)	300 (0)	7.3	No (Yes)	Site time up
780C (MAR-3A)	164 (700)	144 (0)	6.6 (10)	No (Yes)	Abandoned after 4 tries (unstable)
781 (not planned)	250 (—)	0 (—)	2.6 (0)	No (—)	TAMU depth limit
782A (BON-6B)	469 (550)	70 (150)	7.2 (9.1)	Yes (Yes)	782A blown off,
782B (BON-6B)	459 —	-- not cored --			782B stopped and logged (sticking)
783 (BON-7)	168 (500	45 (350)	2.2 (8.8)	No (Yes)	Abandoned (sticking)
784 (BON-7)	452 (500)	130 (350)	4.8	No (Yes)	Abandoned (bent pipe)
785 (BON-6A)	104 (750)	104 (150)	1.1 (15.1)	No (Yes)	Abandoned (sticking)
786A (BON-6C)	166 (200)	20 (50)	14.6 (3.4)	Yes (No)	Leg time up
786B (BON-6C)	828 (200)	720 (50)			

(Information in parentheses is the proposed goals)

Holes 778, 779A, 780C, 781, 783 and 784 were drilled in or near serpentine seamounts; others were on outer arc high.

Summary and Final Points

- Legs 106 and 109 probably count largely as scientific failures, due mostly to overly optimistic engineering expectations, relative to past experiences.
- Legs 118 and 125 were both major scientific successes, but a lot of serendipity was involved.
- Things seldom go as planned; a flexible attitude, or one motivated by desperation, is important.
- The most exciting achievements on these legs were a result of back-up or unplanned drilling (deep gabbro hole at 735B in unplanned location; deep basement hole at 786B at alternate site; serpentine at unplanned site 670; hydrothermal vent area holes at unplanned Site 649). Does this mean planned things are already too "well known" and only surprises are new and exciting?
- Very few instances of drilling operator-error were uncovered (unlike DSDP days). A core barrel was run up into crown block when it should have been lowered; a drill pipe miscount resulted in a 222 m drill string error and considerable confusion while trying to unstick a pipe; a cement pump outflow line was hooked into a mud pump line by mistake, and pumped full of cement.
- Perhaps the "unplanned" reality of ODP drilling should be more explicitly acknowledged in the detailed "planning" of legs?

ODP Active Margins - Goals Versus Achievements

Leg 110	Lesser Antilles forearc
Leg 125	Bonin Mariana region
Legs 127-128	Japan Sea
Leg 131	Nankai Trough

General Remarks

- The legs listed represent 3 different type drilling environments: Accretionary prism, forearc slope and back-arc basin

- From a standpoint of coring and core recovery, there has been much improvement since DSDP days: recovery is better and core quality is higher. Thus the objectives that depend on samples have been fairly successful.

- The major problem, particularly in accretionary material, is that in-situ (down hole) measurements have been unsuccessful. In part this is a tool problem and in part an environmental problem. The environmental problem: no holes into accreted sediments were stable enough to permit decent logging, let along in-situ measurements. This could be due to swelling clay, loose sand but primarily to instantaneous breakouts and bridging in these highly stressed regions. This very serious problem is recognized but difficult to overcome. Technical solutions are yet untested. Chances are very small of reaching objectives involving pore pressure, permeabilities and stress in prisms - and these are major goals. The tool problem: tools to measure important parameters and fluid samples either do not exist or are not efficient. There has been particularly poor performance of fluid sampling and packer experiments (except for deployment in basalts). In active tectonic zones, earthquake mechanisms can give many more measurements of stress orientations than the few stress orientations that can be obtained from hole deformation as measured by the bore hole televiewer for example.

- From a tectonic standpoint, the ensemble of legs devoted to the margin of Asia provide useful constraints to understand the link between the deformation of Asia, subduction and the evolution of the Asiatic margin.

- Most of the drilled targets in active margins have been shallow and only incipiently deformed material has been cored. In order to bridge the gap between geology observed in orogenic belts and that of active margins, there is the need to drill deeper into prisms, maybe as much as 1500-3000 m, and also to use a 3D strategy in hole distribution.

Leg 110 - Lesser Antilles Forearc

The leg did better than anticipated since penetration of the detachment surface separating the two plates converging in the subduction zone was achieved through coring 500 m of imbricately thrusted, offscraped muds and mudstones, 40 m of sheared and flattened mudstones in the decollement and 150 m of a little-deformed underthrust sequence. This left time available to drill 5 other holes. Three holes near the deformation front provide good control on the geometry of the imbricate packages. One reference hole was drilled 6 km east of the deformation front. Two holes were drilled 12 and 17 km up slope and west of sediments. The logging operations and measurements of water flow and pressure downhole were nil for two reasons: 1) the nature of poorly compacted sediments leading to hole instability (impossibility to lower the logging tools or to anchor the packer to the sidewall), 2) untested packer prior to the cruise which yielded poor performance. Note that the achieved maximum penetration (770 m) falls short of the planned (900 m) penetration. The first site (site 671) was moved landward about 1 km to avoid an active fault zone overlying the proposed site (LAF1).

Leg 125 - Bonin Mariana Region

The main purpose of the leg was to drill into forearc terranes and to investigate the dewatering of the subducted lithosphere. Six sites were located on or adjacent to serpentinite domes. The recovered material, serpentinite muds with clasts of serpentinite muds, would have been difficult to sample from dredging or submersible. It is also essential to determine the internal structure of the domes in order to understand their origin and mode of emplacement: this can be achieved only by drilling. There is some hope that the collective results from the cores and the fluids may shed some light on processes of serpentinization and the origin of the domes.

One unexpected result was the discovery of a Pliocene or younger basalt flow or sill on the lower most flank of one dome, the first evidence for such recent magmatic activity in any extant intraoceanic forearc terrane (a case of serendipity).

One hole (786B) penetrated over 700 m into the massive, brecciated and pillowed lavas and dikes of what is interpreted to be a volcano. The hole was interrupted because time ran out.

Leg127-128 - Japan Sea

It cannot be said with confidence that basement was reached at any of the sites of leg 127, a major objective of the leg. All sites had to be abandoned because of poor hole conditions. On leg 128 one hole aimed at basement (site 794) was deepened an extra 80 meters. Leg 128 scientists argue on the basis of geochemistry that true basement was reached in this reeintry hole where coring stopped because of time limitations self-imposed at this site. One site drilled in a failed rift setting (site 799 in the KITA-YAMATO trough) failed to sample sulfide KUROKO-like deposits but provided useful information on the depositional history of the KITA-YAMOTO trough. Hole 799 had to be terminated because of safety at the top of a zone in the early stages of petroleum generation.

Successful geophysical experiments were carried out at one site: emplacement at 715 mbsf of a digital broad-band seismometer and an active-source electrical resistivity experiment conducted for a 24 hour-period. Two legs were necessary to complete all these goals but the drilling strategy could have been more focussed on major goals. The dispersion of efforts hampered the overall results of the legs.

Leg 131 - Nankai Trough

The leg occupied only one site, the primary site through the decollement to basement at the deformation front, instead of two sites as planned (the second site providing a reference seaward of the deformation front).

The downhole logging and measurement was planned as a major and critical part of the leg providing in-situ data on the critical parameters required for quantitative modelling of accretionary wedges. Results were very poor. Only two short logs with limited tools were obtained. Hole stability and strong ocean currents were part of the problem. Note that some success was met with, the first measurements downhole of the new lateral stress tool (LAST) showing excess sediment pore pressures at a depth of about 200 mbsf. The great success of the leg is that continuous coring was achieved through the decollement with an excellent recovery (56 percent recovered for over 1 km cored). Sampling and analysis of this cored column exceeds most other ODP legs. This compensates to some extent the failure in downhole logging. Note that the GEOPROPS tool, a key tool justifying the leg, was not even ready.

A Preliminary Report on an Evaluation of High-Latitude Drilling for PEC

Introduction.

High-latitude drilling, as far as I recall, was one of the 3 major objectives during the first phase of ODP. I should know that because I was a member of P-Comm at the time of initial planning.

High-latitude drilling requires utilization of weather windows. Six legs were scheduled namely Legs 104 and 105 to the north and Legs 114, 115, 119, and 120 to the south during the initial planning stage. They were all drilled. The Southern Ocean Panel was disbanded, as I understand, after Leg 120 drilling, and no high-latitude drilling took place since then.

This preliminary evaluation report asks the following questions:

(1) What were the objectives?

(2) What remarkable results have been obtained?

(3) Could the results have been better?

(4) Has there been any need of high-latitude drilling after Leg 120?

Objectives

The Subarctic drilling was approved on the principle because we had had practically no record of sub-Arctic paleoceanography. Any data would be importance of first order, and unexpected discoveries could be encountered.

The Antarctic drilling was approved to resolve major controversies on paleoceanography and paleoclimatology, when the data from DSDP/IPOD cruises failed to provide unique answers. Those include:

(1) Age of the oldest Antarctic ice cap of continental proportion: Early Oligocene or Middle Miocene?

(2) Age of initiation of the circum-Antarctic circulation. Oligocene, Miocene, or Pliocene?

Objectives of the second order included acquisition of information on migration of Antarctic fronts, paleoclimatic and paleoceanographic records of the Southern Oceans, event stratigraphy (K/T, Paleocene/Eocene), etc., etc..

It was hoped that the results from drilling will lead to a formulation of new paradigms on the history of the Cenozoic climate in the polar regions, on the causes and feedback mechanisms leading to continental glaciation, and on the evolution of organisms in response to global changes.

Tectonic evolution of the region was, of course, not neglected, because of its relation to climatic evolution, but tectonic investigations were not the primary objectives except during the Leg 104, which had been scheduled to investigate the genesis of dipping-reflectors (a lithosphere objective).

Results

I have neither the time nor the competence to attempt a comprehensive review of the drilling results, not to mention that such a review is premature before all B-volumes of the cruises are published. I could only catch the headlines. Unfortunately the single most significant result was not headlined, but hidden in one of the 11 site-reports of Leg 119, A-Volume. That alone is a cause for concern.

Referring to the primary objectives, my impressions are as follows:

(1) The results of Legs 119 and 120 drilling indicated that an Antarctic ice cap of continental proportion existed in Early Oligocene, although the importance of this glaciation and the question whether the West Antarctic was then also extensively glaciated seemed to remain debatable between the scientists of the "East" and "West".

(2) I have seen no decisive statements on the age of the initiation of the circum-Antarctic circulation.

(3) Out of the objectives of "secondary importance" came out a surprising discovery on the catastrophic nature of the Paleocene/Eocene event of sudden changes in bottom conditions and the consequent changes of biota and climate.

(4) Valuable data from the Subarctic were obtained, and the results seemed to be in general accord of past paradigms.

I suggest that PEC circumlate this preliminary evaluation to ODP scientific staff and probably to Leg Chief scientists for comments on the accuracy of the statements. It is not the purpose of the PEC to mention all the positive results which could be routinely expected of an investment of 12 *months* of drillship-time, and we expect corrections, not additions that enumerate the many achievements of secondary importance.

Could they have done better?

I have my opinions after going through the reports and thinking over the history of planning of selecting chief scientists, and of drilling. We can discuss this orally in our La Jolla meeting, but it would be unfair to write those "shooting-from-the-hips" type of comments down. I have, therefore, written three of my colleagues who have been on board JOIDES Resolution to the three regions drilled. I have asked the questions

(1) What they would have done if they were working under the boundary conditions of the JOIDES/DSDP/IPOD model for Mediterranean and South Atlantic planning panels. The boundary conditions were shiptime, and they had the free choice of drilling objectives, of co-chiefs, and operations, within the framework of the existing rules. Would they have done differently?

(2) In hindsight, would that have made a difference?

To insure maximum freedom of expression, their identity will not be disclosed to the Committee without their expressed wish. Their replies would assist us in the preparation of the final report of PEC.

Why No More High-Latitude Drilling after Leg 120

Again I do not think I know enough to say very much It seems ironic that ODP should turn their attention when the whole scientific community, represented by the International Council of Scientific Unions, turned their attention to the Internationl Geosphere and Biosphere Program (IGBP) and set up a Global Change Program. I would think that the ODP could make some big splashes, writing articles in noted scientific journals on sudden global changes of the past, such as the Paleocene/Eocene event, the initiation of Antarctic glaciation, the initiation of continental glaciation in the northern hemisphere, the relation of tectonics to ocean circulations and thus indirectly to global climate. I have found few ODP scientists in the IGBP/Global Change meetings attended by me. As a chairman of the IUGS's Committee on Global Change, I have received no contact from JOIDES/ODP officials and hardly any from ODP scientists (working on shipboard or on ODP samples). At the beginning of IPOD, the Director of NSF told us that scientific endeavouring has an analogue in surfing: One has to go with the waves. In the early seventies of over-concern for energy supply, IPOD could "surf" with their ocean margin objectives, and carry the other thematic groups with them. Now the time has changed, but the ODP has been slow in discovering the new waves of Global Change. Of course, I do not know if I have been fair in this judgment, I have, therefore, written my three friends to pose an additional question:

If they feel that there could be a chance, would they think that further high-latitude drilling would have been justified in the 10-year program of ODP. If the answer is affirmative, what was the reason that such proposals were not made, or not accepted.

Communications and Public Relations - Examples of Topics

Climate Changes

Deep ocean sediments collected by the ODP provide the most complete and accurate record available of cyclical changes in global climate (global warning followed by continental glaciation), a cycle of about 40,000 years. The ODP information, along with scientific findings from other sources, is being fed into a massive scientific global climate research program to determine "... whether, and to what extent, human activities are changing, or will likely change the global climate system" ("Our Changing Research Program, " p. 9). Results from this research will be invaluable in providing a "scientific basis for national and international policy making in this field" (ibid, p. 1).

Clathrates in Deep Ocean Sediments

Current data indicate that enormous volumes of hydrocarbon gases, chiefly methane, occur as metastable solids (clathrates) in deep ocean sediments. Based on seismic signatures attributed to clathrates, deep sea deposits of hydrocarbons may greatly exceed remaining liquid and gaseous hydrocarbons on land and adjacent shallow water. Hence, the clathrate layers, and especially the gases which may be trapped below them, could be an enormous source of clean-burning natural gas.

Unfortunately, the clathrate layers may also constitute a threat to climate stability. A geologic incident such as the development of a new volcanic center, large scale faulting, or perhaps even massive sediment slumping could cause the release of large volumes of this methane into the atmosphere. It is therefore important not only to obtain more information on the locations, volumes and geologic environments of the clathrates, but also to inform the public of the potential positive and negative aspects of this phenomenon.

Genesis of One Bodies

The discovery of "black smokers" by the W.H.O.I. submersible "Alvin" initiated a new era in the understanding of ore body genesis, as well as the discovery of an hitherto unknown fauna dependent on the "poisonous" hydrogen sulfide and other gases emitted. The available sulfide ion also allows the formation of sulfide minerals characteristic of many copper-gold ore deposits. Several such deposits have now been sampled and our present understanding of the process of ocean crust formation suggests that similar deposits are widespread and numerous in the world oceans. One such deposit, drilled recently off the coast of Vancouver Island, during Leg 139 apparently is of a size and ore grade to be mineable if it occurred on land. How, or whether such deposits will be utilized can only be conjectured, but the rate of world population growth suggest they will soon be needed.

JOI PERFORMANCE EVALUATION COMMITTEE III

TERMS OF REFERENCE

During the life of the Ocean Drilling Program JOI will periodically evaluate the management of the program and the performance of its subcontractors. This evaluation will be accomplished at 2-3 year intervals by a committee of experts appointed by the President of JOI. The President will consult with NSF, the JOIDES EXCOM, PCOM, and others as appropriate in the formation of the evaluation committee. The Performance Evaluation Committee (PEC) will report to the Board of Governors through the President of JOI. Terms of Reference for the evaluation will embody the following general procedures and criteria:

(1) The committee membership will consist of experts in the fields of engineering, management, and science to be appointed by the President of JOI in consultation with NSF, the JOI Board of Governors, JOIDES and others. The committee should be chaired by an eminent scientist who should be knowledgeable about ODP but not currently active in the program. Committee members should not be currently active in the program.

(2) The committee will review and evaluate the performance of Texas A&M, Lamont-Doherty, and other subcontractors in accordance with a schedule to be developed by the PEC chairman and approved by the President of JOI. JOI will provide for sufficient funds in the Performance Evaluation Committee budget for staff support.

(3) The committee will be briefed by the Chairman of the JOI Board of Governors and/or the President in advance of any scheduled performance evaluation. Following completion of the evaluation and receipt of subcontractor comments and plans, the committee will report its results to the JOI Board of Governors.

(4) The committee will transmit in writing to the subcontractor being evaluated the scope and procedures of the evaluation together with any questionnaires or questions to be answered. Copies of such correspondence will be furnished to the President of JOI who will keep the Board of Governors informed.

(5) The committee will conduct its evaluation at the headquarters site of the principal contractor and subcontractors. Sufficient time shall be allocated

for a thorough review. The drillship also will be visited for evaluation when appropriate and convenient. If scheduling is impractical, interviews will be conducted with members of recent past crew and past scientific parties.

(6) The committee will evaluate the principal items of performance, including accomplishment of scope of work in the contract, particularly with regard to achievement of scientific objectives; program plan management and adherence; personnel policies and personnel management; overall management effectiveness and efficiency, including cost consciousness; subcontract management; reports and report management; public information, particularly in regard to scientific dissemination of data; liaison and relationships with JOIDES, JOI, NSF, and national and international scientific bodies; engineering maintenance, development, and application; attention to environmental conditions and adherence to environmental impact statements; safety procedures and safety record; staff morale; and other items considered important by the committee.

(7) After completion of each evaluation, the Chairman of the PEC will discuss the committee's findings with the senior official of the subcontractor and/or the subcontractor's staff, as is mutually agreed. This discussion and its content shall be communicated to the President of JOI who shall in turn inform the Board of Governors.

(8) Within two months of completion of site visits, the Chairman of the PEC will submit the performance evaluation report to the President of JOI who will discuss with and transmit the report to the subcontractors with a request for written comments, including plans for any action required.

(9) The President of JOI, after receiving the subcontractors' comments and plans, will arrange with the Chairman of the PEC to present the final report and implementing recommendations to the Board of Governors. The President will then transmit a copy of the report and implementation plans to NSF, the JOIDES EXCOM and PCOM. This should occur within two months after receipt of the report from the Performance Evaluation Committee. Those recommendations requiring consultation with EXCOM and NSF will be reviewed with these organizations prior to implementing action.

The foregoing procedures for performance evaluation will be refined and/or modified as experience is gained. The ultimate objective is to achieve a reliable and effective evaluation system that will best serve the scientific community, NSF, and JOI.

2. General Guidance

(1) The PEC will visit JOI Headquarters in Washington, D.C. and the subcontractors at LDGO, TAMU, and the JOIDES office. The PEC will visit JOIDES RESOLUTION should the vessel be in a convenient part of the world.

(2) The PEC will interview selected members of EXCOM and PCOM.

(3) The PEC will determine the type and style of paperwork to be provided, again in advance of interviews.

(4) The PEC will decide its own interview process. It may be necessary, occasionally, for people to be interviewed privately or on a group basis, e.g., marine technicians, etc.

(5) The PEC will have the right to call for any papers or information which it deems necessary.

(6) The PEC should have the right to propose specific studies of ODP and its operations by professional consultants, as appropriate.

(7) The report should consist of a descriptive section outlining activities, a section dealing with observations and impressions, and a section on conclusions and recommendations. The report will be accompanied by an executive summary. It may be necessary to convene a special PEC meeting to discuss the final report. The final report shall be submitted within two months following completion of site visits.

April 30, 1992

Dr. D. James Baker
Joint Oceanographic Institutions Inc.
1755 Massachusetts Ave., NW
Suite 800
Washington, DC 20036

Dear Jim:

We are very pleased with the Performance Evaluation Committee's (PEC) overall impression that "ODP at TAMU was functioning very well," "...that the whole operation seems smoother and more effective than in 1988," and that... "Many of the flaws perceived by the earlier PECs have been effectively addressed,..." We certainly will continue to work hard to sustain this record and receive similar favorable performance evaluations in the future. I list below some comments that pertain to the various headings in the PEC report.

Science Operations

We concur with the PEC report that operations are going well and that the staff scientists complete their responsibilities in a professional manner. However, it is clear that the reduction of 3 FTEs in FY88 has resulted in an increase in individual staff scientist work loads at the expense of efficiency and research.

PEC has noted that additional shipboard technical support staff is required, not only to restore the cuts of 1988, but also to cope with increased shipboard technical responsibilities. We have already responded to their recommendation (as well as JOIDES) to increase the size of the technical staff by providing an additional sea-going technician per cruise. In addition,we have reorganized the technical group to provide a second system manager for each cruise.

The PEC notes that the Editorial Review Board (ERB), which consists of the two co-chief scientists, the ODP staff scientist and an outside scientist has not worked as well as anticipated. They note that unacceptable delays occur and that the staff scientist must shoulder a large part of the editorial burden. Steps such as time lines, monthly updates, etc., have been established in order to obviate the burden put on the staff scientist and ensure that the volumes are published on schedule. Volumes are indeed being published according to the schedules set by the JOIDES IHP and Planning Committee and we do not anticipate major problems in the future with the publications schedule. However, the success or failure of the ERB's clearly are based, as true with any peer reviewed publication, on the efforts of each ERB board member and on the willingness of outside reviewers to complete their reviews on time.

Policy on Selecting Co-Chief Scientists

We agree, the co-chief scientists are obviously critical to the success of each cruise. The co-chief selection process and their interaction with the TAMU/ODP staff has worked well in the past. We will continue the important interaction with the co-chief

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scientists from pre-cruise planning to final publication of the results. Further, we will continue to value their advice (as obtained in post leg overviews with them and in annual co-chief scientist meetings) so as to incorporate it into future procedures.

Engineering and Cruise Operations

We agree with PEC that "both the tools under development and the improvement to existing tools testify to the capability, imagination and determination of the small staff." We also agree that with the relatively small staff, financial constraints, and the large menu of tasks, PCOM should continue to prioritize engineering developments.

Core Storage and Curation

The repositories are indeed functioning well, as noted by PEC. The repositories will be filled soon after the *JOIDES Resolution* returns to the Atlantic Ocean; and, as noted by PEC, we are looking into various solutions to the space problem.

Publications

The Publications Department has done an excellent job reducing the imposed backlog and bringing the publication time line to those goals of the JOIDES science community. One very important advantage of the present ODP volume format is that it is a single reference source for each cruise's results. The PEC suggests major changes in the format of the *Science Results* volume. Though, personally, I am not convinced that this proposed format is ideal (it has been discussed on many occasions by the JOIDES IHP and PCOM), we certainly will alter the publications format as necessary if the JOIDES community requests the change.

Computer Services

The computer operations on both ship and shore have been extensively revised over the years. However, we concur that the field is changing very rapidly. A JOIDES steering group will be working closely with ODP to develop and implement a major upgrade of the ship and shore based computing and data base environment.

Administration

We agree with PEC that the Administrative support group at TAMU provides an essential service to ODP by allowing smooth operation of contracts, purchases and personnel issues.

Ship - Science Facilities

PEC is correct in noting that some of the shipboard laboratories are crowded. We have reviewed the laboratories and have since modified the description, sampling, physical properties, and magnetics laboratories. The new configuration provides more open space and allows more efficient core flow through these labs. The science space does, however, have limits. The amount of equipment on the ship and size of the science party have increased with time. However, efficiency experts tell us that the current configuration maximizes usage of space.

With respect to meeting rooms, etc., it appears that the shipboard science parties indeed have ample (though at times somewhat crowded) spaces for their important scientific meetings.

Ship - Drilling Facilities

We concur that the SEDCO personnel are professional, responsive, and talented and take great pride in their work. I do not understand the criticism that SEDCO does not carry sufficient spare parts for ODP equipment maintained under contract and that they charge a rig rate for down time that is too favorable to SEDCO/FOREX. For one, there has been virtually NO DOWN TIME on the ship for its first seven+ years of operations. This itself attests to the favorable spare parts inventory. Second, I believe that I can unequivocally state that the rates we have are probably the most favorable to any contractor in the history of offshore drilling!

Ship Living Conditions

As we stated in the previous PEC report, the living conditions are fine as long as one doesn't mind up to four persons in a room and up to eight to a shower. We could:

i) sail fewer personnel (impractical under present guidelines given to us);
ii) build more rooms (impractical - only space available is science labs).

From reports we receive from scientists, there is no problem with the housekeeping and laundry within the quarters. In addition, the scientists over the past several years have informed us that the food aboard the ship is very good and that Catermar personnel were pleasant and professional.

Ship Personnel

Numerous corrective steps have been taken to ensure high morale of the technical group. These include the addition of shipboard technical staff (1 FTE per cruise), sailing of two computer specialists per cruise, institution of a sea only option for the technical group and changes in the middle management structure. These steps have been favorably received and have raised morale of the technical support staff. We agree with PEC that an educated, experienced, and well trained technical group is fundamental to the success of the overall program. I should note that in almost all post leg overviews, given by the shipboard parties as well as the co-chief scientists, the TAMU/ODP technical support staff have been highly praised both for professionalism and competence.

Jim, once again, there is no doubt in my mind that Texas A&M University as Science Operator of the Ocean Drilling Program will continue to be responsive to the JOIDES community and will continue to receive excellent performance evaluations in the future.

Sincerely,

Philip D. Rabinowitz
Director

PDR:hk

xc: Dr. Robert A. Duce
Dean, College of Geosciences and Maritime Studies
Texas A&M University

29 January, 1992

To: Joint Oceanographic Institutions, Inc.

From: Borehole Research Group
Lamont-Doherty Geological Observatory

Subject: Wireline Logging Service contractor's response to Performance Evaluation Report III (PECIII)

We are pleased with the evaluation of our performance in the report of the PECIII. They correctly understood our accomplishments within the constraints of the limited resources available to the program. We are especially proud of the improved acceptance of logging since the PEC II that has been accomplished with much coordinated work by our group and the Downhole Measurements Panel. Also, the correlation between log and core measurements is indeed a major step forward for the entire ODP.

We have the following specific comments about points in their report:

1. Concerning the ability to compare logs and core aboard ship and in real time: We have made this one of our very highest priorities. The integration of ODP datasets is essential to the improvement in ODP science. The PECIII correctly pointed to this function for future attention. For example, the MAXIS logging system, which we are trying to install on the drillship, will make decided improvements in the speed with which the logging data are processed and available to shipboard scientists for integration with core data aboard the JOIDES RESOLUTION. In addition, the MAXIS will allow real-time transmission of logging data from the ship to the BRG for more intense processing before transmission back to the ship for further integration with core results. This would make the ship's second-look lab a much more important component of shipboard science. All major oil companies are now handling their logging jobs in this networked manner. The MAXIS is an

excellent example of ODP taking advantage of an industry development that has proven itself in quality control improvements and financial benefits. Also, the proprietary nature of shipboard data need not be violated. Both the Science Operator and the Wireline Logging Service operator routinely deal with proprietary data, and none has ever been released prematurely, to our knowledge. If the shipboard scientists are really concerned about interception of the data stream, the data can easily be encrypted. After all, oil companies would not transmit their logs if competitors could steal them.

2. Concerning the quality of the shore-based processing of in situ chemical logging results: We indeed do use Schlumberger programs to do much of the preliminary log processing (depth-shifting, natural gamma-ray processing, density corrections). However, we have revised Schlumberger programs that process the Geochemical logs. In particular, we have changed the oxide factor assumptions to better work in the lithologies that are encountered in ODP, but not typically seen in the oil industry (basalts, oozes, etc.). We have worked closely with the Schlumberger's Ridgefield Research Laboratory in these revisions, and have succeeded in obtaining their proprietary set of elemental yields at Lamont. To our knowledge, this is the first instance of Schlumberger's letting these algorithms outside the company. We have found that the proprietary yields work better in ODP lithologies than the commercial product. We do agree that more effort is needed experimenting with the development of even better data processing software techniques. However, with our present staffing and work load, we do not often have this option.

3. Concerning the uniformity of the Geochemical log processing: The geochemical log data has not been uniformly processed for two reasons. Firstly, the processing of geochemical data is evolving as a result of our constant effort to improve it. Secondly, we don't have the resources to go back and reprocess all old geochemical logs with newly developed software. Such a capability would be a real improvement in the ODP product. To compensate for the changing procedures, we have been

careful to document our processing steps in detailed notes kept at Lamont and fully outlined in the geochemical log data reports published in the scientific volume for each Leg. The detailed information regarding the processing that any given well underwent is thusly available to any interested scientist upon request.

4. Concerning our workload at the BRG: It has indeed increased with the successes of the ODP logging effort. We recommend networking our services to the ODP community over Internet to refocus the workload to more productive and fully electronic tasks. At present, we do too much tape copying and paper mailing. This "modernization" should improve our workload burden.

5. Concerning fiscal deficits: The PECIII correctly noted that the modest baseline funding level of the Wireline Logging Service provides for no contingency funds. Consequently, as the operation has become more complex, unforseen expenditures have occurred. The PECIII recommends that JOI continue to maintain an adequate fund for contingencies such as those recently incurred by the BRG operations. We recommend a more formal mechanism be established to deal with requests of subcontractors for expenditures that will clearly result in deficits. On the operational side, ODP benefits if new science results from such flexability. On the fiscal side, the funding of efforts that are not budgeted are a problem for the program, and more formal procedures for the processing of such requests should probably be established.

6. Concerning the staffing and financial shortages related to high temperature tool development: We certainly agree that insufficient ODP resources are being dedicated to tool development tasking, and particularly to the high temperature tool development (a known money-sink).

7. Concerning the delicate balance between the priorities set for different BRG tasks: We too are concerned with the present *modus*

operandi, in which we must balance the assignment of priorities within our limited resources. We must document, support, interpret and calibrate existing logs, as well as advance new technology and improve existing instrumentation . We are gratified that PECIII agrees that we do a fine job at this balancing act at this time. We are convinced that the decision process indeed could soon turn "dysfunctional", however, as those pressures continue to increase in the future. The planning structure could perhaps be asked to assign numerical priorities to all new tasks assigned to the BRG within a single tasking schedule. We could then react with how such tasks match our capabilities. If there is a manpower or fiscal mismatch, then the program would decide whether to increase committments or decrease the priority of such tasks.

8. Concerning the overcrowded quarters and the fire danger to the BRG: We do operate in overcrowded quarters and there is an enhanced fire danger to wooden frame buildings. Other pressing construction requirements at Lamont prevent significant improvements to the BRG housing problems in the forseeable future, however. We have taken steps to insure that catastrophic fire will not result in the loss of any ODP data trusted to our care. We archive duplicates of all ODP logging tapes in the brick Geosciences building on the Lamont campus, as well as at the BRG building. These archived tapes are convenient to the new Convex 3420 mini-supercomputer, which is the new home to our on-line logging database. We also send all ODP logging data to NGDC in Denver for permanent archival, as well.

In summary, we applaud the PECIII for getting to the heart of both the successes and constraints to our operations in such a short time. They are correct in their perception that we are doing a fine job, but are stressed at the moment. Future operations will, if anything, become even more complex. We will continue to do our best to deliver the stellar wireline logging services that the ODP has come to expect from us.

JOIDES/ODP Site Survey Data Bank

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21 January, 1992

Dr. D. James Baker
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Dear Jim,

I was pleased by the PEC's complimentary comments about the Site Survey Data Bank. I was rather startled, however, to see a certain statement attributed to me, namely that I "recommended that site survey funds be restored to the ODP program, both to assure adequate data and to insure implementation of good proposals whose authors lack ready access to site survey funds or facilities." This subject did indeed come up during discussions with the PEC, but this point of view was advanced by them, not by me. My reaction at the time was that the implementation of such a plan, even if one agreed with its philosophical underpinnings, was politically untenable without a major overhaul of the JOIDES planning process.

Given the fact that PEC went on later in their report to suggest just such an overhaul, however, I feel I might as well address some of the issues they raise. First of all, PEC is quite right in asserting that the present emphasis on "maturity" favors P.I.'s with easier access to ship time, and their discussion of the history of the proposal process leading up to the present state of affairs is well-informed. The question of a "top-down" versus a "bottom-up" approach is, in my opinion, fundamentally unresolvable, as the pendulum of DSDP/ODP history seems to suggest. When the program is driven by the panels, even if the panels include scientists from non-JOI institutions, ODP is vulnerable to charges of being a "closed shop"; when the process is opened up and becomes proposal-driven, scientists with access to ship time do indeed have an advantage. Early in ODP, it was decided to let the geophysics drive the drillship, because many people in JOIDES felt that the scientific community couldn't define problems intelligently without the proper geophysical reference frame. In retrospect, this philosophy may have been a bit rigid, but we mustn't forget that the entire JOIDES panel structure and proposal-review process were based on this premise.

As for international site survey cooperation, there is always room for improvement, though PEC points out that the present proposal system hardly encourages it, in light of the competitive nature of the review process. Still, when scientists from different countries collaborate on drilling proposals, there has been an impressive record of international site survey cooperation (EPR, Kerguelen Plateau, Arctic Gateways, and many others). I think that in the final analysis, the present system does not preclude international cooperation, though a more integrated approach at the Thematic Panel or Working Group level might be worth considering.

Sincerely,

Carl Brenner

Carl Brenner

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INSTITUTE FOR GEOPHYSICS
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April 22, 1992

Dr. D. James Baker, President
JOI Inc.
Suite 800
1755 Massachusetts Ave., NW
Washington DC 20026-2102

Dear Jim:

In response to your letter April 14, 1992 requesting a formal response on the PEC III report from the JOIDES EXCOM and PCOM, please consider the following. The JOIDES EXCOM at its meeting in Bonn reviewed the PEC III report and made certain recommendations. Some of these will be discussed at the next EXCOM meeting in June, others may be referred to PCOM for consideration. Consequently, it is not timely for either of these bodies to have a formal report.

On the other hand, the JOIDES Office, which is a JOI subcontractor should probably respond to the report. The PEC III Committee had its initial meeting at the site of the JOIDES Office. This was primarily an organizational meeting having little discussion about the operation of the Office. Consequently, the PEC III report does not discuss the JOIDES Office operations specifically. Therefore, as far as the JOIDES Office is concerned, we find no problem with the report. Please consider this as our official comment.

It would appear to me that if all of the subcontractors have had an opportunity to comment on the PEC III report then it is up to JOI to distribute the report as JOI sees fit. At that time, it will be appropriate for the EXCOM to officially take action on some of the recommendations.

Sincerely

Arthur E. Maxwell
Chairman, JOIDES EXCOM

cc: JOIDES Office

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Performance Evaluation Committee - III

Reply by JOI

The comments of PEC-III on JOI specifically are rather brief and positive. We do not argue with the assessment that "the management of JOI, with both academic and government experience, obviously works effectively to serve the needs of ODP and to interface with the National Science Foundation..."

The primary recommendation of PEC-III is that JOI "...strengthen its communications public relations program to broaden public knowledge and support for ocean drilling. The addition of at least a part time, experienced science writer would probably be required...." We agree with this suggestion in principle but have always found it difficult to propose such an effort when there are so many other pressures on the budget.

The Committee recommends that NSF's payment of a management fee for ODP (as well as member institution dues) be continued. We concur.