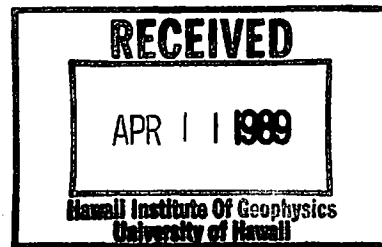


JOIDES Lithosphere Panel Meeting  
Miami, Florida  
28-30 March 1989

EXECUTIVE SUMMARY



1.0 WPAC PLANNING

1.1 Geochemical Reference Sites

New field data needed by PCOM to choose between BON-8 and A2-2 for drilling during the geochemical reference sites leg (130) are now available. LITHP feels either site would fulfill the scientific objectives of Leg 130.

2.0 WORKSHOP ON DEEP CRUSTAL DRILLING

A JOI/USSAC workshop was recently convened at WHOI to discuss priorities and strategies for drilling the lower oceanic crust and mantle. Recommendations include complementary strategies of total crustal penetration to Moho combined with drilling of offset sections in areas where lower crustal and mantle rocks are present near the surface. The high-priority objectives identified at the workshop (attended by 150 scientists) are strongly endorsed by LITHP and will require 14 legs of drilling over the next 10 years. LITHP recommends the creation of a Deep Crustal Drilling (DPG) early in 1990.

3.0 CEPAC PLANNING

3.1 Engineering Legs

LITHP recommends that the diamond coring system along with drill-in casing and the new mini-guide base be thoroughly tested on rubbly volcanic rock during 129E. Future engineering legs, including 129E and 134E should include a contingent of scientists interested in the scientific results of the engineering legs.

3.2 Contingencies for Leg 134E

The second engineering leg (134E) at 504B and the EPR is scheduled to take place after Lau Basin drilling (Leg 134). A proposal has been submitted to examine the casing in 504B using wireline reentry. If the casing is sound, attempts to clean junk from the hole should proceed as scheduled. If these attempts fail, 504B should be side tracked and deepened by 100 m-200 m. At the EPR, a hole should be started using the new diamond-coring system with a mini-guide base, reentry core and drill-in casing.

3.3 Post 134E Drilling

If 504B can be deepened, a drilling leg to continue to the layer 2/3 transition should be scheduled as soon as possible. If in addition, the EPR site is successfully established, then the first leg of EPR drilling could start six months later. There should be a twelve month delay between the first and second legs of EPR drilling.

If 504B cannot be deepened, another deep crustal penetration site in the Pacific should be chosen.

#### 4.0 OTHER MATTERS

##### 4.1 Liaisons

LITHP recommends the following liaison appointments:

- to OHP - G. Smith
- to TECPP - C. Mevel
- to SGPP - L. Cathles
- from OHP - D. Kent
- from SGPP - M. Goldhaber
- from TECP - Roger Buck (already approved)

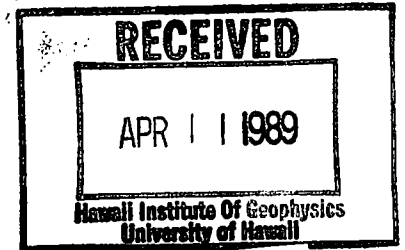
##### 4.2 Next meeting

LITHP has tentatively scheduled to meet with DMP (one day of overlap) Sept. 8-11 at the KTB deep drill site in Germany (J. Erzinger as host).

JOIDES Lithosphere Panel Meeting

Miami, Florida

28-30 March 1989



Members present:

R. Batiza (HIG), Chairman  
K. Becker (RSMAS)  
L. Cathles (Cornell)  
J. Erzinger (FRG)  
J. Franklin (Canada)  
T. Fujii (Japan)

S. Humphris (WHOI)  
C. Mevel (France)  
J. Phipps-Morgan (MIT)  
J. Mutter (LDGO)  
M. Perfit (U. Florida)  
G. Smith (St. Louis Univ.)

In attendance:

G. Brass (PCOM)  
E. Davis (CEPAC DPG)  
R. Detrick (EPR/SR DPG)  
H. Dick (WHOI)  
S. Howard (TAMU)  
J. Natland (SIO)

Absent:

S. Cloetingh (ESF)  
J. Pierce (UK)  
R. Buck (TECP)

SGPP Liaison  
OHP Liaison

Agenda

1. Liaison Reports
2. New Proposals
3. Long-Range Planning
4. Other Matters
  - Liaisons
  - Next meeting

## MINUTES

The meeting began at about 8:45 a.m. Detrick passed the chairman's LITHP binder to Batiza, thus formally completing his chairmanship. The membership thanked Bob for his outstanding efforts and accomplishments during his two-year term as chairman of LITHP. New members (Jason Phipps-Morgan and Guy Smith) were welcomed and Keir Becker, our host, provided some information on meeting logistics, availability of tickets for a nearby tennis tournament and other matters.

### 1.0 LIAISON REPORTS

#### 1.1 PCOM (K. Becker and G. Brass)

Keir Becker, Bob Detrick and G. Brass reviewed the PCOM meeting which took place 18 Nov.-2 Dec. 1988. Several issues of importance to LITHP were reviewed and discussed:

WPAC: PCOM approved one Geochemical Reference Leg (Leg 130) including sites BON-8 and MAR-4. During a recent cruise to the western Pacific, E. L. Winterer was asked to collect single-channel seismic data over sites A2-2 and A2-3 because A2-2 is a possible alternative to BON-8. J. Natland, who was on that cruise, discussed the issue of A2-2 which offers some possible advantages by combining goals of the Geochemical Reference holes with drilling the M-series anomalies in the Western Pacific (proposal 287/E by Handschumacher and Vogt). The new results confirm the magmatic anomaly amplitude changes noted previously but showed that site A2-3 is directly over a seamount. For this reason, Winterer et al. surveyed a site just west of A2-3 on normal crust along the M18 anomaly. Site A2-2 has approximately 200 m of sediment over basement. These new survey data will soon be sent to the L-DGO data bank. In addition, Jim Natland will send to R. Moberly, a letter discussing the results of these surveys and how these results might bear on scientific issues to be decided by PCOM in choosing between BON-8 (on M-13) and A2-2 (on M-18) as part of the Geochemical Reference Hole Leg. Either site is fully compatible with the LITHP objectives in the program.

Next, the status of the Lau Basin drilling (Leg 134) approved by PCOM was discussed. The Lau Basin working group met in November 1988 to consider the new Gloria data collected there. It was noted that J. Hawkins recently completed a cruise to the Lau Basin and these new results may have some impact on the selection of specific sites. In particular, new seismic data collected by Hawkins may affect the exact placement of sites LG-2, LG-7 and LG-9. Hawkins, J. Gill and members of the WPAC DPG are expected to discuss these new results to determine the best site locations.

CEPAC - After the second year of WPAC drilling, PCOM approved a third engineering leg (134E) at hole 504B and the EPR. It was noted that the drilling schedule after that is not firm, but a transit to the Juan de Fuca area followed by a counterclockwise circuit of the North and Central Pacific is a possibility. LITHP discussed possible options for the CEPAC program later in the meeting (see section 3-2).

DPG's - PCOM approved a detailed planning group (DPG) for sedimented ridges while disbanding the EPR working group. The new sedimented ridges DPG (SRDPG) should consider proposals for EPR bore-rock drilling as well as sedimented ridges. Bob Detrick is the chairman of the group and at their next meeting (June 1989) they will discuss several new proposals: 319/E (Galapagos), 321/E (EPR), existing proposals and proposals expected prior to June 1989 (e.g. Endeavour Ridge). During discussion, it was emphasized that the new DPG's and planned DPG's, such as one for deep crustal drilling, should not be dissolved prematurely. The thematic panels may require the input of DPG's regularly because new drilling proposals are submitted continuously. Such input does not necessarily require frequent meetings, however it is essential that DPGs be able to provide their expertise for decision-making for as long a period as necessary. The length of this period may vary, but it cannot be predicted accurately, since it is partly decided by the submission of unsolicited drilling proposals.

### Long-Range Planning Document

The ODP long-range planning document is in the final stages of preparation. The priorities of the LITHP for the next decade of drilling, reflecting discussion over several years, are well-integrated into this document. J. Erzinger (FRG) noted that the document was discussed at a recent meeting of the FRG ODP group and was endorsed strongly. During discussion, it was noted that LITHP planning for post-1992 ODP drilling must proceed in a timely manner. Also it was noted that the long-range planning document should be viewed as a "living document," as new site survey results, new proposals and changing scientific ideas and priorities must also be accommodated in LITHP planning recommendations to PCOM.

#### 1.2 CEP-DPG (E. Davis)

The Central and Eastern Pacific DPG has recently completed its prospectus for CEPAC drilling (Blue cover). At their next meeting (April 11, 12 at Hilo) CEP-DPG will attempt to shorten the present program, if possible, and to construct several "straw-men" drilling schedules. It is important to note that LITHP priorities during CEPAC remain unchanged. LITHP continues to recommend a high priority for drilling unsedimented ridges, sedimented ridges, deep crustal drilling, (504B) and a case study of the early evolution of hot spots at Loihi. A new drilling proposal (321/E) for the EPR was recently received and was very favorably reviewed by LITHP. This proposal, plus additional proposals to be considered in detail by the SRDPG in June, should considerably strengthen the case for the scientific importance of drilling unsedimented ridge crests. (CEPAC planning is discussed also in section 3.2).

An important concern for drilling all the above LITHP targets continued to be the potential problem of high temperatures. Temperatures of 300°-400°C are expected and these pose a problem for drilling and subsequent logging of the holes. It was noted that Lou Garrison, M. Langseth and others intend to meet in April at TAMU to consider the problems of drilling into rock at high temperature. In parallel, the down-hole measurements panel (DMP) has recommended a workshop to investigate the implications of high-temperature drilling (possibly in slim, 4" holes) on logging requirements. TEDCOM also is concerned with these potential problems and will discuss them at length in Summer 1989.

Since all of LITHP's highest priority drilling targets in CEPAC are likely to encounter high temperatures and some may be drilled with the new diamond coring system (DCS), LITHP believes it is essential to carefully consider the implications for drilling and logging. Partly for this reason, we propose our next meeting to overlap with the DMP meeting in September 1989 (see 4.2). The Pollution Prevention and Safety Panel (PPSP) also is concerned with high-temperature drilling and plans to start considering it in detail. Potential hazards include not just the high temperatures in the hole but also possible venting of hydrogen sulfide gas and hot water. These problems are not considered especially difficult, but should be resolved during 1990 well in advance of drilling high priority LITHP targets in CEPAC.

### 1.3 - Workshop on Deep Crustal Drilling (H. Dick, J. Natland)

A JOI/USSAC-sponsored workshop on drilling the lower ocean crust and mantle was convened March 7-10 at Woods Hole. This workshop was organized by H. Dick with the aid of an Organizing Committee and a Steering Committee of eleven scientists. It was attended by 150 scientists representing diverse disciplines within earth and ocean sciences and was intended as a major effort to design a realistic strategy to drill rocks from the lower ocean crust and mantle.

Results of the workshop will be widely distributed to the community in the form of a workshop report. A copy of the preliminary working document is appended to the minutes and gives the major recommendations of the workshop. Essentially, the workshop recommended continued attempts to complete a hole through the ocean crust into the mantle. This is a long-term goal probably requiring engineering developments such as a 11.5 to 12 km-long drill string, new heavy duty casing and others. An important complementary strategy to complete crustal penetration involves drilling offset partial sections in regions where deep crustal and mantle rocks are present near the surface. Important long-term goals of these combined strategies are to penetrate the layer 2/3 boundary and the Moho and to obtain long sections of rock from layer 3 and the oceanic mantle. Major questions concerning tectonic processes at mid-ocean ridges and transforms also can be addressed at the same time.

Careful estimates of drilling times needed to achieve these objectives have been made by Jim Natland. Preliminary indications are, that to fully succeed, the recommended program of Deep Crustal Drilling will require about 14 drilling legs over a ten-year period, which slightly exceeds the present recommendation in the ODP long-range planning document for Objective 1 (presently 12 legs over 10 years).

LITHP strongly endorses the workshop recommendation and will make efforts over the next several years to help implement them. As an important part of this effort, LITHP recommends to PCOM that a DPG for deep crustal drilling be formed to consider site selection criteria for deep crustal drilling sites and to consider specific proposals. Several proposals for drilling the lower ocean crust and mantle are expected to arrive in 1989, so the DPG should probably be formed in late 1989 or very early in 1990.

## 2.0 NEW AND REVISED PROPOSALS

LITHP considered nine new or revised drilling proposals. Each proposal was discussed at length and under the new review system, detailed letters summarizing the discussion will be sent to proponents. At this moment, the letters have not yet been sent, however below are listed some of the main points of discussion for each proposal.

### 2.1 3/E(R) - Hawaii Flexural Moat and Arch (Watts et al.)

The flexural response to loading the oceanic lithosphere is a very important question, however doubt still remains that the dating resolution obtainable in sediments of the Hawaiian moat will be sufficient to resolve the loading/flexure response history of the moat at the required level. However, new Gloria data showing massive debris flows entering the moat from the Hawaiian islands, plus large lava flows on the Hawaiian arch indicate some new and very interesting scientific questions that can be addressed by drilling. The nature, history and significance of arch volcanism is of particular interest to LITHP and consequently this portion of the proposal was highly rated.

### 2.2 275/E Gulf of California (B.R.T. Simonett et al.)

This proposal has many scientific goals, of which two are of interest to the lithosphere panel. The nature of the continent-ocean transition along the Gulf of California is an important question, however LITHP feels that the proposed drilling is inadequate to fully resolve most important issues. The hydrothermal drilling program, especially a careful program in the Guaymas basin aimed at an understanding of fluid circulation is of interest to LITHP and probably also SGPP. The proposed program, however, is too scant to address most questions of interest thoroughly. This portion of the proposal received the highest rating but, as proposed, received only moderate ratings. This portion of the proposal should be considered further at the SRDPG meeting in June.

### 2.3 310/A Dipping Reflectors - E. Greenland (Morton et al.)

The nature of dipping reflectors was investigated on DSDP Legs 38 and 81. They are now known to consist of basalt lavas generated during early rifting. This proposal argues that drilling the conjugate margin of E. Greenland would shed further light on the melting process, extent of contamination of basalt and other matters. LITHP feels that some of the arguments in the proposal are flawed and that the drilling strategy is inappropriate in the light of present knowledge about dipping reflectors. This proposal did not receive high ratings.

### 2.4 312/A Reykjanes Ridge (Cann and Powell)

Although this proposal is very immature, it received high ratings in principle because ridge processes are a high thematic priority of LITHP. The proponents will be encouraged to submit a fully mature proposal for young crustal drilling of the Reykjanes Ridge. LITHP notes, however, that merely because the rocks may be more vesicular than at deeper ridge axes, it is not likely that they will be any easier to drill than young fractured basalts of zero-age elsewhere along the mid-ocean ridge system.

## 2.5 315/F Global Seismic Network - Hawaii Test Site (Purdy and Dzeiwonski)

The notion of a Global Network of Ocean Floor broad band seismometers placed in ODP holes received very strong support from LITHP. LITHP reaffirms its strong interest in the program, which is an element of the ODP long-range planning document. However several important questions were raised about the proposed site off Oahu. First, it was not clear whether adequate site surveys are available to avoid placing the instrument into a sill intruded into sediment (which would cause poor instrument response). Secondly, while Oahu is an accessible and convenient site, it was not clear that equally convenient sites are not available elsewhere. For example, could the instrument be tested using an existing DSDP or ODP hole with wire-line reentry? Thus while the concept of conducting a pilot study, instrument development, testing and all steps required to eventually establish a net of ocean floor seismometers is strongly endorsed by LITHP, this proposal raises questions. The proponents will be asked to provide clarification of these issues.

## 2.6 318/E Chile Margin Triple Junction (Cande and Lewis)

This proposal is strongly endorsed by TECP and is aimed mostly at tectonic questions. However, several of the proposed sites are also of interest to LITHP: TJ-4 to look at hydrothermal activity at the triple junction and TJ-7 on the Taitao ridge, which possibly is related to the Taitao ophiolite exposed on land nearby. Of additional interest to LITHP are sites on zero age crust near the margin, but none are proposed in the present drilling proposal. The problem of ridge subduction is one of great interest to LITHP, but this question is de-emphasized in the present proposal. Although there are some concerns about whether TJ-4 alone will be sufficient to resolve the hydrothermal questions, overall, the proposal was rated highly.

## 2.7 319/E Galapagos Stockwork (Perfit et al.)

This proposal has several goals including investigating the possible links between high iron basalts and hydrothermal activity. Site GRIT-1, to drill an extinct hydrothermal system received high ratings, though it was noted that study of on-land stockworks generally require an array of many drill holes for thorough understanding of their genesis. Site GRIT-4 to drill a section of Fe-Ti-rich basalts also received reasonably high ratings. Sites GRIT-2 and 3, used to tie alteration, hydrothermal activity and eruption chronology together spatially, received less high ratings because it was felt that more holes would be required to make the test conclusive. Overall, the proposal was rated moderately high. LITHP recommends that it be considered further at the upcoming SRDPG meeting as it deals with bare-rock drilling at the Galapagos Spreading Center and with extinct hydrothermal activity.

## 2.8 321/E EPR at 9°40'N (Fornari et al.)

This proposal is of great interest to LITHP and received high ratings. This segment of the EPR was considered as a good candidate for drilling by the EPR working group and the only important site-selection criteria lacking is documentation of hydrothermal activity. A field program in November 1989



(Fornari and Haymon) will map this EPR segment in detail using the ARGO-JASON deep tow instrument and should find hydrothermal vents if they are present. Even though these results will not be known prior to the SRDPG meeting in June, LITHP recommends that this proposal be considered at their June meeting.

## 2.9 322/E Pipe-like Structure on the Ontong-Java Plateau (P. H. Nixon)

This drilling proposal is very interesting because if the pipe-like structures present on the Ontong-Java Plateau (OJP) are kimberlites, as suggested, this would be the first oceanic occurrence. Unusual, possibly related rocks (alnoites) are thought to have been explosively emplaced on the island of Malaita just south of the OJP 34 MY ago. While the possibility of kimberlites on the OJP is exciting, evidence to substantiate that the pipe-like structures on truly buried kimberlites is lacking. Unless the OHP could incorporate a hole on one of the structures into their program, which seems doubtful, LITHP does not favor devoting a major effort to this question. A deep-basement penetration on the OJP is a much higher priority to LITHP.

## 3.0 LONG-RANGE PLANNING

### 3.1 Engineering Developments

Steve Howard of the TAMU engineering group attended the LITHP meeting to discuss results of Leg 124E and additional plans for engineering work. While the results of Leg 124E were mixed, it is clear that the tests of the new diamond coring system (DCS) were highly successful. LITHP was impressed by the great progress that has been made in a very short period of time. Steve also reported on several new engineering concepts which could be used to drill young fractured volcanic rock and other problematic materials. These employ a number of different strategies featuring the new mini-guide bases, reentry cones and cement bags in combination with the new DCS. For example, for shallow (<200 m) holes into fractured basalt, Steve Howard described a possible strategy using a mini-guide base and a reentry cone weighted with doughnut collars. This arrangement might allow starting a hole on bare rock with the DCS and continuing down up to 200 m. It was noted that for future site selection, a camera mounted on the mini-guide base would be extremely helpful for finding areas of unfractured bare-rock for spud-in. Several of these combinations give great promise of success and are described in more detail in the attached trip report of Steve Howard.

LITHP emphasizes the importance of continued testing of the diamond coring system during the next engineering leg (Leg 129E). It is important that several shallow sites known to contain fractured volcanic rock be identified well before 129E is scheduled. While the present WPAC schedule is uncertain, several sites in the Bonin's, and elsewhere in the northwest Pacific are good candidates. LITHP further recommends that a scientific party interested in the drilling results at the proposed test sites be aboard for 129E. This would help improve site selection options and also help maximize the scientific return of the leg. LITHP strongly endorses the notion of dedicated engineering legs, and feels that better-integrated participation by interested scientists will help the success of the engineering tests.

### 3.2 Long-Range Planning

Two major planning items were considered: 1) LITHP objectives during CEPAC drilling (Phase 1, to 1992) and 2) Planning for Phase 2 (1993 to 1996). Phase 1 - PCOM has recommended that after Leg 134 (Lau Basin), the RESOLUTION transit to hole 504B to begin the third engineering leg (134E). The main purposes of the leg are to prepare 504B for later deepening and to start a base-rock hole at the EPR. LITHP considered possible options for 134E and subsequent legs, based on the level of success achieved during 134E. At 504B, there are two problems. The first is to determine whether the casing is sound, or whether it is worn, as suggested by repeated hang-ups at the end of Leg 111. Keir Becker has submitted a proposal to enter 504B using wire-line reentry to determine the state of the casing. If the casing is badly worn, then it may be possible to install new casing (see S. Howard's trip report). This possibility, however, does not seem very promising, so if the casing is worn, it may be necessary to abandon hole 504B.

If the casing is sound, then the second problem is the junk at the bottom of the hole. If the junk can be removed or milled away, the hole could then be deepened 100-200 m or more. Milling and fishing activities are estimated to take 4 weeks. If at the end of this time, the hole cannot be cleared of junk, sidetracking the hole and deepening it by 100-200 m is estimated to take an additional 2 weeks. Thus it is possible that up to 6 weeks of Leg 134E may be needed at 504B. This would leave only about 2 weeks at the EPR to set a guideline and establish a hole. If the new mini-guide bases (expected cost \$30,000 each), reentry cone, drill-in casing and DCS are successfully tested during 129E, then it may be possible to accomplish a great deal at the EPR during 134E. In any case, it will be essential to have a scientific party on 134E.

If 504B can be successfully deepened, LITHP favors returning to continue drilling to the layer 2/3 transition as soon as possible in the drilling schedule. If it cannot, then additional logging and side-wall coring may be desirable to present depth. This could possibly be done during 134E, but if not, could be postponed to a later time. In general, the following options and desirable scenarios appear:

<u>134E - 504B</u>	<u>EPR</u>	<u>LITHP recommendations</u>
Success	Success	Leg 135 - E. Equatorial Pac., 136- ?, 137-504B, 138-EPR I. EPR II - 12 mos. later.
Success	Failure	Leg 138-504B
Failure	Success	Leg 138 - EPR I
Failure	Failure	EPR-I 12 mos. later (with possible additional engineering half leg) - start new deep crustal drilling site prior to Leg 140.

Phase 2 (1993-1996) - LITHP's high priority goals for Phase 2 drilling include: 1) deep crustal drilling and recovery of deep crustal and mantle sections, 2) studies of crustal accretion, 3) establishing sea-floor seismic observations, and 4) case studies. The ODP long-range planning document provides 7 legs of drilling for these objectives prior to 1993 during Phase 1. In Phase 2, the specific priorities for LITHP drilling have not yet been determined in detail, but LITHP will have thematic priorities of global significance for the Atlantic, Pacific and Indian oceans soon. For each of the four LITHP priorities, above, there are existing, highly rated proposals available. In addition, many new proposals are expected in the next year or two for Phase 2. At its next meeting LITHP will attempt to rerank existing proposals and to discuss planning priorities for Phase 2. In this way, LITHP is expected to have highly rated case studies as contingency drilling objectives as well as highly rated drilling targets to help determine whether CEPAC drilling should be extended modestly, or alternatively whether the RESOLUTION should move into the Caribbean/Atlantic. Existing proposals for MAR drilling in the Kane Fracture Zone area, plus expected proposals for Reykjanes ridge, the Vema area and the Caribbean indicate that LITHP will have no shortage of outstanding drill targets. Even so, some discussion was held on the notion of placing an Ad in EOS to solicit drilling proposals (for all oceans). LITHP feels that the community should be more widely aware of the LITHP thematic priorities so that a variety of proposals that address them can be considered.

#### 4.0 ADDITIONAL MATTERS

##### 4.1 Liaisons

LITHP recommends the following liaisons from LITHP be appointed:

to OHP - Guy Smith  
to SGPP - Larry Cathles  
to TECP - Catherine Mevel

At present, LITHP lacks liaisons from OHP and SGPP. The TECP liaison to LITHP is Roger Buck. LITHP requests that the following suggestions for liaisons be considered by OHP and SGPP liaisons to LITHP:

from OHP - Dennis Kent  
from SGPP - Morton Goldhaber

LITHP believes that strong liaisons to and from TECP, OHP and SGPP are essential, not only for information transfer but also for long-range planning. All thematic panels have overlapping interests as set out in their mandates and should thus work closely on high priority drilling objectives of common interests.

##### 4.2 Next Meeting

The next meeting is tentatively scheduled for September 8-11 at the KTB deep drill site in Germany. This is planned as a one-day overlap with the downhole measurements panel which meets September 11, 12. Jörg Erzinger has agreed to act as host.