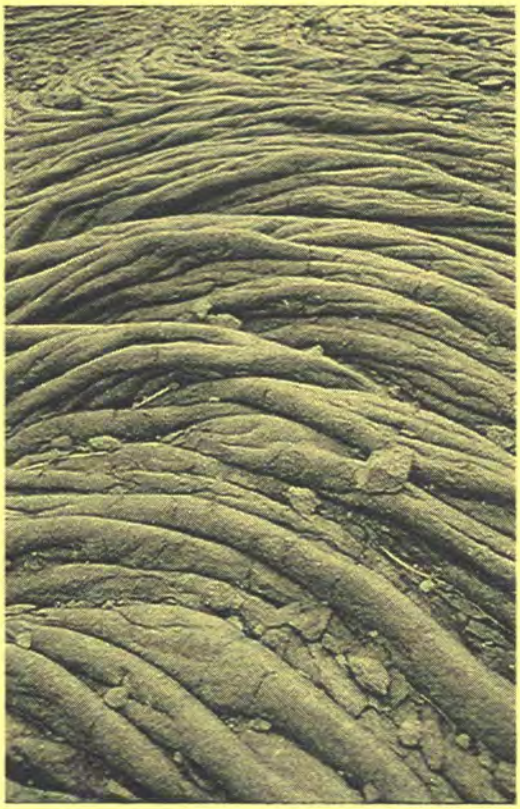
JOIDES SCIENCE COMMITTEE (SCICOM)

22-24 April, 1997, Kona, Hawaii

AGENDA BOOK



Joint Oceanographic Institutions for Deep Earth Sampling

University of California, Scripps Institution of Oceanography • Canada - Australia -Korea Consortium • Columbia University, Lamont-Doherty Earth Observatory • European Science Foundation: Belgium, Denmark, Finland, Iceland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, Turkey • France: Institut Francais de Recherche pour l'Exploitation de la Mer • Germany: Bundesanstalt für Geowissenschaften und Rohstoffe • University of Hawaii, School of Ocean and Earth Science and Technology • Japan: Ocean Research Institute, University of Tokyo • University of Miami, Rosenstiel School of Marine and Atmospheric Science • Oregon State University, College of Oceanography • University of Rhode Island, Graduate School of Oceanography • Texas A&M University, College of Geosciences and Maritime Studies • University of Texas at Austin, Institute for Geophysics • United Kingdom: Natural Environment Research Council • University of Washington, College of Ocean and Fisheries Science • Woods Hole Oceanographic Institution

Prepared by the Woods Hole JOIDES Office

JOIDES Office

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April 2, 1997

Dear SCICOM Members, Liaisons, and Guests

Please find enclosed the Agenda Book for the first SCICOM meeting to be held 22-24 April 1997 in Kona, Hawaii. Those of you who were previously at PCOM will notice that this meeting is scheduled for three days, rather than the three and one-half days typical of PCOM meetings. It is my hope that by working efficiently we can accomplish all our tasks; however, please note that this will require three **full** days of meetings, so you should plan not to leave until after 5 pm on the 24th.

There are a few items I would like to bring to your attention:

- The Agenda Book contains a great deal of background information relevant to the decisions we need to make. Please be sure to read it prior to the meeting so we can be efficient at the meeting.

- We will be setting up the new Operations Committee (OPCOM) at this meeting. This will involve selection of two SCICOM members, plus three others from the international drilling community. Please give some thought prior to the meeting as to individuals familiar with ODP operations who might be appropriate members for OPCOM.

- We will also be determining membership of two Program Planning Groups (PPGs): the Deep Biosphere PPG, and the Long-Term Observations PPG. I have received some nominations for membership of these groups, but I request you also provide additional names.

- One of the tasks of SCICOM is to provide liaisons to other Panels within the JOIDES Advisory Structure to ensure that there is efficient and constructive flow of information and advice. This requires that most SCICOM members will act as a Liaison to a Panel or other Group, and attend their meetings. Please consider on which Panel you might be interested in serving in a liaison capacity.

- Please remember to bring the Active Proposals booklet (with the yellow cover) to the meeting that was sent to you under separate cover. You will need it for the Long-Term Planning discussion.

Finally, one of the long-standing traditions of PCOM that I believe we should continue, is wine and cheese to mark the end of the meeting. Please bring a bottle of wine that you would like to share with your colleagues after business is concluded on Thursday!

If you have any questions, please feel free to contact the JOIDES Office. I look forward to seeing you and to a productive meeting in Hawaii.

Sincerely,

Susan

Susan E. Humphris
Chair, Science Committee

Enclosure
SEH/sjw

SCICOM Meeting Agenda and Schedule

Tuesday, April 22.....8:30 AM

A. Welcome and Introduction (30 min.)

1. Introduction of SCICOM Members, Liaisons and Guests
2. Logistics of the Meeting
3. Responsibilities and Mandates of SCICOM
4. Approval of the Agenda
5. Approval of the Minutes of December 1996 PCOM Meeting
6. Update on Action Items from December PCOM

B. Reports of Liaisons

1. NSF (B. Malfait- 15 min.)
2. JOI (D. Falvey - 15 min.)
3. ODP-TAMU (J. Baldauf - 30 min.)

(The ODP-LDEO Report will be presented on Wednesday, April 23)

Coffee Break.....10:00-10:30

C. JOIDES Advisory Structure

1. New Mandates and Terms of Reference
2. SCICOM/OPCOM
   - 2.1 Rotation Schedule of SCICOM
   - 2.2 OPCOM Membership
3. SSEPs
   - 3.1 Chairs for SSEPs
   - 3.2 SCICOM Liaisons to SSEPs
4. SciMP
   - 4.1 Chairs for SciMP
   - 4.3 SCICOM Liaison to SciMP
5. Other Panels
   - 5.1 Updates on Membership
   - 5.2 SCICOM Liaisons

Lunch.....12:00-1:00

C. JOIDES Advisory Structure (continues)

6. Approved PPGs (Subsurface Biosphere and Long-Term Observatories)
   - 6.1 Subsurface Biosphere Workshop (Farrell - 15 min.)
   - 6.2 Mandates
   - 6.3 Chairs and Members
   - 6.4 Reporting and Liaising Relationships

D. Proposal submission and Evaluation

1. Background to the Development of a New Proposal Submission and Evaluation Process
2. Report of Interim SSEPs (Ludden - 15 min.)

Coffee Break.....3:00-3:30

D. Proposal submission and Evaluation (continues)

3. Discussion of Proposal Submission and Evaluation Process

E. Workshop/Committee Reports

1. JOI JANUS Steering Committee Report (Farrell - 15 min.)
   1. 1. Steps Taken to Address PCOM Motion 96-3-11 (Fox- 10 min.)
2. ICDP (Larson - 15 min.)
3. Final Outcome of Sampling Policy Workshop (Farrell- 20 min.)

Meeting adjourns.....5:00

Wednesday, April 23.....8:30 AM

E. Workshop/Committee Reports (continues)

4. JOI Publications Steering Committee Report (Scholl - 30 min.)
5. SCICOM Discussion on Publications Policy (40 min.)

B. Reports of Liaisons (continues)

4. ODP-LDEO (D. Goldberg-20 min.)

Coffee Break.....10:00-10:30

F. Leg Reports

1. Leg 170 (Silver - 30 min.)
2. Leg 171A (Casey Moore - 30 min.)
3. Leg 171B (Kroon - 30 min.)

Lunch.....12:00-1:00

G. Short-Term Planning

1. Review of Status of Upcoming Legs (Humphris- 45 min.)
2. Dry-dock Requirements (Fox- 30 min.)
3. SCICOM Discussion on Prioritization of Items for Dry-dock (45 min.)

Coffee Break.....3:00-3:30

H. 5-Yr. Planning-Scientific

1. Review of the Strategic Implementation Plan
2. Review of Proposals within the System Categorized by the LRP Theme
3. Need for PPGs and DPGs
4. Four-year Ship Track Recommendation
5. Steps to Achieve the Goal of Testing the Depth Capabilities of the *JOIDES Resolution*

Meeting adjourns.....*5:00*

Thursday, April 24.....**8:30 AM**

I. 5-Yr. Planning - Technological

1. Technological Issues for Long-Term Planning
2. CONOCO-Hydril Update (Falvey or Fox - 15 min.)
3. Prioritization of Technological Requirements Identified in the Strategic Management Plan

Coffee Break.....*10:00-10:30*

J. Long-Term Planning

1. OD-21(Tamaki - 15 min.)
2. CONCORD (Humphris - 15 min.)

K. SCICOM Correspondence

Lunch.....*12:00-1:00*

L. New Business

M. Future Meetings

N. Review of Motions and Action Items

PARTICIPANT LIST

Members

Gerard Bond	Lamont-Doherty Earth Observatory, Columbia University
Kevin Brown	Univ. of California San Diego, Scripps Institution of Oceanography
Susan E. Humphris (Chair)	Woods Hole Oceanographic Institution
Emily M. Klein	Duke University, Durham
Hermann R. Kudrass	Bundesanstalt für Geowissenschaften und Rohstoffe, Germany
Roger L. Larson	University of Rhode Island, Graduate School of Oceanography
John Ludden	CRPG, Vandoeuvre-les-Nancy, France
Judith A. McKenzie	Swiss Federal Institute of Technology (ETH), Zurich
Kenneth G. Miller	Rutgers, The State University, New Brunswick
Gregory F. Moore	University of Hawaii
J. Casey Moore	University of California, Santa Cruz
Jonathan C. Overpeck	NGDC, NOAA, Boulder
Julian A. Pearce	University of Durham, United Kingdom
Maureen E. Raymo	Massachusetts Institute of Technology, Cambridge
Steve D. Scott	Canadian Secretariat for Ocean Drilling, Toronto
Kensaku Tamaki	Ocean Research Institute, University of Tokyo, Japan

Liaisons

Dave Falvey	Joint Oceanographic Institutions, Inc.
Jack Baldauf	Science Operator (ODP-TAMU)
Dave Goldberg	Wireline Logging Services (ODP-LDEO)
Bruce Malfait	National Science Foundation

Guests & Observers

Bob Carter	James Cook University, Australia
Ju-Chin Chen	Chinese Taipei ODP Consortium
Kathy K. Ellins	JOIDES Office, Woods Hole Oceanographic Institution
John Farrell	Joint Oceanographic Institutions, Inc.
P. Jeff Fox	ODP-TAMU
Dick Kroon	University of Edinburgh, United Kingdom
Maria Mutti	JOIDES Office, Woods Hole Oceanographic Institution
Eli Silver	University of California, Santa Cruz
David Scholl	USGS, Menlo Park
Alister Skinner	TEDCOM Chair, British Geological Survey, Edinburgh
Shirley Waskilewicz	JOIDES Office, Woods Hole Oceanographic Institution

JOIDES Resolution Operations Schedule

Leg	Destination	Cruise dates	Port of Origin	Total Days	Tran-sit	On Site
173	Iberia	21 Apr- 16 Jun '97	Lisbon, 16-20 Apr	56	10	46
174A	New Jersey Shelf	21 Jun-19 Jul '97	Halifax, 16-20 Jun	28	3	25
174B	CORK Hole 395A	22 Jul-10 Aug '97	New York, 19-21 Jul	19	14	5
175	Benguela	15 Aug- 10 Oct '97	Las Palmas, 10-14 Aug	56	19	37
176	Return to Hole 735B	15 Oct-10 Dec '97	Cape Town, 10-14 Oct	56	16	40
177	S. Ocean Paleoceanography	15 Dec '97-9 Feb '98	Cape Town, 10-14 Dec	56	16	40
178	Antartic Peninsula	14 Feb- 11 Apr '98	Punta Arenas, 9-13 Feb	58	18	38
179	NERO Hammer Drlling	16 Apr- 30 May '98	Cape Town, 11-15 Apr	44	22	22
180	Woodlark Basin	4 Jun- 30 Jul '98	Singapore, 30 May- 3 Jun	56	14	42
181	SW Pacific Gateways	4 Aug- 29 Sep '98	Townsville, 30 Jul-3 Aug	56	15	41
182	Great Australian Bight	4 Oct-29 Nov '98	Wellington, 29 Sep-3 Oct	56	13	43
183	Kerguelen	4 Dec '98- 2 Feb '99	Fremantle, 29 Nov-3 Dec	60		

JOIDES Meeting Schedule

Panel/Committee	Dates	Location
SCICOM	22-24 April, 1997	Kona, Hawaii
PPSP	26-27 May, 1997	Australia
SSEPs	2-4 June, 1997	Washington, D.C.
EXCOM/ODP Council	9-11 June, 1997	Brest, France
SciMP	18-20 June, 1997	Halifax
SSP	14-17 July, 1997	Palisades, NY
SCICOM	18-20 August, 1997	Davos, Switzerland
OPCOM	22-23 August, 1997	Davos, Switzerland
SSEPs	November, 1997	TBA

SCICOM Meeting Agenda Notes

Tuesday, April 22.....8:30 AM

A. Welcome and Introduction (30 min.)

1. Introduction of SCICOM Members, Liaisons and Guests
2. Logistics of the Meeting
3. Responsibilities and Mandates of SCICOM

The new Mandates and Terms of Reference are in Section C of this Agenda Book.

4. Approval of the Agenda

SCICOM is asked to approve the Agenda for the meeting.

5. Approval of the Minutes of December 1996 PCOM Meeting

SCICOM is asked to put forward any corrections in addition to those passed to the JOIDES Office before this meeting, and then vote on approving the Minutes of the Biosphere meeting, in the Agenda Book (section A). These contain all revisions received by the JOIDES Office before March 28, 1997.

6. Update on Action Items from December PCOM

The Minutes from the February EXCOM meeting are in Section A of this Agenda Book.

B. Reports of Liaisons

1. NSF (B. Malfait- 15 min.)
2. JOI (D. Falvey - 15 min.)
3. ODP-TAMU (J. Baldauf - 30 min.)

(The ODP-LDEO Report will be presented on Wednesday, April 23)

Coffee Break.....10:00-10:30

C. JOIDES Advisory Structure

1. New Mandates and Terms of Reference

The new Mandates and Terms of Reference for the JOIDES Advisory Structure are in Section C of this Agenda Book.

2. SCICOM/OPCOM

2.1 Rotation Schedule of SCICOM

A list of SCICOM members with the starting date of their appointment can be found in Section C of this Agenda Book. Given that a large number of SCICOM members have the same start date, SCICOM needs to agree upon a rotation schedule that will even out the turnover of Panel membership.

2.2 OPCOM Membership

As per the new Mandate and Terms of Reference, OPCOM will consist of three SCICOM members, plus three other members from the International drilling community. SCICOM is asked to select the membership for OPCOM.

3. SSEPs

3.1 Chairs for SSEPs

A list of members for both SSEP panels can be found in Section C of this Agenda Book. SCICOM is asked to select a Chair for each SSEP.

3.2 SCICOM Liaisons to SSEPs

SCICOM is asked to appoint two of its members to act as liaisons to each of the SSEPs.

4. SciMP

4.1 Chairs for SciMP

A list of SciMP members can be found in Section C of this Agenda Book. SCICOM is asked to select a Chair of SciMP.

4.3 SCICOM liaison to SciMP

SCICOM is asked to appoint one of its members to act as a liaison to SciMP.

5. Other Panels

A list of members of the other panels within the JOIDES Advisory Structure can be found in Section C of this Agenda Book.

5.1 Updates on Membership

5.2 SCICOM Liaisons

SCICOM needs to consider liaisons to SSP, PPSP and TEDCOM. In the case of SSP and PPSP, liaisons who are members of OPCOM are appropriate. In the case of TEDCOM, SCICOM should appoint one of its members to act as a Liaison.

Lunch.....12:00-1:00

C. JOIDES Advisory Structure (continues)

6. Approved PPGs (Subsurface Biosphere and Long-Term Observatories)

During its December 1996 meeting PCOM set up two PPGs:

- *the Deep Biosphere Pilot Project PPG (PCOM Consensus 96-3-2)*
- *the "Long-Term Observatories" PPG, concerned with long-term instrumentation both in and around the boreholes (PCOM Motion 96-3-21).*

6.1 Subsurface Biosphere Workshop (Farrell- 15 min.)

This is a short report on the Subsurface Biosphere Workshop, which met in Washington DC on March 17-18, 1997, as a background information for the PPG mandates and membership.

6.2 Mandates

The SCICOM Chair will present Draft mandates for each PPG and request SCICOM comment and approval.

6.3 Chairs and Members

SCICOM is asked to recommend a Chair and members for each PPG. SCICOM members are expected to provide nominations at the meeting to add to those that will be presented by the SCICOM Chair.

6.4 Reporting and Liaising Relationships

SCICOM is asked to determine appropriate liaising and reporting relationships to the JOIDES Advisory Structure.

D. Proposal Submission and Evaluation Process

1. Background to the Development of a New Proposal Submission and Evaluation process

A draft document describing new proposal submission and evaluation procedures can be found in Section D of this Agenda Book.

2. Report of Interim SSEPs (Ludden - 15 min.)

The Minutes of the Interim SSEP meeting, held in Woods Hole, January 20-22, 1997, can be found in section D of this Agenda Book.

Coffee Break.....3:00-3:30

D. Proposal Submission and Evaluation Process (continues)

3. Discussion of Proposal Submission and Evaluation Process

E. Workshop/Committee Reports

1. JOI JANUS Steering Committee Report (Farrell - 15 min.)

This is a short update on the JANUS project- implementation of a major upgrade to ODP computer systems to facilitate data collection and integration. Information on the JANUS Project can be found in Section E of this Agenda Book.

1. 1. Steps Taken to Address PCOM Motion 96-3-11 (Fox- 10 min.)

*TAMU will respond to following **PCOM Motion, 96-3-11**:*
PCOM is concerned that the success of the fundamentally necessary and expensive JANUS data base upgrade is being hampered by management-related issues at TAMU. PCOM recommends that JOI direct TAMU to investigate and correct any management related problems that are posing a serious risk to the successful completion of this project. TAMU should report to SCICOM at their April meeting on the steps they have taken to rectify these problems.

2. ICDP (Larson - 15 min.)

This is a short report on the April meeting of the International Continental Drilling Program (ICDP), a consortium established to address a spectrum of scientific problems that will improve our understanding of Earth's lithosphere.

3. Final Outcome of Sampling and Curation Policy Workshop (Farrell - 20 min.)

This is an update on the sampling policy and its modifications after the December PCOM meeting. A draft copy of the sampling policy is in Section E of this Agenda Book.

Meeting adjourns.....5:00

Wednesday, April 23.....8:30 AM

E. Workshop/Committee Reports (continues)

4. JOI Publications Steering Committee Report (Scholl - 30 min.)

This is a short report on the JOI Publication Steering Committee, which met in Washington D.C. on April 3-4, 1997.

5. SCICOM Discussion on Publications Policy (40 min.)

PCOM during its April 1996 meeting passed the following motion:

PCOM Motion 96-1-13

To address continuing concerns about the cost of ODP publications and also the impact of the December 1995 PCOM recommendations on the quality of the Scientific Results volume, PCOM makes the following recommendations to JOI for one possible new model for ODP publications:

1) That ODP-TAMU publish a single Proceedings volume for each drilling Leg.

2) The Proceedings should be a single high quality monograph containing the prime data, synthesis and scientific results.

3) The contents of the Proceedings volume should contain:

(A) in text form

(a) site summaries
(b) operations reports
(c) site chapters
(d) scientific syntheses
(e) scientific papers
(f) text of data reports
(g) abstracts of papers submitted or published outside the Proceedings.

(B) on CD-ROM

(h) large data sets (>1 page tables)
(i) core photographs
(j) core descriptions
(k) VCD's and barrel sheets
(l) thin section descriptions

4) The publication date of the Proceedings should be 48 months post-cruise with an initial submission deadline for scientific papers 30 months post-cruise.

5) An initial core description volume should be published 3 months post-cruise in a relatively inexpensive form in soft cover. This document, however, should be citable and might contain:

(a) core photographs
(b) VCD's and barrel sheets
(c) site summaries
(d) operations reports
(e) thin section descriptions in table form

Specific items to be included will be amended after discussions with ODP-TAMU and JOI.

6) PCOM re-affirms its advice to JOI that scientific participants in drilling legs should be permitted to submit single or multi-authored scientific articles after 12 months post-cruise without prior approval of the scientific party.

7) PCOM reaffirms its advice to JOI that the scientific participants should be required to submit either a paper to a peer-reviewed journal or to the Proceedings by the closing date of the Proceedings volume.

8) PCOM advises JOI that the Editorial Review Board should be constituted by 12 months post-cruise and be charged with reviewing papers submitted for publication outside the proposed Proceedings volume for proper citation of the site summaries and site chapters, and for proper use of data and conclusions of other members of the scientific party.

9) PCOM advises JOI that permission to submit to a non-ODP publication prior to closing of the Proceedings should be contingent upon simultaneous transmittal of a full copy of the manuscript to the Editorial Review Board.

After this PCOM meeting, due to financial considerations, a new Electronic Publications Strategy was prepared by D. Falvey, A. Klaus and H. Dick and presented to EXCOM. This document is in Section E of this Agenda Book. With the following Consensus, EXCOM endorsed the policy:

EXCOM Consensus 96-2-6

EXCOM endorses the new ODP Publication Strategy proposed by JOI in response to the NSF Inspector's general Report with the aim of enhancing the usefulness and visibility of products of ODP Science.

PCOM during its August 1996 meeting passed the following Motion:

PCOM Motion 96-2-9

PCOM reaffirms its intent in PCOM motion 96-1-13 to continue for the immediate future to publish the basic information of ODP in both text (hard copy) and electronic formats in order to archive and display this information in the most certain and visible manners available to us at present. However, PCOM also agrees with the general philosophy that publication technology is moving towards universally compatible electronic formats.

Publication of the basic information in this format in an Initial Reports volume will consist of the site summaries, operations reports, site chapters, one scientific overview authored by the co-chiefs, and a guide to electronic usage. Other items specified in 96-1-13 for electronic publication, section 3 B (e.g. core descriptions, VCDs, etc.) will remain in electronic-only format and will be published 12 to 18 months post-cruise.

PCOM acknowledges the need for additional cost savings over the original form of motion 96-1-13 and therefore propose that the Scientific Results

volume consisting of scientific papers, texts of data reports, and abstracts of papers published outside of ODP, be published in electronic format only, starting with Leg 169.

Electronic publication of the Scientific Results volume should be 48 months post-cruise. The publication of the Initial Reports volume, 12 to 18 months post-cruise, in text form will alleviate the need for an initial core description volume as described in 96-1-13, section 5, and this will achieve further cost savings.

ODP must continue to re-evaluate its publication options as technology and scientific community attitudes evolve, but should continue to publish the Initial Reports volume in both text and electronic formats for the immediate future. The issue of moving to electronic-only publication of the Initial Reports volumes should be continuously reviewed by the JOI Publications Steering Committee and SCICOM.

B. Reports of Liaisons (continues)

4. ODP-LDEO (D. Goldberg-20 min.)

Coffee Break.....10:00-10:30

F. Leg Reports

SCICOM will receive science reports on the three legs detailed below

1. Leg 170 (Eli Silver - 30 min.)
2. Leg 171A (Casey Moore - 30 min.)
3. Leg 171B (Dick Kroon - 30 min.)

Lunch.....12:00-1:00

G. Short-Term Planning

1. Review of Status of Upcoming Legs (Humphris- 20 min.)

The FY'98 Science Plan is Section G of this Agenda Book will be taken as read. The SCICOM Chair will request that the Science Operator and Wireline Logging Contractor update SCICOM on any issues requiring SCICOM attention. The PPSP minutes are in Section G of this Agenda Book. In Section G is also a letter from Tim Francis regarding Leg 175.

2. Dry-dock Requirements (Fox- 20 min.)

Fox will present a report on the status of dry-dock preparations, together with a preliminary list of items being considered for the refit of the JOIDES Resolution and their budgetary implications. A preliminary overview of the requirements for the 1999 Dry-Docking is in Section G of this Agenda book.

3. SCICOM Discussion on Prioritization of Items for Dry-dock (45 min.)

TAMU needs feedback regarding the prioritization of items needed for the refit of the JOIDES Resolution. SCICOM needs to provide some guidance for action required from SciMP in order that SCICOM can prioritize projects at their August meeting.

Coffee Break.....3:00-3:30

H. 5-Yr. Planning-Scientific

1. Review of the Strategic Implementation Plan

A copy of the Strategic Implementation Plan is in Section H of this Agenda Book.

2. Review of Proposals within the System Categorized by the LRP theme

SCICOM needs to review the major themes of the LRP and identify areas where proposal pressure is lacking. SCICOM then needs to devise a plan for each theme that will foster development of realistic drilling proposals.

3. Need for PPGs and DPGs
4. Four-year Ship Track Recommendation
5. Steps to Achieve the Goal of Testing the Depth Capabilities of the *JOIDES Resolution*

SCICOM is as to respond to the following EXCOM motion:

EXCOM Motion 97-1-17
EXCOM recognizes that the full drilling capability of JOIDES Resolution is not yet fully tested and recommends that major deep drilling scientific objectives be included as early as possible in Phase III. SCICOM is asked to address this question and report to EXCOM in June.

The only proposal in the system that involves deep drilling is Somali Basin. A copy of this proposal can be found in Section H of this Agenda Book.

Meeting adjourns.....5:00

Thursday, April 24.....8:30 AM

I. 5-Yr. Planning - Technological

1. Technological Issues for Long-Term Planning

Background information related to the long-term technological development issues for both drilling and logging are in Section I of this Agenda Book.

2. CONOCO-Hydril Update (Falvey or Fox- 15 min.)

EXCOM at their February meeting passed the following Motion:

EXCOM Motion 97-1-15
EXCOM recognizes that development of improved technology for ocean drilling has been, and continues to be, an important element of ODP. It is essential to add the capability of a mud circulation system to achieve the scientific goals of drilling deep into the ocean crust and continental margins. The CONOCO-Hydril joint industry project (JIP) on riserless drilling, of which ODP is a member, now proposes to construct and test a riserless system and to explore use of the JOIDES Resolution as a test platform.

EXCOM encourages JOI and ODP to:
- *explore the proposed collaboration in the JIP*
- *consider, with JOIDES, revision of the ODP Program Plan to incorporate this work that contributes to the goals of the ODP Long Range Plan*
- *negotiate terms that are in the best short-term and long-term interest of scientific ocean drilling.*

3. Prioritization of the Technological Requirements Identified in the Strategic Implementation Plan

EXCOM Motion 97-1-20:
EXCOM tasks SCICOM to address two issues:
1. Prioritization of technological developments required to support the objectives of the Long Range Plan.
2. Identification of mechanisms for the development of this technology (in house, collaborations, external).

Coffee Break.....10:00-10:30

J. Long-Term Planning

1. OD-21 (Tamaki - 15 min.)
2. CONCORD (Humphris - 15 min.)

K. SCICOM Correspondence

Letters from Brian Taylor to TECP and from Jim Natland regarding the site for the hammer drill-in casing test are in Section K of this Agenda Book.

Lunch.....12:00-1:00

L. New Business

M. Future meetings

The next SCICOM meeting will be in Davos, Switzerland, August 18-20, 1997. SCICOM needs to consider location and dates of future meetings.

N. Review of Motions and Action Items

Meeting of the
JOIDES Executive Committee

February 10-13, 1997,
ANA Hotel, Washington DC, USA

DRAFT MINUTES

Executive Committee - EXCOM

Helmut Beiersdorf	Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, Germany
James Briden	Dept. of Earth Sciences, Oxford University, United Kingdom
Otis Brown	Rosenstiel School of Marine and Atmospheric Sciences, University of Miami
Brent Dalrymple	College of Oceanic & Atmospheric Sciences, Oregon State University
Robert Detrick (Chair)	Woods Hole Oceanographic Institution
Robert Duce	College of Geosciences & Maritime Studies, Texas A&M University
Olav Eldholm	European Science Foundation (Consortium for Ocean Drilling)
Yves Lancelot	CNRS, CEREGE, Aix-en-Provence, France
Margaret Leinen	Graduate School of Oceanography, University of Rhode Island
Larry Mayer	University of New Brunswick, Australia - Canada-Chinese Taipei - Korea Consortium
John Mutter	Lamont-Doherty Earth Observatory, Columbia University
Arthur Nowell	School of Oceanography, University of Washington
John Orcutt	Scripps Institution of Oceanography, Univ. of California, San Diego
Barry Raleigh	School of Ocean and Earth Science and Technology, Univ. of Hawaii
Paul Stoffa	Institute for Geophysics, University of Texas at Austin
Asahiko Taira	Ocean Research Institute, University of Tokyo, Japan

EXCOM Liaisons

David Falvey	Joint Oceanographic Institutions, Inc.
Jeff Fox	Science Operator (ODP-TAMU)
David Goldberg	Wireline Logging Services (ODP-LDEO)
Donald Heinrichs	National Science Foundation (United States)
Susan Humphris	PCOM Chair, JOIDES Office, WHOI
James Watkins	Joint Oceanographic Institutions, Inc.

Guests and Observers

Pamela Baker-Mason	Joint Oceanographic Institutions, Inc.
J. Paul Dauphin	US National Science Foundation
Peter Eisenberger	Lamont-Doherty Earth Observatory, Columbia University
John Farrell	Joint Oceanographic Institutions, Inc.
David Feary	Australian Geological Survey Organisation, Australia - Canada - Chinese Taipei - Korea Consortium
Michele Fratta	European Science Foundation, Strasbourg, France
Ellen Kappel	Joint Oceanographic Institutions, Inc.
Hajimu Kinoshita	JAMSTEC (Japan)
Kazuhiro Kitazawa	JAMSTEC (Japan)
François Madelain	IFREMER, Issy-les-Moulieaux, France

Hiroshi Maegawa	MONBUSHO (Japan)
Bruce Malfait	US National Science Foundation
Dietrich Maronde	Deutsche Forschungsgemeinschaft, Bonn, Germany
Kenji Ohkuma	STA (Japan)
Michael Purdy	US National Science Foundation
Shinichi Takagawa	JAMSTEC (Japan)
Akira Ueda	STA (Japan)

JOIDES Office

Kathy Ellins	Science Coordinator
Maria Mutti	International Liaison

Joint Meeting of the JOIDES Executive Committee/ODP Council (February 12, 1997, Washington D.C., USA)

Representatives of EXCOM, Official Liaisons to EXCOM, JOIDES Office

As listed above

ODP Council

Axel Bjîornsson	Icelandic Council of Science, Reykjavik, Iceland
Suzanne Egelund	Danish Natural Science Research Council, Copenhagen, Denmark
Michele Fratta	European Science Foundation, Strasbourg, France
Peter Fricker	European Science Foundation, Strasbourg, France
Naci Gorur	Scientific and Technical Research Council, TÜBITAK, Ankara, Turkey
Don Heinrichs(Chair)	National Science Foundation, Arlington, Va., U.S.A.
Jan Hertogen	Universiteit Leuven Fysico-Chemische-Geologie, Heverlee, Belgium
John Krebs	Natural Environment Research Council, Swindon, U.K.
François Madelain	IFREMER, Issy-les-Moulieaux, France
Dietrich Maronde	Deutsche Forschungsgemeinschaft, Bonn, Germany
Chris Pigram	Australian Geological Survey Organization, Canberra, Australia
Robin Riddihough	Natural Resources Canada, Ottawa, Ontario, Canada
Renzo Sartori	Dipartimento di Scienze Geologiche, Univ di Bologna, Bologna, Italy
Asahiko Taira	Ocean Research Institute, University of Tokyo, Tokyo, Japan

EXCOM MOTIONS AND CONSENSUS STATEMENTS

EXCOM Motion 97-1-1

EXCOM approves the agenda for the Feb. 10-13, 1997 meeting in Washington DC.

Proposed by Orcutt; Seconded by Mayer
15 in favor; one absent (Lancelot)

EXCOM Motion 97-1-2

EXCOM approves the minutes of the June 1996 Oslo meeting as a true record with minor modifications noted.

Proposed by Dalrymple; seconded by Orcutt
15 in favor; one absent (Lancelot)

EXCOM Motion 97-1-3

EXCOM endorses PCOM motion 96-2-19 regarding the establishment of a Scientific Measurements Panel (SciMP) in place of the former IHP, DMP, and SMP to advise OPCOM on the handling of ODP data and information, on methods and techniques of ODP measurements, and downhole measurements and experiments.

Proposed by Orcutt; seconded by Mayer
14 in favor; one absent (Lancelot); one abstention (Beiersdorf)

EXCOM Motion 97-1-4

EXCOM endorses PCOM motion 96-3-18 regarding the elimination of the JOIDES Working Groups from the new JOIDES Advisory Structure.

Proposed by Raleigh; seconded by Briden
15 in favor; one absent (Lancelot)

EXCOM Motion 97-1-5

EXCOM endorses, with specified modifications, PCOM Motion 96-3-17 regarding the constitution, chairmanship and operation of OPCOM.

Proposed by Mayer; seconded by Leinen
13 in favor; two abstentions (Beiersdorf and ?); one absent (Lancelot)

EXCOM Motion 97-1-6

EXCOM formally approves the Mandates and Terms of Reference of the new JOIDES Advisory Structure.

Proposed by Duce; seconded by Taira
14 in favor; one abstention (Beiersdorf); one absent (Raleigh)

EXCOM Motion 97-1-7

EXCOM formally establishes a SCICOM and two Science Steering and Evaluation Panels (one on Dynamics of Earth's Interior and one on Dynamics of Earth's Environment) with membership on each committee as nominated by appropriate national committees.

Proposed by Brown; seconded by Orcutt
16 in favor (unanimous)

EXCOM Motion 97-1-8

EXCOM approves the new JOIDES advisory structure panel meeting schedule with the modification that EXCOM meetings will remain as currently scheduled (Jan-Feb. and June-July).

Proposed by Brown; seconded by Beiersdorf.
15 in favor; 1 absent (Lancelot)

EXCOM Motion 97-1-9

EXCOM recommends to JOI that the RFP for the next JOIDES Office should:

1. identify *both* the person proposed as SCICOM Chair and head of the JOIDES Office, and the person proposed as EXCOM Chair, as "key personnel" in any RFP response

2. cover a two year period, starting on 1 January, 1999, and ending on 31 December, 2000.

Proposed by Orcutt; seconded by Duce
15 in favor, one absent (Raleigh)

EXCOM Motion 97-1-10

EXCOM approves the new ODP Sampling and Distribution Policy amended to keep the current sampling moratorium length of 12 months post-cruise.

Proposed by Briden; seconded by Orcutt
14 in favor; 2 absent (Raleigh and Lancelot)

EXCOM Consensus 97-1-11

EXCOM urges that non-US ODP partners provide more than the statutory two names of scientists from a wider range of disciplines to the Science Operator in their staffing nominations for drilling legs so as to insure a proper disciplinary balance.

EXCOM Consensus 97-1-12

EXCOM approves the recommendation from JOI for the creation of an EXCOM Public Affairs subcommittee to advise JOI on the new Public Affairs communications strategy.

EXCOM members who agreed to serve on the Public Affairs subcommittee are Nowell, Orcutt, Beiersdorf, Mayer. This subcommittee will meet at the June EXCOM meeting in Brest.

EXCOM Consensus 97-1-13

EXCOM recognizes the recent developments in NAD Science planning and their relevance to the ODP Long Range Plan. To further the collaborations between ODP and NAD, EXCOM extends an invitation to a representative of the Nansen Arctic Drilling program to present the NAD Science Implementation Plan at the next EXCOM meeting in June 1997 in Brest.

EXCOM Consensus 97-1-14

EXCOM recognizes that flat budgets over the past five years have had a significant impact on the program. JOI's leadership in instituting project-based management has been beneficial in reducing costs and improving program delivery.

EXCOM commends management at ODP-TAMU for overseeing a reorganization of service delivery and operations which has significantly improved program effectiveness and reduced costs, and for managing this reorganization in a professional manner.

EXCOM Motion 97-1-15

EXCOM recognizes that development of improved technology for ocean drilling has been, and continues to be, an important program element of ODP. It is essential to add the capability of a mud circulation system to achieve the scientific goals of drilling deep into the ocean crust and continental margins. The CONOCO-Hydril joint industry project (JIP) on riserless drilling, of which ODP is a member, now proposes to construct and test a riserless system and to explore use of the *JOIDES Resolution* as a test platform.

EXCOM encourages JOI and ODP to

- explore the proposed collaboration in the JIP
- consider, with JOIDES, revision of the ODP Program Plan to incorporate this work that contributes to the goals of the ODP Long Range Plan;
- negotiate terms that are in the best short-term and long-term interest of scientific ocean drilling.

Proposed by Briden; seconded by Dalrymple
15 in favor; one absent (Raleigh)

EXCOM Motion 97-1-16

EXCOM endorses the FY 98 Science Plan (Legs 176 to 181), voted on by PCOM at its December, 1996 meeting. EXCOM also endorses PCOM's scheduling of Legs 182 and 183 into FY 99.

Proposed by Nowell; seconded by Briden
14 in favor; one abstention (Mutter); one absent (Lancelot)

EXCOM Motion 97-1-17

EXCOM recognizes that the full drilling capability of *JOIDES Resolution* is not yet fully tested and recommends that major deep drilling scientific objectives be included as early as possible in Phase III. SCICOM is asked to address this question and report to EXCOM in June.

Proposed by Eldholm; seconded by Duce
14 in favor; one abstention (Mutter); one absent (Raleigh)

EXCOM Motion 97-1-18

EXCOM moves to accept JOI's recommendations for providers of the Wireline Logging Services and Site Survey Data Bank for ODP during Phase III of the Program (1998 - 2003).

Proposed by Raleigh; seconded by Leinen
14 in favor; two absent (Orcutt and Mutter)
Mutter and Orcutt were absent as they were conflicted.

EXCOM Motion 97-1-19

EXCOM recommends that JOI develop a strategy to investigate partnerships with the oil and oil service industries with the objective of developing joint programs in technology development and other program innovations.

Proposed by Mutter; seconded by Eldholm
15 in favor; one absent (Raleigh)

EXCOM Motion 97-1-20

EXCOM tasks SCICOM to address two issues:
1. Prioritization of technological developments required to support the objectives of the Long Range Plan.
2. Identification of mechanisms for the development of this technology (in house , collaborations, external).

Proposed by Brown; seconded by Mayer
14 in favor; two absent (Briden and Raleigh)

EXCOM Motion 97-1- 21

EXCOM has unanimously endorsed the scientific direction and goals of the ODP embodied in the Long Range Plan. Before deciding on support for the funding profile in the LRP, we evaluated the existing and proposed program in light of funding.* We found that improvements in program efficiency have been achieved through cost cutting, the implementation of project management, and a major reorganization at TAMU. A decrease in inflation-adjusted funds of more than 12%, has resulted in postponement of major technical advances that would have substantially enhanced the scientific innovation of the program for the 1994-1998 period.

After this analysis, EXCOM agrees that increased funding in real terms (inflation-adjusted funds) is necessary to achieve the goals of the Long Range Plan. Further we strongly sup-

port the recommendations of the International Review Committee that real growth in funding is necessary to achieve the pre-2003 goals of the ODP.

* *See attached motion background*

Proposed by Leinen; seconded by Brown
15 in favor; one absent (Raleigh)

EXCOM Motion 97-1-22

EXCOM appreciates the effort of STA/JAMSTEC and Monbusho/ORI to have organized a series of workshops (International Conference on Ocean Drilling in the 21st Century, February 1996; International Conference on Riser Technology, October 1996) to discuss the future of Ocean Drilling in the 21st century.

EXCOM endorses the proposed plan to organize CONCORD (Conference of Cooperative Ocean Riser Drilling), July 1997, Tokyo.

EXCOM reiterates its continuing support for the development of the OD21 program in the context of the ODP Long Range Plan, including the building of a riser drilling vessel.

EXCOM notes the phased approach to the construction and operation of a riser drilling vessel outlined in the OD-21/ODP Management Report (EXCOM Agenda Book, TAB 26, p. 5)

Proposed by Orcutt; seconded by Stoffa
15 in favor; one absent (Raleigh)

EXCOM Consensus 97-1-23

EXCOM endorses the establishment of a standing "Joint STA/JAMSTEC-JOI-MONBUSHO Management Committee" to continue work on the outstanding issues to ensure continued communications and consultation between the three key organizations involved in developing an integrated management and structure for a scientific ocean drilling program beyond 2003.

JOIDES DRAFT EXCOM MINUTES
Feb. 10-13, 1997

1. Welcome & Introductions

1.1 Introduction of EXCOM Members, Liaisons, Guests

EXCOM Chair Bob Detrick welcomed members of the Executive Committee and observers. He thanked JOI for hosting the meeting and recognized Johanna Pasquier for her efforts in organizing the meeting. Detrick introduced new meeting participants: David Feary (Australia), who will replace Larry Mayer (Canada) as the EXCOM representative for the Australia-Canada-Chinese Taipei- Korea Consortium at the June meeting in Brest; and Chris Pigram, the Australian ODP Council representative who was also observing the EXCOM meeting. Detrick reminded EXCOM that the JOIDES Office had moved from Cardiff to WHOI in October. He introduced Susan Humphris, Head of the JOIDES Office and PCOM-SCICOM Chair, Maria Mutti, the International Liaison, and Kathy Ellins, the Science Coordinator. Ellins will serve as the JOIDES Office liaison to EXCOM .

1.2 Meeting Logistics

Ellins outlined the meeting logistics.

1.3 Approval of Agenda

Detrick noted the revised agenda book format and explained that as far as possible, action items will be dealt with as the agenda progresses.

Detrick explained that the most important tasks at this meeting are the final approval of changes to the JOIDES Advisory Structure, and finalizing a response to a request from ODP Council for a science and management implementation plan for Phase III of ODP, including the implications of several different funding levels. One addition to the agenda was noted (an update from JOI on the response to PEC IV), which will be included as agenda item 4.2.7.

EXCOM Motion 97-1-1 EXCOM approves the agenda for the Feb. 10-13, 1997 meeting in Washington DC.

Proposed by Orcutt; Seconded by Mayer
15 in favor; one absent (Lancelot)

2. Minutes and Matters Arising

2.1 Approval of June 1996 EXCOM minutes **TAB 1**

Dietrich Maronde noted that the June 1996 EXCOM minutes should be changed to read that the BRG has an increase in overall budget, not just in the budget for ODP science.

Eldholm reiterated his previous request that the Minutes be made shorter. Briden noted that he had received a good response to the short set of Minutes which he had prepared for the Oslo meeting. Mayer stated that the Minutes need to serve as a documentation of the meeting; therefore he prefers that they remain as they are in order to permit those who did

not attend to follow the rationale of discussions. Detrick noted both these points of view and requested EXCOM to permit the JOIDES Office to proceed in a manner that would address both concerns.

Briden requested to have the record of the Oslo EXCOM meeting Executive Session (the motion connected to the report of the investigation regarding allegations made by Professor Ken Hsu) be attached to the Minutes. This will be done.

EXCOM Motion 97-1-2 EXCOM approves the Minutes of the June 1996 Oslo meeting as a true record with minor modifications noted.

Proposed by Dalrymple; seconded by Orcutt
15 in favor; one absent (Lancelot)

2.2 EXCOM Liaison to the International Continental Drilling Program TAB 2

Detrick called attention to a letter from Christian Patermann, Chair of the International Continental Drilling Program (ICDP) Assembly of Governors (AOG), in which he points out the common scientific interests of ODP and ICDP and invites ODP to establish liaisons between SCICOM and the ICDP Executive Committee (EC), and between EXCOM and the ICDP Assembly of Governors (AOG). Humphris noted that Roger Larson will attend the first meeting of the ICDP EC and report back to SCICOM, which will decide whether to continue the arrangement. After some discussion EXCOM agreed to send a liaison (Mutter) to the next ICDP AOG meeting in Washington, DC in May. Beiersdorf will serve as the non-U.S. liaison of EXCOM to the ICDP AOG and, if appropriate, will attend subsequent non-U.S. meetings. Detrick will send Patermann a letter identifying these liaisons.

3. Program Leadership

3.1 New Advisory Structure

Detrick briefly summarized the evolution of the approval process of the new JOIDES Advisory Structure since the Oslo EXCOM meeting. Detrick noted that some questions were raised in Oslo about the plan that PCOM had developed. This led to the establishment of a PCOM/EXCOM subcommittee which met in Washington DC in July, 1996. At its August meeting, PCOM requested that EXCOM formally approve the new structure before the December PCOM meeting. In September, EXCOM passed a motion by email adopting the structure in outline form, deferring certain issues (OPCOM, SciMP and WGs) to the February EXCOM meeting. At the December PCOM meeting, PCOM considered these issues and passed motions relating to them.

3.1.1 PCOM Response to EXCOM Outstanding Issues TAB 3

OPCOM: Humphris explained that OPCOM will have two major tasks: scheduling proposals to be drilled as programs (legs) and advising SCICOM on the technological development needed to achieve the goals of the LRP. Consequently, the composition of OPCOM must represent a balance between scientific and technological expertise. PCOM and

PANCH both recommend that for the first two years, the SCICOM Chair and OPCOM Chair should be the same person in order to facilitate the transition to the new structure. The need for a common Chair can be revisited at a later date. Humphris also reviewed the mandate and timing of OPCOM meetings. She noted that the length of term of the membership has been changed from a single meeting, renewable by SCICOM, to term length of one year, renewable for up to three years to preserve continuity and corporate memory.

SciMP: The mandate for SciMP, which was developed by a subcommittee of PCOM working with the Chairs of IHP, DMP, and SMP, has now been incorporated into the "Terms of Reference" for the new Advisory Structure which EXCOM is requested to approve. Humphris explained that three general areas of responsibility have been identified for the Scientific Measurement Panel (SciMP). She pointed out that some terminology in the mandate has deliberately been kept broad to allow for the future possibility of ancillary platforms. SciMP will develop policies, which would then be communicated to the subcontractors by management (JOI) for their implementation. From time to time, SciMP would be responsible for reviewing how these policies were working. Humphris reviewed the reporting path for SciMP. SciMP will send all recommendations forward to OPCOM. Those with large budgetary implications will be passed form OPCOM to SCICOM. Minor recommendations will go directly to JOI. Humphris reiterated that the mandate for SciMP is very large and these responsibilities were previously handled by three panels.

PPGs and WGs: Humphris reported that PCOM, noting the overlap in the mandates of the PPGs and WGs, recommends the elimination of WGs. PCOM recognized, however, that the WGs could be useful in conjunction with the service panels. As a result, the PPG mandate was modified by PCOM to incorporate previous WG responsibilities relating to technological strategies associated with planning science. Humphris also noted that there had been some confusion on whether PPGs could write proposals or not. They can, but proposals can still only be submitted by individuals or groups of individual proponents. She added that the PPG level is where interaction with other global geoscience programs will occur, and the PPGs and individual proponents should be the driving force of the science of the Program.

Discussion

Beiersdorf asked whether the three non-SCICOM members of OPCOM would come from the ODP community at large. Humphris responded that the additional members could be selected from any of the partner countries. Beiersdorf asked if these would be members of SSEPs or PPGs. Humphris said she hoped to find other scientists not already represented on panels from the partner countries. Beiersdorf noted the extra burden of travel costs for the partner countries associated with such an arrangement.

Dalrymple asked who would appoint these groups. Humphris replied that in the "Terms of Reference" it is stated that the JOIDES member committees will appoint PPG members with SCICOM advice in consultation with the SSEPs. DPGs will be created by SCICOM. The JOIDES member committees will also appoint members of the SSEPs and SciMP.

Raleigh asked whether OPCOM would have the final decision in determining the ship's operations schedule. Humphris clarified that SCICOM must approve the schedule developed by OPCOM. Orcutt pointed out an inconsistency in the wiring diagram and what is stated in the "Terms of Reference" for TEDCOM. He noted that on the wiring diagram TEDCOM is shown to report to both SCICOM and OPCOM because this committee has a tactical short-term input and a strategic long-term input to ODP science planning. In the "terms of reference" it is stated that "TEDCOM is responsible for recommending to SCICOM through OPCOM...".

Taira inquired why there is no mention of the US/non-US balance on OPCOM. Humphris explained that it is a subcommittee of SCICOM because a large committee with proportional representation was not necessary for the tasks of OPCOM. OPCOM, she added, will make decisions by consensus. Beiersdorf noted that if members are selected from the entire community, then national committee approval will be required as they will have to pay to send people to the committee. Humphris said that SCICOM determines who is needed, and she noted that some members will already be at the meeting site. SCICOM will select whom they would like to serve and work with the national committees to try to keep down travel costs.

Briden said that common sense and a two-way liaison between national committees and JOIDES structure, especially the OPCOM/SCICOM Chair, is the key to making this work. Briden also said he wanted the sentence which states, "Additional expertise required to address specific issues may be brought in with the approval of SCICOM," modified to clearly indicate that these people are for advice only and will not serve as members of OPCOM. Briden also advocated including wording to state that composition of the committee will be determined with regard to international membership, not proportional membership.

Mutter expressed concern about the size of OPCOM and with the Chair of OPCOM being the same as the Chair of SCICOM to whom it reports. Orcutt agreed and noted that OPCOM was established as a means to unburden PCOM. Humphris explained that this arrangement was intended as the setup for the first two years. Mayer commented that in the past this work had all been done by a single panel and that the creation of OPCOM was not intended to establish an adversarial situation, but to allow things to function more efficiently. Detrick noted that PCOM has left the door open to evolve to an arrangement of different SCICOM and OPCOM Chairs in the future.

Beiersdorf informed EXCOM that the new Advisory Structure had received only lukewarm support in Germany. The German community is especially concerned that the mandate of the SciMP is too broad and the mix of people very different. Germany is concerned that the panel will be deciding on issues in which they have no expertise. He stated that he would abstain in any voting on SciMP because of Germany's concerns.

Detrick asked EXCOM to endorse PCOM motion 96-2-19 regarding the establishment of a Scientific Measurements Panel (SciMP). After the motion had been proposed and seconded, but before the vote, Briden proposed a change in the wording to the sentence which

read, "If purely operational , the recommendations will go directly to JOI for action" to "If purely operational, the recommendations will go directly *from OPCOM to JOI* for action".

EXCOM Motion 97-1-3
EXCOM endorses PCOM motion 96-2-19 regarding the establishment of a Scientific Measurements Panel (SciMP) in place of the former IHP, DMP, and SMP to advise OPCOM on the handling of ODP data and information, on methods and techniques of ODP measurements, and downhole measurements and experiments.

Proposed by Orcutt; seconded by Mayer
14 in favor; one absent (Lancelot); one abstention (Beiersdorf)

EXCOM Motion 97-1-4
EXCOM endorses PCOM Motion 96-3-18 regarding the elimination of the JOIDES Working Groups from the new JOIDES Advisory Structure.

Proposed by Raleigh; seconded by Briden
15 in favor; one absent (Lancelot)

EXCOM Motion 97-1-5
EXCOM endorses, with specified modifications, PCOM Motion 96-3-17 regarding the constitution, chairmanship and operation of OPCOM.

Proposed by Mayer; seconded by Leinen
13 in favor; two abstentions (Beiersdorf and ?); one absent (Lancelot)

The modifications specified by Nowell and Orcutt are: 1) " as chaired by the SCICOM chair initially"; and 2) the mandate must be changed to reflect that OPCOM is established as a subcommittee of SCICOM.

3.1.2 Approval of Panel Terms of Reference TAB 4

The Mandates and Terms of Reference of the panels in the new Advisory Structure were discussed on Monday morning, and again on Wednesday morning after a draft copy with revisions was distributed to the committee for review and comment. Some of these recommended changes were noted above; additional substantive comments are summarized below:

- Heinrichs stressed that proportionality of membership on SCICOM (the successor to PCOM) is a critical point as it is stated in the MOUs. Humphris said that this had been brought to her attention.
- Mayer noted his concern with the membership description for the SSEPs and SCICOM. Under membership for the SSEPs, he said he was unclear about the meaning of "a number of members from the US and ...." . Humphris explained that the wording was

taken from the old Thematic Panel mandates and sometimes the old Thematic Panels did not all fill their membership quota. The wording will be changed to read, "to 10 or fewer US members". Mayer also asked about the history of the number 16, which appeared throughout the document. Mayer noted that this may result in disproportional representation biased against the US.

- The need to clarify the reporting lines in the new structure in the "Terms of Reference" was stressed several times. With reference to OPCOM, Raleigh expressed concern about advice from OPCOM that will go to JOI. He asked whether the reporting line was a short circuit around SCICOM. Falvey explained that the annual drilling schedule devised by OPCOM would go back to SCICOM for endorsement. He added that SCICOM could also reject the schedule by an up or down vote. Raleigh said that he would prefer to see wording to indicate that OPCOM "recommends" the annual drilling schedule to SCICOM.
- The issue of thematic balance on the new committees was raised by Lancelot. Humphris responded that there was also great concern at PCOM regarding this issue and the outcome was that the she had agreed to work with the national committees to try to achieve this balance. After PCOM, Humphris had followed up with an email letter to the national committees in which she had requested choice in terms of membership. She expressed concern that this arrangement may not be working. She added that this was particularly important for SciMP, which has such a large mandate. Humphris noted that this was a difficult time because there are no panels in place and suggested that it would be easier to achieve scientific balance in the future as panel members rotate off committees. It was noted that each country selects its members differently and a dialogue between the Chair and the various national committees will be essential.
- A number of wording changes were noted which the JOIDES Office will address (Appendix 1).

EXCOM Motion 97-1-6

EXCOM formally approves the Mandates and Terms of Reference of the new JOIDES Advisory Structure.

Proposed by Duce; seconded by Taira
14 in favor; one abstention (Beiersdorf); one absent (Raleigh)

EXCOM Motion 97-1-7

EXCOM formally establishes a SCICOM and two Science Steering and Evaluation Panels (one on Dynamics of Earth's Interior and one on Dynamics of Earth's Environment) with membership on each committee as nominated by appropriate national committees.

Proposed by Brown; seconded by Orcutt
16 In favor (unanimous)

3.1.3 Approval of Panel Meeting Schedule TAB 5

Humphris explained the annual meeting schedule developed by the JOIDES Office for the new Science Advisory Structure. This calendar moves up the time when the annual ship schedule is determined from December to late August - early September, giving the sub-contractors more time for planning. Proposal deadlines have changed; they are now September 15 and March 15. She pointed out that it is proposed that EXCOM meet in November to give initial approval to the Science Plan determined in September. It is proposed that EXCOM meet in April to give final approval to the annual ODP Program Plan and budget. Finally, Humphris showed how the program will achieve the transition to this new meeting schedule. By November 1997, the new panel structure will be fully implemented.

A lengthy discussion ensued centered around the proposed new timing of the EXCOM meetings. It was noted that the November meeting will occur right after the JOIDES Office rotates every two years and it may not be possible for the new office to put together the EXCOM agenda book in time for the meeting. Another potential problem was that budget information for the next FY might not be available in November. A BCOM might still be necessary even with the rest of the planning effort moving up in time. If the timing of EXCOM meetings are left as they now are, then the winter EXCOM could look at a better developed budget than it has in the past. Heinrichs noted that the one constraint on the timing of the EXCOM meetings is the approval of the annual Program Plan, which must be done before October 1, as it is the one thing mandated in the MOU to be done by EXCOM. During this discussion Humphris suggested that the timing of the transfer of the JOIDES office should take place during December as this is a time when there are no meetings and the transfer could happen easily. In the end it was decided that there was no compelling reason to change the current EXCOM meeting schedule.

EXCOM Motion 97-1-8 EXCOM approves the new JOIDES advisory structure panel meeting schedule with the modification that the EXCOM meetings will remain as currently scheduled (Jan-Feb. and June-July).

Proposed by Brown; seconded by Beiersdorf.
15 in favor; 1 absent (Lancelot)

3.1.4 Mail Review/Proposal Submission Procedures TAB 6

Detrick asked EXCOM to comment on the mail review/proposal submission procedures formulated by PCOM with input from NSF and JOI. This procedure will be discussed at the April SCICOM meeting and presented to EXCOM for formal approval in June.

Stoffa noted that it is odd that evaluators are not asked to comment on the research record of proponents. He felt that ODP should want comments on the qualifications and capabilities of proponents throughout the proposal review process. Both Dalrymple and Briden agreed. Mayer noted, however, that there is a decoupling of proponents from proposals in ODP when proposals are scheduled as legs. He added that the scrutiny of those carrying out the science should be carried out later by the ship's operator since

TAMU has the responsibility of staffing legs. Mutter said he was in agreement with Stoffa and Dalrymple. It was noted that evaluators are not asked whether the proponents would be a good co-chief. Mayer said that he did not understand how a person's record is appropriate if the science is well stated. Dalrymple and Mutter were both of the opinion that a proponent's research record and record of achievement is important. Leinen said that the problem has two sides--one piece is the science problem; and the other is the review of what a person brings to the table in making a case for the scientific problem. Fox noted that PCOM has historically provided input to the selection of co-chiefs, and he added that the way a proposal is reviewed should not be limited. On the basis of this discussion, EXCOM recommends to SCICOM that a short two-page CV of the lead proponent should now be attached to every proposal.

Beiersdorf questioned the role of JOI in the external mail evaluation process. Falvey responded that JOI is the mailbox. JOI will send out the proposals to external evaluators and then edit them to insure anonymity of the reviewer. He explained that the reason for having JOI do this was a recommendation from NSF to retain confidentiality since the JOIDES Office moves every two years. Nowell noted, however, that the identity of the reviewer will be revealed in the case of a negative review. Humphris explained the rationale behind this, but several EXCOM members expressed concern that by revealing the identity of an external reviewer in the case of a negative review, the integrity of the whole process could be compromised. Mutter asked for clarification on what material SCICOM will receive. Humphris responded that SCICOM will get copies of the reviews. On the basis of this discussion, EXCOM recommends to SCICOM that the identity of reviewers be kept anonymous.

It was observed that JOI will do this without additional resources and it is a lot of work. Eldholm expressed concern that we are creating a new level of bureaucracy. Detrick noted that there has been an attempt to limit the proposals to be reviewed to a manageable number in order to minimize the work of the community and the workload of the JOIDES Office and JOI.

3.2 Guidelines on RFP for the 1998-2000 JOIDES Office TAB 7

Detrick noted that at its Oslo meeting EXCOM asked to review and comment on the statement of work and selection criteria for the next JOIDES Office (1998-2000) before it went out for bid. Some of the discussion in Oslo surrounded the leadership issues raised by the Greve Committee Report (see background for this item under Tab 7 in meeting book).

Restrictions on bids. Briden supported the view that bids should be submitted only through EXCOM representatives of non-US members, but felt that the EXCOM and SCICOM Chair do not need to be from the same institution. He noted that in the last JOIDES Office, the EXCOM and PCOM Chairs were not located at the same institution. Falvey stated that the bidding procedure must be consistent with US government requirements. In the past, JOI has argued that the JOIDES Office contract is in a sense a restricted tender, but JOI might have a problem restricting it to one per non-US member. Detrick asked if currently the bids can come in without mentioning the name of the

EXCOM member. Falvey answered that was correct. Mayer said that requiring EXCOM and SCICOM chairs to be from the same country could create problems within consortia. Beiersdorf explained that in Germany since BGR is the member, the EXCOM and SCICOM Chairs would also both have to be from the BGR. He said that BGR would have to pull out of the bidding if the Germany was asked to support a looser arrangement regarding this point. Falvey responded that if another institution in Germany bid for the office, they could designate Beiersdorf as EXCOM Chair. Taira asked if the EXCOM Chair can be head of the JOIDES Office. Falvey responded that the head of the JOIDES Office must be the SCICOM Chair.

Selection of US JOIDES Offices. Mayer applauded the bidding process used to select non-US JOIDES Offices, but he questioned how the same assurances regarding leadership, etc. are met by the situation when the office is in the US. Detrick explained that the US JOIDES Office rotates among the JOI institutions. Mayer responded that this was a non-selective process. Detrick said that any change will need to be made by the JOI BoG. Mayer reiterated that there is currently a difference in the way the US and the non-US JOIDES Offices are selected (one is competed, the other is based on a preset rotation) and he wondered if this was healthy in terms of the Greve Report. Nowell said that the matter was discussed four or five years ago and then it fell off the table. He added that there was also discussion as to whether the US should be involved in the selection of non-US JOIDES Offices and it was agreed that the US should be involved. Briden said that this is a delicate issue. Raleigh said that he saw no problem in allowing the non-US members also to select the JOIDES Office on a rotational basis. Mayer reiterated he has a problem in terms of the Greve Report and the issues of scientific leadership with using a preset rotation to select the JOIDES Office. Leinen said that this has been discussed by JOI BoG and there was agreement that JOI BoG should revisit the selection of the US JOIDES Office in light of the new US process of selection of SCICOM membership. Heinrichs said that NSF wants to see the US follow a strategy that will allow the strongest scientific leadership on SCICOM for the US.

Issues related to the Greve Report. Detrick said there were two issues related to the Greve Report: one was the work load on the PCOM/SCICOM Chair and the other was attracting the most qualified person to that position to assure the highest quality of scientific leadership for the Program. A longer term length of the JOIDES Office, a Chair-elect, and the level of salary support were previously mentioned as possible mechanisms to reduce the workload of the SCICOM Chair and attract the most qualified person.

Term Length of JOIDES Office: Detrick solicited comments on whether the term length of JOIDES Office should be 2 years or 3 years, and the pros and cons were discussed. A longer term length would improve continuity, but on the down side, a longer term length may discourage some very qualified people from applying. Leinen said that when the Greve report recommended that the term of office of the PCOM Chair be reviewed it was with the intent of lessening the burden on this person. She noted that increasing the term does not ease the burden. Humphris pointed out that currently the Chair-elect serves for one year as a liaison to PCOM and then one year after in an ex-officio capacity. This is essentially a four year term. If the tenure of the Office is increased to 3 years the total

commitment would be 5 years which could pose difficulties in attracting the right kind of person.

Chair-Elect: Orcutt noted that the President-Elect of AGU actually has some tasks that he/she conducts and suggested that ODP should look into this as a way to reduce the burden on the Chair. Dalrymple said he would not take the AGU analogy too far as the President-Elect of AGU is a corporate officer. Currently, the PCOM Chair-elect serves for one year as a liaison prior to assuming the responsibility of the office and then one year after in an ex-officio capacity. This is essentially a four year term although it is not laid out as such in the RFP and is not part of the contractual agreement regarding the Head of the JOIDES Office. Mutter said that the chair-elect should serve for two years, not one, and also must have real duties. Falvey noted that there will be financial implications here and pointed out that if EXCOM wanted a Chair-elect to sit for two full years corresponding to the tenure of the next JOIDES Office, then the RFPs for both the non-US and US JOIDES Offices would have to go out for bid at the same time and ASAP. Humphris noted that this requires the person who is the SCICOM Chair-elect to serve for four years plus a year ex-officio representing an increased commitment to the Program. Leinen said the only suggestion that directly has the potential of specifically lessening the burden of the SCICOM Chair is the appointment of a Chair-elect. Briden pointed out that there are other things besides appointing a SCICOM Chair-elect that will lessen the burden on the SCICOM Chair, such as having a different OPCOM Chair from within SCICOM. He expressed the opinion that this is a better solution than what has been considered so far. Brown noted that many items that should not be mixed into the discussion on the RFP had been interwoven into this discussion. These issues, including how to actually reduce the workload of the SCICOM Chair, must be addressed separately. He said that he could imagine many scenarios regarding OPCOM/SCICOM that could be implemented to address the concerns of the work load of the SCICOM Chair. He stated that the issue of term length, but not the details, must be resolved.

More Salary Support for SCICOM Chair: One suggestion was that this could be a part of the proposed bidding package. Briden said that he would be happier to see JOI pay the whole (12 mo.) salary of the Chair and, should EXCOM agree, provide salary support for a period after the tenure of the chair. He said, however, that the RFP could state that the contribution of the bidding institution towards the Chair's salary would be taken into account in the evaluation. Falvey explained that the RFP is structured in two parts: a technical bid and a financial bid, and that the evaluation subcommittee from EXCOM does not normally see the financial bid.

After some further discussion, an EXCOM consensus was reached to recommend to JOI to leave the term length of the SCICOM Chair at two years. EXCOM also recommended to JOI that the EXCOM nominee be treated as a key individual in the bid. There was no consensus regarding the formal appointment of a Chair-elect.

Timing of Transfer of JOIDES Office. Humphris again raised the issue of the timing of transfer of the JOIDES Office; she proposed that the date of the office transfer be changed from October 1 to January 1. Humphris explained her rationale for this request

- the workload on the office is very high in the September/October period but relatively light in December.

A lengthy discussion ensued of the potential pros and cons, and considerations of moving the date for the transfer of the office. There appeared to be no contractual reasons why the transfer date couldn't be changed although it would require a supplement to the present office to provide support for an additional 3 months. Some on EXCOM felt there was no compelling reason to change the transfer date; others thought that if the JOIDES Office staff felt a January 1 date would be less disruptive, then EXCOM should follow their recommendation. At this point in the meeting the matter was not resolved, but on Wednesday morning when motion 97-1-9 was presented for approval it was agreed to follow Humphris' recommendation and transfer the office effective January 1.

EXCOM Motion 97-1-9

EXCOM recommends to JOI that the RFP for the next JOIDES Office should:

1. identify *both* the person proposed as SCICOM Chair and head of the JOIDES Office, and the person proposed as EXCOM Chair, as "key personnel" in any RFP response

2. cover a two year period, starting on 1 January, 1999, and ending on 31 December, 2000.

Proposed by Orcutt; seconded by Duce
15 in favor, one absent (Raleigh)

4. Current Issues

4.1 NSF Report (Heinrichs) **TAB 8**

Heinrichs reviewed the timelines for Phase III Renewal and for Phase IV. He explained that Bob Corell, Assistant Director of NSF Geosciences, had written to all the sponsoring organizations requesting firm commitments to ODP for the 1998-2003 period by the June EXCOM meeting in Brest. As part of this decision-making process, several items that are overlapping have been requested from JOIDES, JOI and the ODP structure. ODP Council requested a five year Science Implementation Plan coupled to a budget and financial strategy, and NSF, for contractual reasons, requires a Five Year Program Plan. Ultimately, the two items will be merged and the resources to implement them will be developed in conjunction with the non-US member ODP partners. Following commitments that are made in June, a membership structure, a basic science plan, and a basic budget strategy that will set the framework for the 1998-2003 Program will be in place. In terms of looking beyond 2003, sponsor organizations will need to both examine how ODP addresses Phase III (1999-2003) issues and look into the future in order to commit to the Program in the long term. In order for Japan to start receiving commitments from the Ministry of Finance related to the construction of the riser ship in their upcoming fiscal year, the next step of OD-21 project development must be in place by September 1,1997.

Heinrichs also described NSF Phase III planning. The target budget established for FY 98 will be level with the FY 97 budget and will assume the support of six full international partners in addition to NSF. The contract with JOI allows for modest increases in support of the five year program plan that is being developed. The key principles on which an increase would be based are: 1) the basic financial models must be science driven; and (2) a financial framework for an integrated budget using commingled funds must be developed by ODP (US and non-US members). NSF agrees with the basic principles of the models in the financial strategy prepared by JOI which propose that a fair amount of the growth is assumed to come from new partners. NSF intends to look at the whole renewal package jointly with the other sponsor organizations before June 1997 in order to anticipate the additional funding requirements. Any ramp up in funding must be justified by the science. According to Heinrichs, the challenge to JOIDES and the management of JOI is to have a clearly defined set of science plans and the associated scenarios outlining the resources to meet these plans.

4.2 JOI Management Report (Appendix 2)

4.2.1 Approval of ODP Sampling and Curation Policy TAB 9

Falvey reported on the JOI-hosted workshop in Washington (November 18-19, 1996), which reviewed the Program's curatorial and core sample distribution procedures in light of recent advances in shipboard laboratories and scientific approaches, as well as in ODP procedures (e.g., new publication policy and changes in the JOIDES Advisory Structure) and thematic directions (e.g., the 1996 ODP Long Range Plan). Dalrymple asked if the sampling allocation policies are continuous, without a term length. Falvey responded that they are not, but are focused on the official science party of each leg. The sampling allocation policy extends for only a fifteen month period. Stoffa said that a period of fifteen months is a regressive step. John Farrell (JOI) noted that the publications deadline had been extended and the idea was that the sampling moratorium should be similarly extended. Orcutt said that it was not clear to him that there is a compelling reason to extend the sampling moratorium. Falvey said that, according to the old policy (which is still in place), the current sampling moratorium is now 12 months or publication of the IR volume, whichever came first. The proposed policy, in which the moratorium length has been increased, is aimed at this ambiguity. EXCOM, however, favored keeping the sampling moratorium at 12 months.

EXCOM Motion 97-1-10 EXCOM approves the new ODP Sampling and Distribution Policy amended to keep the current sampling moratorium length of 12 months post-cruise.

Proposed by Briden; seconded by Orcutt
14 in favor; 2 absent (Raleigh and Lancelot)

4.2.2 Response to Co-Chiefs Meeting Report TAB 10

Falvey reported on the Co-Chiefs Review meeting, which was hosted by JOI in November of 1996. He noted two issues for EXCOM. The first is that the report is very complimentary of how TAMU and LDEO delivered their services. The second issue relates to

selection of the shipboard party. Falvey explained that the non-US members commonly submit just two names for consideration and this constrains TAMU in their selection of a balanced science party. It also places the burden of achieving scientific balance on the US scientists. The Co-Chiefs review report requests that all non-US ODP members submit more than two names to provide TAMU with sufficient scientific breadth from which to select the staff for the ship.

EXCOM Consensus 97-1-11

EXCOM urges that non-US ODP partners provide more than the statutory two names of scientists from a wider range of disciplines to the Science Operator in their staffing nominations for drilling legs so as to insure a proper disciplinary balance.

4.2.3 Approval of EXCOM Public Affairs Subcommittee TAB 11

Falvey reminded EXCOM that in Oslo they approved a public affairs strategy for ODP. Falvey reviewed the highlights of this strategy (Appendix 2). Falvey noted that the port call strategy will be conducted by JOI and TAMU and is based on a refinement of the model that worked very well at the UK port call in Edinburgh. Falvey noted that the project manager for the news release policy and procedures is in ODP TAMU. Press releases are now deliberately an iterative process with the relevant people providing input. Material and development products are managed in TAMU or JOI as needed. The proposal for an EXCOM Public Affairs Subcommittee is to insure that EXCOM, as the primary stakeholder, is involved in the implementation of this policy. Mutter added that it is important to articulate not only the achievements of each leg but also the vision of the Program. He questioned where this could be found. Falvey said that Mutter's comments had just pointed out why it is important to have an EXCOM subcommittee. Beiersdorf said that press releases in the past have been too late and they must be accelerated in order to catch media interest. Falvey said the first thing to address is the quality of the press release. Mayer stated that he had witnessed the start of this public affairs policy with the Victoria port call and found it to be highly effective.

EXCOM Consensus 97-1-12

EXCOM approves the recommendation from JOI for the creation of an EXCOM Public Affairs subcommittee to advise JOI on the new Public Affairs communications strategy.

EXCOM members who agreed to serve on the Public Affairs subcommittee are Nowell, Orcutt, Beiersdorf, and Mayer. This subcommittee will meet at the June EXCOM meeting in Brest.

4.2.4 JANUS Update TAB 12

Falvey reported that JANUS Phase 1 is now deployed on the JR. He noted that the recent PCOM motions reflect concern about certain issues and added that he was satisfied with

assurances from Kate Moran, the JOI Steering Committee Chair, that these concerns have been properly addressed. In response to the project management issue raised by PCOM, TAMU has gone through a contract amendment with TRACOR. The JOI JANUS Steering Committee will meet during the Charleston port call. Beiersdorf asked about the RFP for the database migration project. Falvey said these will go to all JOIDES institutions that responded to the expression of interest solicited in October, as well as all national offices. The RFP will also be advertised in the US according to government requirements. Detrick asked if there would be a final report on JANUS prepared by JOI. He queried whether there are lessons learned that may help in terms of ODP Phases II and III. Falvey said there will be a final report to JOI later this year on JANUS Phase I and it can be presented to EXCOM at its February 1998 meeting.

4.2.5 ODP Publications Policy Update **TAB 13**

Implementation of the new ODP Publications Strategy will be monitored by a JOI Publications Steering Committee, chaired by Dave Scholl, with Ellen Kappel as JOI liaison. Members of this steering committee will convene for the first time (in person) in April in Washington DC. (currently, interaction is conducted via email). At present, Scholl is conducting a global market research project on development in the area of publications. Falvey will report in June on the JOI Publications Steering Committee.

Mayer questioned some of the details of the PCOM motion and the USSAC Newsletter report. Falvey explained that ODP is working towards electronic publication by Leg 176 but will not abandon the traditional book format if it turns out that ODP is out of step with what is happening in the world of electronic publication. Humphris noted that in August, PCOM did not want to see the IR book discontinued with Leg 176. Falvey stated that the decision as to whether or not Leg 176 will go to electronic publication will be made by the Publications Steering Committee. Beiersdorf said that Germany's funding agency is opposed to electronic publication now. Fox said ODP-TAMU would develop an appropriate model based on guidance from the Steering Committee which SCICOM will evaluate in August 1997. The short time period between the first meeting of the Steering Committee in April and the target date of August poses a challenge. Briden said he was impressed by the strategy but disturbed that he detected a lack of determination to carry it through.

Mutter noted that when the publications strategy was initially considered, the Program was devoting more than10% of the science budget to publications. The idea was to take these funds from "talking about science results" and put them towards achieving science. Mutter questioned the real savings of the policy. Detrick said that the magnitude of any cost savings are unclear and an implementation plan with budgetary implications is needed. Falvey said it this was hard in light of the implicit threat of overturning the strategy and going back to the old system of just having hard copy publications. He said that unless the Program had a coherent policy and a way to execute it, the issue would not go away and the hard copy cost would rise substantially. Mutter said that electronic publications was seen initially as the way towards significant cost savings in publications and it became the entire strategy of cost savings. Falvey disagreed and said that the publications strategy had been presented as only one aspect of cost savings. Orcutt noted that the initial start up costs are great but in the future there would be cost savings (postage and paper). He said

that he does not expect that in the end ODP will actually save very much money. Kappel agreed with Orcutt and also pointed out the financial impact of the time lag in switching as there are still books to be published. Cost reductions will not be realized for a couple years. Fox pointed out that Leg 168 will not be published until the next century! Fox said TAMU has tried to garner support from the community for the strategy. While some Co-Chiefs have aggressively gone after other publishers, others have threatened to sue TAMU if the hard copy reports of their Legs are not published.

Detrick said that EXCOM needs to see output from the Publications Steering Committee in terms of a firm plan and the real costs associated with electronic publications. JOI will be asked to present an interim report of the Publications Steering Committee at the June meeting. The final report of this committee is due in August.

4.2.6 Internationalization Update **TAB 14**

Falvey provided a brief update on the internationalization of ODP. Taiwan Universities are now contributing a 1/6 membership under the name of Chinese Taipei.

4.2.7 Response to PEC IV

Falvey provided a brief report on the implementation of the 46 PEC IV recommendations (Appendix 2). Many issues raised in the report have been dealt with by the new Advisory Structure and the TAMU reorganization. The PEC V report is due in FY 98.

Beiersdorf asked for an update on NAD. Falvey said that NAD met in October and formulated an implementation plan which is modeled on ODP. This plan is about 3 months away from being published. This publication timetable is to permit funding applications in Germany and the US. Eldholm asked if it would help NAD to have a supportive statement from EXCOM and volunteered to draft such a statement.

EXCOM Consensus 97-1-13

EXCOM recognizes the recent developments in NAD Science planning and their relevance to the ODP Long Range Plan. To further the collaborations between ODP and NAD, EXCOM extends an invitation to a representative of the Nansen Arctic Drilling program to present the NAD Science Implementation Plan at the next EXCOM meeting in June 1997 in Brest.

4.3 Science Operator Report **TAB 15**

4.3.1 TAMU Reorganization

Between the June Oslo meeting and the present time, management and operations have gone through extensive internal review. As a result, JOI has developed the FY 98 budget in keeping with the NSF budget of $44.4 M. The savings are summarized in Appendices 3 and 4.

In response to EXCOM's request, TAMU looked at its internal organization for ways of improving service delivery and reducing costs. Fox described to EXCOM the procedure

which was followed. An external management consultant was hired for a 3 weeks period in June-July. The study recommended that TAMU reorganize to bring together operational and science support functions, and to allow for team building in the future. The plan was implemented in December of 1996. The result was the elimination of the technical and logistics department and elimination of a number of positions. Fox said that the most difficult thing was to have to release people, who had done their job well over many years of service, but whose positions were eliminated. The organization was shocked and the feeling of family at TAMU was shattered. Nonetheless, Fox added, TAMU is rebuilding stability and team spirit. There are, however, people who are holding their breath as they are scared that he will return with another cost-cutting mandate from EXCOM. He noted that there are risks in the new model but Fox expressed his confidence that TAMU is heading in the right direction.

Falvey pointed out that the budget for FY 98 could not have achieved the target amount without this reorganization at TAMU. Duce added that the Human Resources Department and Provost at TAMU expressed the opinion that this was one of the best such processes to have taken place at the university. Mayer said that EXCOM should express some solidarity with Fox in taking these steps to economize.

EXCOM Consensus 97-1-14

EXCOM recognizes that flat budgets over five years had a significant impact on the program. JOI's leadership in instituting project-based management has been beneficial in reducing costs and improving program delivery.

EXCOM commends management at ODP-TAMU for overseeing a reorganization of service delivery and operations which has significantly improved program effectiveness and reduced costs, and for managing this reorganization in a professional manner.

4.3.2 Approval of the use of the JR for CONOCO/Hydril Riserless Drilling Tests

TAB 16

Falvey reported on the plan involving utilization of the *JOIDES Resolution* for up to 14 days in order to test riserless drilling prototype equipment in FY 98. He explained the concept behind the CONOCO/Hydril riserless mud circulation system. The advantage to ODP is that this technology might provide an alternative approach to scientific ocean drilling or reveal a modified approach with lower costs. The reason that this item has come before EXCOM is to determine whether ODP wishes to proceed with this and to accept money for the use of the ship for testing. The monies received could be used for the charter of an alternate platform. One obvious target program of such a charter would be the completion of the NJ margin sea level transect.

Mutter asked what else would be negotiated to benefit the program apart from the immediate financial rewards. He pointed out that the arrangement of leasing the ship would save the CONOCO-Hydril consortium over $2M. Mutter asked if ODP was looking to

enter an agreement with this consortium. Falvey responded that ODP is already officially a non-paying part of the consortium. In addition, Falvey said that he expected ODP to be able to get the prototype that will be tested on the ship. Stoffa asked if thought had been given to ODP participating as a full paying partner. Heinrichs interjected that this is not a simple contract. All decisions must go through the JOIDES program structure - SCICOM etc. He noted that there was also an insurance issue. The U.S. Government gives an indemnification clause to ODP which would not apply if this venture was done as a subcontract outside of the Program. Heinrichs said that whatever happens, it must be part of programmatic planning. Falvey said that there are two options by which this can be achieved: seek an amendment to the program plan, or treat the matter as an engineering mini-leg or a contract just between TAMU and CONOCO. Falvey said he was seeking sufficient endorsement to allow continued exploration of a possible collaboration with CONOCO-Hydril. Dalrymple said that this would be an enormous benefit to the Program. Briden requested that a motion on this collaboration note the short and long term benefits to the Program.

EXCOM Motion 97-1-15

EXCOM recognizes that development of improved technology for ocean drilling has been, and continues to be, an important program element of ODP. It is essential to add the capability of a mud circulation system to achieve the scientific goals of drilling deep into the ocean crust and continental margins. The CONOCO-Hydril joint industry project (JIP) on riserless drilling, of which ODP is a member, now proposes to construct and test a riserless system and to explore use of the *JOIDES Resolution* as a test platform.

EXCOM encourages JOI and ODP to

- explore the proposed collaboration in the JIP
- consider, with JOIDES, revision of the ODP Program Plan to incorporate this work that contributes to the goals of the ODP Long Range Plan;
- negotiate terms that are in the best short- term and long-term interest of scientific ocean drilling.

Proposed by Briden; seconded by Dalrymple
15 in favor; one absent (Raleigh)

4.4 Wireline Logging Service Report TAB 17

Detrick asked Goldberg if there was anything from his report that he wished to highlight. Goldberg said that, in less than 3 months, LWD had logged more than 4500 m at a total of ten holes (LWD recorded five holes on Leg 170 and another five holes on Leg 171). He said that this was a big ticket item for WLS on the order of half a million dollars.

4.5 PCOM Report TAB 18

The PCOM Report, consisting of Motions and Minutes from the August and December Minutes, was entered into the record as read. Orcutt asked about the status of the DCS, which is now on hold. Humphris explained that PCOM Motion 96-3-10 was based on a recommendation from TEDCOM, which had asked PCOM to endorse a further review of the active heave compensation system as an alternative to continuing the DCS development. Fox explained that in the past two and a half years, industry has developed an active heave compensation system, which removes 90 to 95 % of the weight-on-bit variation. This technology could benefit many aspects of the drilling program, leaving only the removal of the last 5 to 10 % of the heave critical to diamond coring implementation. Installation of a primary active heave compensation system could potentially solve the DCS problem at the rig floor at considerable cost savings. The last 5 to 10 % could be removed by tools at the seafloor.

5. FY 1998 Planning

5.1 FY 1998 Science Plan TAB 19

Humphris presented an overview of the Science Plan. She said that PCOM considered 18 programs of which seven were scheduled as legs - five in FY 1998 and two into FY 1999. Scheduling into FY 1999 was done because of the implications of getting the ship back into Antarctic waters and also in terms of achieving the objectives of the LRP.

Raleigh asked what would happen if, on the last day of a scheduled leg, a major accomplishment like drilling through Moho at 735B was in sight. Fox said that there is an attempt to be flexible. He noted that TAMU must also consider how the morale of the crew is affected when they are asked to stay in an area for too long. Raleigh stated that he wanted to ensure that there is sufficient flexibility to pursue scientifically important goals if drilling reaches a critical horizon late in a leg. Detrick said that another possibility is to return to the site in an accelerated way. Raleigh said that this is a nice option, but pointed out that it was necessary to wait nine years to go back to 735B. Fox noted that the ship will transit the Indian Ocean in late 1998 so an early return to 735B would be possible. Eldholm asked about testing the capabilities of the JR. Humphris replied that PCOM had tried to encourage the submission of proposals that address this to the JOIDES system. She further explained that the Somali Basin proposal, which would have provided a location where the JR's drilling capabilities could have been tested, did not fare well from a scientific perspective.

EXCOM Motion 97-1-16

EXCOM endorses the FY 98 Science Plan (Legs 176 to 181), voted on by PCOM at its December, 1996 meeting. EXCOM also endorses PCOM's scheduling of Legs 182 and 183 into FY 99.

Proposed by Nowell; seconded by Briden
14 in favor; one abstention (Mutter); one absent (Lancelot)

EXCOM Motion 97-1-17

EXCOM recognizes that the full drilling capability of *JOIDES Resolution* is not yet fully tested and recommends that major deep drilling scientific objectives be included as early as possible in Phase III. SCICOM is asked to address this question and report to EXCOM in June.

Proposed by Eldholm; seconded by Duce
14 in favor; one abstention (Mutter); one absent (Raleigh)

5.2 FY 1998 Budget Overview **TAB 20**

A draft FY 98 budget was presented by Falvey for review and comment. He pointed out that this is the fifth year of a flat budget . He noted the impact on the FY 1998 budget of the distant ocean tax (the cost incurred by drilling in remote regions - Southern Ocean, Antarctic). The FY 98 budget is more or less resolved (Appendix 4) although some balancing, which should not amount to more than about $50K, is still required. The cost of the ice boat at $770K may, in reality, be higher. The budget also includes leg enhancements and logging tool enhancements, and the clean-up cost for Southern Ocean drilling so that ODP conforms with the MARPOL protocols. There is also an incremental cost to JOI for the PEC V Review. Last year, BCOM recommended an increase in the X-Base budget from $3.5M to $5M. Falvey said that he had not made this adjustment because of the distant ocean tax and other factors. The LDEO budget has gone down because the FY 1998 legs have fewer specialty tools.

EXCOM discussion focused on three issues.

The flat budget: Mayer pointed out that the budget presented by Falvey is the budget is based on 5 2/3 ODP partners. ODP now has more partners and hopes to increase membership again in FY 1998. Heinrichs responded that NSF is working on the base budget of $44.4M dollars and they are holding this as the starting point, irrespective of the number of members. He acknowledged, however, the possibility of augmenting the base program budget always exists if there are driving scientific arguments. Mayer said that this approach takes the wind out of the sails of the effort to acquire new members. Leinen expressed the concern the flat budget scenario had become firmly implanted and would put a damper on any costly innovation.

Need for additional funds: Watkins observed that ODP's budget has really been squeezed for the past four years. Both he and Brown asked where the breaking point was and said that it was necessary to know what would be lost if the budget was not increased. Watkins argued that it was time to seek additional dollars to support the Program. Heinrichs agreed and said that one of the challenges for JOI and JOIDES is to clearly articulate the science goals and the resources that are required to meet it. He noted that the 5-Yr. science implementation plan and corresponding budget plan will have to be aligned to carry the message. Watkins said that the Program needed to go beyond this budget to kick start the LRP. He declared that if NSF could not do this, then they must permit a major initiative to be launched to directly fight for the dollars another way, without competing for dollars currently in the NSF budget. Watkins said that he believed that there was enough excitement in the program to go forward. Strong political steps are needed but possibilities exist on Capitol Hill. Detrick suggested that this issue would be an appropriate topic for discussion during the Executive Session the following afternoon.

Role of BCOM: Detrick explained that in the past, BCOM had dealt with unresolved issues and noted that the prioritization of the budget items had traditionally come from PCOM. This year, he said, there did not seem to be a need for BCOM, although one is in place. EXCOM can give JOI the okay to go ahead and finalize the budget for formal adoption at the June EXCOM meeting.

6. Phase III Implementation

6.1 ODP Strategic Science Plan (1998-2003) TAB 21

Detrick reviewed the request from Council regarding the Phase III Implementation of the LRP and noted the letter to Briden from Heinrichs. The JOIDES response is embodied in the new Advisory Structure, the 5 year Science Plan and the Strategic Management Implementation Plan. These documents will be important in selling program renewal, documenting the resources needed for the next phases, and in showing the consequences of different funding scenarios in ODP economies and innovations.

Humphris outlined the development of the 5 year Science Plan, starting with the August Townsville PCOM meeting. She made the point that since ODP science must be driven by proposals, it is difficult to assign actual goals that are concrete. The document is structured so that the sequencing shows the legs (general) to achieve the objectives of the core themes and initiatives of the LRP.

Following this presentation, EXCOM discussion centered on the following issues:

"Wordsmithing": Eldholm said that the five year implementation plan conveyed business as usual and he asked where the bold science that is needed was. Mutter said that the document needs "wordsmithing" to make it more forthright. He also expressed his concerned about wording like, "...we will better constrain..." and "...contribute to the solution....". He added that "....and continue to resolve back in time..." is interesting but does not aspire to the achievement of the high level scientific goals of the Program. Mutter cautioned that "site of opportunity " is the wrong terminology used in reference to the

global sampling of high resolution records to study rapid climate change. Heinrichs noted problems with the writing style, a gap in identifying stronger links to technology, and an overview section. In addition he wants the science plan to be more strongly coupled to the 5 year budget plan and the different scenarios.

Percentage of the 5 Year Plan represented by proposals: Leinen raised this issue. Humphris responded that the extent to which the plan was proposal-driven varied from theme to theme depending on the number, maturity, and geographic location of active ODP proposals. She added that for some themes, ODP will have to expend a major effort to jump start the system because proposals are lacking. The SSEPs will take the implementation plan and determine how to address the objectives therein. The SSEPs will decide how to best encourage proposals, which may be with PPGs, or through global geoscience programs and workshops. PCOM recommended the creation of two PPGs, long-term observatories and the subsurface biosphere--as there is an immediate need in these two areas to start the ball rolling. Eldholm said that the capability of the *JOIDES Resolution* must be known for the planning of Phase IV. Taira said a key issue that SCICOM will have to discuses is how to encourage a test of the *JOIDES Resolution*'s capabilities for deep drilling.

Flexibility of the 5 Year Plan: Lancelot said that the LRP was the general framework document and while the 5 year plan was meant to be a more specific plan, it is too precise and too closely linked to the recent past. Humphris assured EXCOM that the plan is flexible, but it is a balancing act between being too proscriptive and maintaining flexibility. She noted that PCOM resisted this format of the plan as they did not want to constrain the creativity of the Program. Mayer stated it serves as an exercise in demonstrating that what is presented in the LRP is feasible, but that accountability is really to the LRP. Heinrichs expressed concern about the number of drilling legs, all of which cannot be drilled in the next five years (there are approximately 50 legs listed although only 30 can be drilled in five years). Humphris explained that the number of legs was deliberately inflated to demonstrate the flexibility of the plan. It was agreed that this planning document is exemplary and that a clear statement of what this plan is intended to do should be included up front, particularly in the presentation to ODP Council. It was also agreed that JOIDES will have to find a way to tell the community that this is not the final plan and that there are openings for new initiatives and exciting science. Leinen said that with SCICOM there is now a good mechanism in place to give more guidance to the implementation of the LRP.

6.2 ODP Strategic Budget Plan (1998-2003) TAB 22

Falvey presented the fundamental elements of the ODP strategic management implementation plan. These elements include an innovative five year science plan, the concept of new partnerships within the Program, cooperation between ODP and other scientific programs, cooperation in technology research and development, and a widening international participation in the Program. He emphasized the need for new technology development and program innovations at a level over and above that currently funded in the style of the X-base projects. He identified what he called "super X base" technology and innovations (Appendix 5) and said that he would work with Goldberg and Fox to further refine these items. Falvey presented a budget for the basic Program operational costs and

proposed technology development, and outlined four different budget options contained in the strategy document. He noted an error on the LRP budget (net inflation for FY 96 requires that the entire row can be shifted to the right and lowers the cost of the LRP option by one million dollars). Falvey said that there was both an opportunity and a need to integrate the ODP strategic budget plan and the five year science implementation plan.

Following this presentation, EXCOM discussion centered on the following issues:

Option assumptions: Many EXCOM members were concerned that in the fallback option which involves the loss of a partner, the Program ended up with more money than the zero growth option. Detrick wondered if the document was understating the impact of the loss of a partner to the Program. It was agreed that the fallback option should represent the worse case scenario defining what would be lost and what the Program could continue doing. Watkins said that the fallback scenario was a dangerous option to get out in public view as it could be a self-fulfilling prophecy. He suggested that after the ODP Council is briefed, it should be dropped. Heinrichs explained that ODP Council had specifically requested that one of the funding models be a five partner Program. Since the document presented to ODP Council would be a public document, the model will be retained after the meeting. A number of members expressed doubt that there could not be a viable program with zero growth and the loss of one partner (fallback). Fox noted that it would be possible to drill many shallow, high-recovery sediment holes for paleoceanographic objectives since this kind of drilling does not cost much above the basic cost of Program. But this approach would minimize the achievement of tectonic and lithosphere objectives. It was agreed that a program with a single direction would no longer be ODP, and would be unacceptable even in a zero growth scenario.

NSF's contribution level: Heinrichs stated that his primary concern with the fallback option is the change in the percentage balance between the US and total non-US levels of contribution. Heinrichs urged the US members to look very closely at the budget because the model for NSF is a 50/50 split and the way the fallback model has been set up, there is an imbalance in this split that negatively affects NSF. NSF has a firm commitment for 51% but runs into problems when its level of contribution exceeds 60%. He stressed that NSF truly wants the Program to succeed and to have adequate resources; but NSF also wants to view ODP as an international partnership. He acknowledged that an acceptable balance is with the US level of contribution at between 55 to 60%. The US level is currently at 62.5%, and NSF wants it back below 60% - this is one of the reasons for holding the FY98 budget at $44.4M despite new member contributions. Mutter pointed out that the effect of a non-US member dropping out has a commensurate effect on the NSF level of contribution; hence, the impact on the Program goes beyond just the loss of a member. Lancelot said that in such a situation, JOIDES would have to ask those remaining in the program to increase their contributions. Lancelot followed up by asking if NSF contributed to ODP only because of international participation in this program, and so was politically motivated. Heinrichs said that NSF is committed to the Program for the next decade. If someone drops out, the Program may change its science goals, or the organizational arrangement, or the US may enter into a 2/3 to 1/3 partnership. He added that these

contingencies have not been addressed. It was also noted that the other partners could register their commitment to the Program by changing their levels of contribution.

Advice on how to improve the documents: Heinrichs said the strategic budget plan must be strongly tied to the science plan. Mayer suggested that the two separate documents be integrated into a unified final document. Lancelot said options that show hard scientific choices instead of a scenario that demonstrates the Program just slowing down must be presented. Detrick, however, noted that ODP Council has requested specific budget scenarios: zero growth, fallback, and LRP. Leinen said that the budget scenarios should be mapped onto the science and the science prioritized to show what will be lost or gained. Heinrichs urged that the numbers used in the budget scenarios are realistic and consistent with the NSF boundary conditions regarding the US/non-US balance. Stoffa suggested using the LRP growth rate but staying in line with NSF guidelines. It was recommended that jargon (X-base, A-base etc.) be omitted. Orcutt noted that some things, such as the BOP and riser, are not mentioned in the science plan, yet are presented in the budget. A connection to OD-21 should be made.

EXCOM tasked Falvey and Humphris with addressing the comments noted above in their presentation to ODP Council on Wednesday afternoon. They are also charged with creating a written integrated Implementation Plan to be sent to ODP Council by the beginning of March.

6.3 Recommendations of RFPs for Services 1998-2003 (Appendix 6) TAB 23

6.3.1 Wireline Logging Services

6.3.2 Site Survey Data Bank

Falvey noted that EXCOM had instructed JOI to issue RFPs for the WLS and the SSDB at the Chantilly meeting. The only bid on the WLS contract was from Lamont. The assessment panel recommended that the LDEO response met or exceeded the requirements of the RFP. The organizational structure proposed by LDEO in their bid not only included LURB and IMT-BRG (Marseille), but was extended to include ORI. Lamont oversees management of this joint structure. The structure is open to other participants on specific X-base projects. An advisory board has been proposed and this will help to establish priorities within the WLS structure.

Falvey reported that there were three responses (U. of Houston, Lamont and Scripps) to the RFP for the SSDB. JOI has recommended that the award for the SSDB contract go to Lamont, which received the best rating without any ambiguity from the assessment panel. EXCOM endorsement was invited. Detrick asked Falvey to comment on the innovative aspect of the LDEO SSDB bid in which online data access to much of the data in the Data Bank was proposed. Falvey said that in November of 1994, he had encouraged Dan Quoidbach (SSDB manager) to move the DataBank toward on-line, digital data access/storage and this had become a central element of the Lamont plan.

EXCOM Motion 97-1-18

EXCOM moves to accept JOI's recommendations for providers of the Wireline Logging Services and Site Survey Data Bank for ODP during Phase III of the Program (1998 - 2003).

Proposed by Raleigh; seconded by Leinen
14 in favor; two absent (Orcutt and Mutter)
Mutter and Orcutt were absent as they were conflicted.

7. Motions Resulting from the Executive Session

Based on discussions in the Executive Working Session on Tuesday afternoon, the following motions were drafted and passed by EXCOM in the Wednesday morning session:

EXCOM Motion 97-1-19

EXCOM recommends that JOI develop a strategy to investigate partnerships with the oil and oil service industries with the objective of developing joint programs in technology development and other program innovations.

Proposed by Mutter; seconded by Eldholm
15 in favor; one absent (Raleigh)

EXCOM Motion 97-1-20

EXCOM tasks SCICOM to address two issues:
1. Prioritization of technological developments required to support the objectives of the Long Range Plan.
2. Identification of mechanisms for the development of this technology (in house , collaborations, external).

Proposed by Brown; seconded by Mayer
14 in favor; two absent (Briden and Raleigh)

EXCOM Motion 97-1- 21

EXCOM has unanimously endorsed the scientific direction and goals of the ODP embodied in the Long Range Plan. Before deciding on support for the funding profile in the LRP, we evaluated the existing and proposed program in light of funding.* We found that improvements in program efficiency have been achieved through cost cutting, the implementation of project management, and a major reorganization at TAMU. A decrease in inflation-adjusted funds of more than 12%, has resulted in postponement of major technical advances that would have substantially enhanced the scientific innovation of the program for the 1994-1998 period.

After this analysis, EXCOM agrees that increased funding in real terms (inflation-adjusted funds) is necessary to achieve the goals of the Long Range Plan. Further we strongly support the recommendations of the International Review Committee that real growth in funding is necessary to achieve the pre-2003 goals of the ODP.

* *See attached motion background* (Appendix 7)

Proposed by Leinen; seconded by Brown
15 in favor; one absent (Raleigh)

8. Phase IV Planning

8.1 Report on International Workshop on Riser Technology **TAB 24**

Taira reported on the "International Workshop on Riser Technology", jointly sponsored by JAMSTEC, ORI, and JOIDES/TEDCOM, which was held in Japan in October 1996 to explore technological development in support of OD-21(Appendix 8; Appendix 9 is the final workshop report). The ODP LRP served as background for the discussion. A series of model holes and corresponding technological requirements were presented (Appendix 8). Taira explained that, while in some cases the model holes were linked to existing proposals, they were different from those which ODP currently drills. Detrick noted that concerns have been expressed regarding the evaluation of the different types of technologies available for deep drilling. Taira said that Takagawa would address this point. Takagawa reviewed the 7 recommendations of the workshop (Appendix 10). He added that Japan is very keen to move from the design phase in 1998 to the construction phase so that the ship will be operational in 2003.

Detrick inquired about the implementation of recommendation B6 (extension to 4000m - ....evaluation "of the range of applicable technologies"). Takagawa answered that current efforts are focused on the realization of the medium depth capability, but JAMSTEC is very optimistic that a 4000m riser system will be developed by modification of the intermediate depth riser system. He referred EXCOM to his report on the simulation study of a 4000m riser system (Appendix 9, P. 254). Slim line riser technology and the riserless mud circulation system were also discussed (Appendix 9, pp. 19-21). Taira added that exploration of the riserless drilling technology, which JAMSTEC will continue to track, is preferred by JAMSTEC over the slim line riser system as an option for deep drilling. Detrick noted that this technology is rapidly changing as industry moves into deep water systems and so there must be a mechanism in place to monitor developments. Taira agreed and said that TEDCOM is where this will occur.

8.2 1997 CONCORD meeting **TAB 25**

8.3 OD-21 Status Report

Kinoshita noted the number of conferences that have already been held or are planned in connection with OD-21. He said that Japan plans to build the proposed riser ship by 2003. The timetable for full implementation is about ten years. In the initial Phase A, the shorter riser will be used. Japan will remain engaged in discussions to determine what type of system will be feasible for Phase B. He said that one of the most difficult things is the preparation of the budget proposal to go forward to Japan's financial agency. To meet this challenge, a number of actions have been prepared of which the

most important is the CONCORD meeting which is intended to convince the Japanese funding agency of the need to proceed with the proposed schedule of planning for OD-21 (Appendix 11). The Co-Chairs of CONCORD are Hans Christian Larsen and Ikuo Kushiro. Preparations for the meeting will begin in earnest after EXCOM. There will be a CONCORD steering committee meeting in April and prior to the CONCORD meeting, in July. Taira reiterated that the important milestone is the April CONCORD steering committee meeting which will produce the initial draft plan for the Japanese position paper, which will be finalized after the conference in July.

8.4 OD-21/ODP Management Report **TAB 26**

Falvey reported the proposed OD-21/ODP integrated management plan and structure for scientific ocean drilling beyond 2003 structure (Appendix 12). The new JOIDES structure would be integrated such that the international partners would fund both programs with agreements spelled out in the MOUs. Agreement has been reached on a parallel advisory structure with both Japanese and NSF Program Offices. A single joint science plan would go to the NSF and equivalent Japanese program offices. He noted that the proposed phased implementation had been laid out by Kinoshita in the previous report.

Mutter asked why OPCOM was not included on the diagram showing the proposed structure. Falvey replied that both OPCOM and BCOM were omitted because they are subcommittees. Mutter noted that the operational aspects can be expected to be very complex. He asked how a budget arrow could go in both directions between the two program offices. Falvey said that this was how "you get a box of commingled funds" to correspond to a single program plan. Detrick asked about the Joint Management committee and its composition. Falvey said that it would remain as it is now - Falvey, Taira and Kinoshita. Briden suggested that a council layer in the Integrated ODP, similar to ICDP's Executive Committee, should be considered.

EXCOM Motion 97-1-22

EXCOM appreciates the effort of STA/JAMSTEC and Monbusho/ORI to have organized a series of workshops (International Conference on Ocean Drilling in the 21st Century, February 1996; International Conference on Riser Technology, October 1996) to discuss the future of Ocean Drilling in the 21st century.

EXCOM endorses the proposed plan to organize CONCORD (Conference of Cooperative Ocean Riser Drilling), July 1997, Tokyo.

EXCOM reiterates its continuing support for the development of the OD21 program in the context of the ODP Long Range Plan, including the building of a riser drilling vessel.

EXCOM notes the phased approach to the construction and operation of a riser drilling vessel outlined in the OD-21/ODP Management Report (EXCOM Agenda Book, TAB 26, p. 5)

Proposed by Orcutt; seconded by Stoffa
15 in favor; one absent (Raleigh)

EXCOM Consensus 97-1-23

EXCOM endorses the establishment of a standing "Joint STA/JAMSTEC-JOI-MONBUSHO Management Committee" to continue work on the outstanding issues to ensure continued communications and consultation between the three key organizations involved in developing an integrated management and structure for a scientific ocean drilling program beyond 2003.

9. Future Meetings and Other Business

The June EXCOM meeting (6/9 -10) will be at Ifremer in Brest, France. Detrick said that it will be a shorter meeting as a joint session with ODP Council may not be necessary.

The winter 1998 EXCOM will be at the BIOSPHERE II in Arizona (January 19 and 20, 1998).

JOINT EXCOM/ODP COUNCIL MEETING

11. Joint EXCOM/ODP Council Meeting

Detrick welcomed attendees and outlined the procedures for presentation of the country reports. Presenters were asked to highlight anything important, especially items related to renewal.

11.1 Country Reports **TAB 27**

11.1.1 Australia-Canada-Chines Taipei - Korea

Mayer reported that on January 28, 1997, Chinese Taipei officially signed an MOU in Canberra for 1/6 membership, bringing the Australia-Canada-Chinese Taipei - Korea consortium membership to 11/12 of a full membership. He noted the rotation of the position of the SCICOM representative (formerly PCOM) from Australia back to Canada, and of the position of the EXCOM representative from Canada to Australia. The consortium will meet in Hawaii in late February. Canada has submitted a proposal for renewal to their appropriate agency, and the site review was conducted on the 10th of January. Notification of the outcome regarding renewal through 2003 is expected in two weeks. Feary added that there is optimism in Australia, although no one had yet signed on the dotted line. Detrick acknowledged JOI and NSF for their efforts in soliciting new members to fill out this consortium.

11.1.2 ECOD

Eldholm reported that there are uncertainties in some Nordic Countries regarding levels of contribution and membership. ECOD has initiated preliminary talks with Portugal on membership.

11.1.3 France

Lancelot reported that all the changes in ODP were welcomed in France and the main scope of the Program is now focused on the interests of the community in France. France will work in concert with its European partners to assure continued future participation. This is considered essential in order to seek the requisite major increase in the funding for Phase IV. Lancelot underscored the positive outlook in France and the high spirits of the community.

11.1.4 Germany

Maronde reported that in early November the Geo. Commission set up a committee Chaired by Roland Barter to evaluate the new Advisory Structure of ODP. This group expressed concern that (1) SCICOM would have to work with a top down approach to implement the LRP; and (2) about the broad mandate of SciMP. The establishment of OPCOM was regarded positively. The group recognized that the new structure has been established, however, and recommended a review of the new structure in two years. There was also concern that the German ODP community did not have sufficient time to evaluate changes in the structure. Maronde said that discussions of the past few days had led him to form the opinion that the full cooperation of the ODP partners is required for the new structure to work. Beiersdorf emphasized that there was not sufficient time for the German ODP community to feel involved and to have contributed input. This action by ODP has damaged community trust in Germany.

Maronde reported that another matter of concern to the Geo Commission was the new publications strategy. While it was agreed that it was necessary to achieve cost savings, it was recommended that, in addition to the use of electronic media, the book version remain available. Germany considers the delivery of the Proceedings of ODP as part of the existing MOU. The group recommended that the links to the International Scientific Union (IUGS and IUGG) be strengthened in light of need for additional support for the future of ocean drilling.

Maronde also noted that science funding is in a very severe position in Germany and there have been some cutbacks. BRG, however, had an increase in their budget in 96 and 97.
The abstract volume of the colloquium in Oldenberg has been published. The senate of DFG accepted the draft gray plan (document published by the DFG every four years) which contains a paper (authored by Wolf Emmerman and Helmut Beiersdorf) that argues that scientific drilling is one of the most important tools in geoscience research. He said that scientists in Germany are convinced that scientific continental and ocean drilling need intensive cooperation in order to attain targets in the ODP LRP, especially with respect to Phase IV.

Detrick agreed that the idea of a review of the new JOIDES structure, in perhaps 2 years, would be very appropriate.

11.1.5 Japan

Taira reported that the official budget goes to Japan's funding agency in July and the decision on renewal will be made in December. Japan needs to know the exact amount of required funding from the partners.

11.1.6 UK

Briden reported that science activity in UK is as lively as ever. The most notable activities were the forum held at the Geological Society in London at Burlington House (October 1996) and the European colloquium in Southampton (Nov. 1996).

On the matter of renewal, Briden reported that after the Oslo ODP Council Meeting, Krebs had asked the Earth Sciences Board to prioritize ODP against all other earth science programs in the UK; it was rated number one. Consequently, Krebs told Briden that he was cautiously optimistic about renewal. Briden noted that the Science budget is not increasing in cash terms, and this represents about a 2% annual decrease in real terms. Thus, the UK would be unable to increase their contribution to ODP. In the longer term, the UK wishes to remain in close discussion with colleagues in France, Germany, and the other European countries regarding ODP renewal activities.

11.1.7 USA

Malfait reported that the 1998 NSF budget was released last week (Appendix 13). ODP has fared well in comparison to other programs. Heinrichs said the increase shown is money that is targeted to go towards the cost of the mid-life refit of the *JOIDES Resolution*. This is required in order to renew the contract for the ship through 2003. He pointed out that NSF budget numbers do not reflect the full $6 million required for refurbishment as this has been targeted as a multi-year effort by NSF.

Kappel reported that the COMPOST II committee would meet the following weekend in Miami to prepare a report documenting the US interests in ODP science post-2003. She mentioned that ODP/JOI will prepare a glossy report on the most exciting accomplishments of ODP for which 75 abstracts have been received (Appendix 14).

11.2 JOIDES Report to Council

Heinrichs reported that at time of the Oslo meeting, the new Advisory Structure was under discussion and, although the LRP had been finished, there was no implementation plan. Thus, Council had requested that JOIDES and JOI provide specific items related to the 1998 to 2003 period. He reminded all attendees they would hear an update on the preliminary reports which they had received with the Agenda Book.

11.2.1 New ODP Science Advisory Structure TAB 4

Humphris summarized the changes to the JOIDES Advisory Structure and noted that the new structure and the new meeting calendar will be in place by November.

Heinrichs noted that editorial and minor changes had been made to the mandates which ODP Council may not have seen. Mayer asked about the two PPGs that PCOM had rec-

ommended. Humphris reviewed this. Mayer asked if nominees for membership could be selected. Humphris answered yes. Maronde asked how many PPGs would set up. Humphris replied more than 6 and less than 10. There was concern that people may imagine a connection between 6 PPGs and 6 legs per year. Budgetary problems could potentially occur, however, if more than ten PPGs were established.

11.2.2 ODP Strategic Science Plan 1998-2003) **TAB 21**

Humphris reviewed the ODP Science Implementation Plan and its evolution. She said that this plan should be viewed as an exemplary document to show how these objectives can be achieved over the next five years. The scenarios presented are intended to allow for creativity and for technological innovation. Humphris also noted that there is a four year ship track which PCOM has affirmed, and this is also reflected in the document. The drilling legs add up to more than 150% of the available legs, which was done deliberately by PCOM to demonstrate that this Science Plan is flexible. It is linked to the themes of LRP and shows how they might be achieved. In her presentation, Humphris also underscored the following points:

- relevance to society of the core themes
- the need for collaboration with other geoscience programs to achieve Program goals
- the plan to drill at least one deep hole to test the capabilities of the JR in Phase III.

Riddihough asked if the 4 year track to which Humphris had referred was deliberate. Humphris explained that PCOM has traditionally set a 4 year ship track as part of their planning - it is a general plan based on the science proposals in the JOIDES system and the ship's area of operation.

11.2.3 ODP Strategic Budget Plan (1998-2003) **TAB 22**

- **Five-year Budget Scenarios**
- **Budget Funding Strategy**

Falvey presented the ODP Strategic Budget Plan to ODP Council. Krebs said that he found the last overhead (Appendix 5) extremely useful as it answered the question that he had posed to Briden regarding how you marry the science plan with the budget. He said that Humphris' presentation, however, did not contain a clear set of priorities. He added that the science plan should be organized to show, come what may, ODP wishes to achieve. He assumed that under the zero growth and fallback scenarios, the essential things to be achieved could be done. Falvey said if the Program had to cutback, it would focus on climate change objectives, which would be cheaper to address. Detrick noted that this had been discussed the previous day, and added that if the focus is only on the climate change objectives, then the broad support that the program currently enjoys throughout the science community would be undermined. He noted that if innovation and technological development are lost, then the Program will be seen to be conducting " business as usual". Leinen presented the EXCOM motion (EXCOM Motion 97-1-21) resulting from the previous day's discussion regarding the science plan, and the consequences for the Program of a decline in inflation adjusted dollars of the Program's budget.

Krebs said that in his remarks about dropping parts of the program objectives, he had provocatively recommended that the tectonics and lithosphere objectives be dropped and ,

in response, he had heard about the threat to the ownership of the Program. He asked again about realigning the Program. Humphris said that SCICOM would take a more active approach in trying to determine which of the scientific objectives, given certain budget scenarios, should be pursued. Leinen pointed out that EXCOM had in essence asked SCICOM this question with EXCOM Motion 97-1-20 which directs SCICOM to address the prioritization of technological developments required to support the objectives of the Long Range Plan. SCICOM has not been asked to choose between the Environment and Interior objectives, although it is implicit in what they have been asked to do that this will be required. Pigram asked whether the issue is to do what is new, innovative, and challenging, or just to continue with business as usual. Krebs said the question really is to determine which of the technological innovations would be chosen at the expense of others. Heinrichs said that the ODP Council would return to this issue in their session.

Detrick said that Council had received a draft version of this document from Humphris and a draft budget management plan prepared by JOI. These documents will be combined in order to tightly integrate the science goals with the budgetary strategies, economies, etc. This merged document should be finished by the end of February and will be mailed to ODP Council in early March.

11. 3 OD-21

The OD-21 presentation from STA was postponed due to the tanker spill in Japanese waters. Kinoshita provided a summary of reports given previously under items 8.1, 8.2, 8.3 and 8.4.

ADJOURN

APPENDIX LIST

Appendix 1	Wording changes to JOIDES "Terms of Reference" (3.1.2) - *on file*
Appendix 2	JOI Management Report (4.2)
Appendix 3	Science Operator Report - TAMU Reorganization (4.3.1)
Appendix 4	FY 98 Budget Overview (5.2)
Appendix 5	ODP Strategic Budget Plan (6.2) - *on file*
Appendix 6	JOI Report on RFPs (6.3)
Appendix 7	EXCOM Motion 97-1-21: Background
Appendix 8	Report on International Workshop on Riser Technology (8.1) - Taira - *on file*
Appendix 9	Final Report on International Workshop on Riser Technology (8.1) - *on file*
Appendix 10	Report on International Workshop on Riser Technology (8.1) - Takagawa *on file*
Appendix 11	OD-21 Status Report (8.3)
Appendix 12	OD-21 Management Report (8.4) - *on file*
Appendix 13	USA Country Report - NSF Budget (11.1.7)
Appendix 14	USA Country Report - ODP's Greatest Hits (11.1.7) - *on file*

Appendices 1,5, 8,9,10,12 and 14 will not be distributed with the minutes but are on file and available upon request from the JOIDES Office.

Appendix 1: Approval of Panel Terms of Reference (3.1.2)

The following wording changes were noted: Executive Committee - "each senior deputy" should be deleted and changed to "one voting member". Also on P. 10, " and providing SCICOM " with comments and written evaluation of them". SSP. 10.2, second bullet point. .. "site not be drilled" should be changed to "..sites not be drilled until data are available." Briden said that the PPGs were designed to open up the access to the programs. He said that with the evolution of the structure, the intent has been retained and he would like the wording (P. 11. Item 6. "...formed by SCICOM.....") changed to reflect this. He noted that there are other programs outside of the JOIDES Structure that can be recognized by SCICOM. Humphris added that there are financial aspects and issues of control that are of concern. Lancelot expressed his concern that the PPGs seem to be adding another level. Taira said that he wanted to see a more positive method of science planning - over the five year period of phase III and beyond.

Item 4.2.1: JOI Report on New ODP Sampling and Curation Policy

- **JOI hosted a Review of ODP Sampling and Curation Policy, November 18-19, 1996 in Washington, D.C.**
  - *users & curators from ODP-TAMU considered more open and "user friendly" approach to sample access*
  - *PCOM has endorsed the new policy*

Issue	Old Policy	New Policy
Curatorial authority	Curator at ODP-TAMU had ultimate authority	Sample Allocation Committee • *approve leg-specific sampling plan* • *Co-chiefs, TAMU Curator, staff scientist* Curatorial Advisory Board • *"appeals board", for special cases* • *ODP D/Director & Mgr. Sci Services, plus 2 JOIDES reps.*
Sampling moratorium*	1 year, or publication of IR	15 months
*(*only scientific party may sample)*		
Archive core	1/2 of every core archived (perm. unsampled)	Less material archived Archive sampling possible
"Sampling Strategy"	Evolved informally	Formal, planned process extending from proposal stage to post-cruise

Item 4.2.2: JOI Report on Co-Chief Scientist Review

- JOI hosted an ODP Co-Chief Scientist Review on November 20-22, 1996 in Washington, D.C.
  - this gave Co-Chiefs from recently legs (160 to 169) an opportunity to discuss their ODP experiences with personnel from JOI, ODP-TAMU, LDEO-WLS and the Site Survey Data Bank.

Principal Outcomes:

- Shipboard staffing issues - more flexibility in nominations from non-US partners is requested
  - *Non-US National ODP Offices are asked to provide more than the statutory 2 nominees per leg, with wider range of expertise, giving Science Operator more flexibility in leg staffing*

- Leg planning issues - PCOM were asked to be more aware of "proposal optimism" (generally cramming too much into a single leg) as obstacle to achieving science goals. Drilling and logging time estimates will be updated and married

- Site survey issues - JOIDES Office will alert National ODP Offices about emerging site survey needs

- Program awareness - JOIDES Office will advertise next year's science plan in EOS to encourage more applicants

PUBLIC AFFAIRS STRATEGY

OBJECTIVES

- Improve public awareness of ODP's scientific achievements
- Improve recognition of the participating scientists and their institutions
- Improve public recognition of national funding institutions' support for ODP
- Improve collaboration between participant and potential participant scientists, national institutions, industry, and ODP management and delivery functions

COMMUNICATING A UNIFIED OCEAN DRILLING PROGRAM

ODP Public Affairs will strive to promote:

SCIENTIFIC ACHIEVEMENTS

↓

Scientific party and their institutions

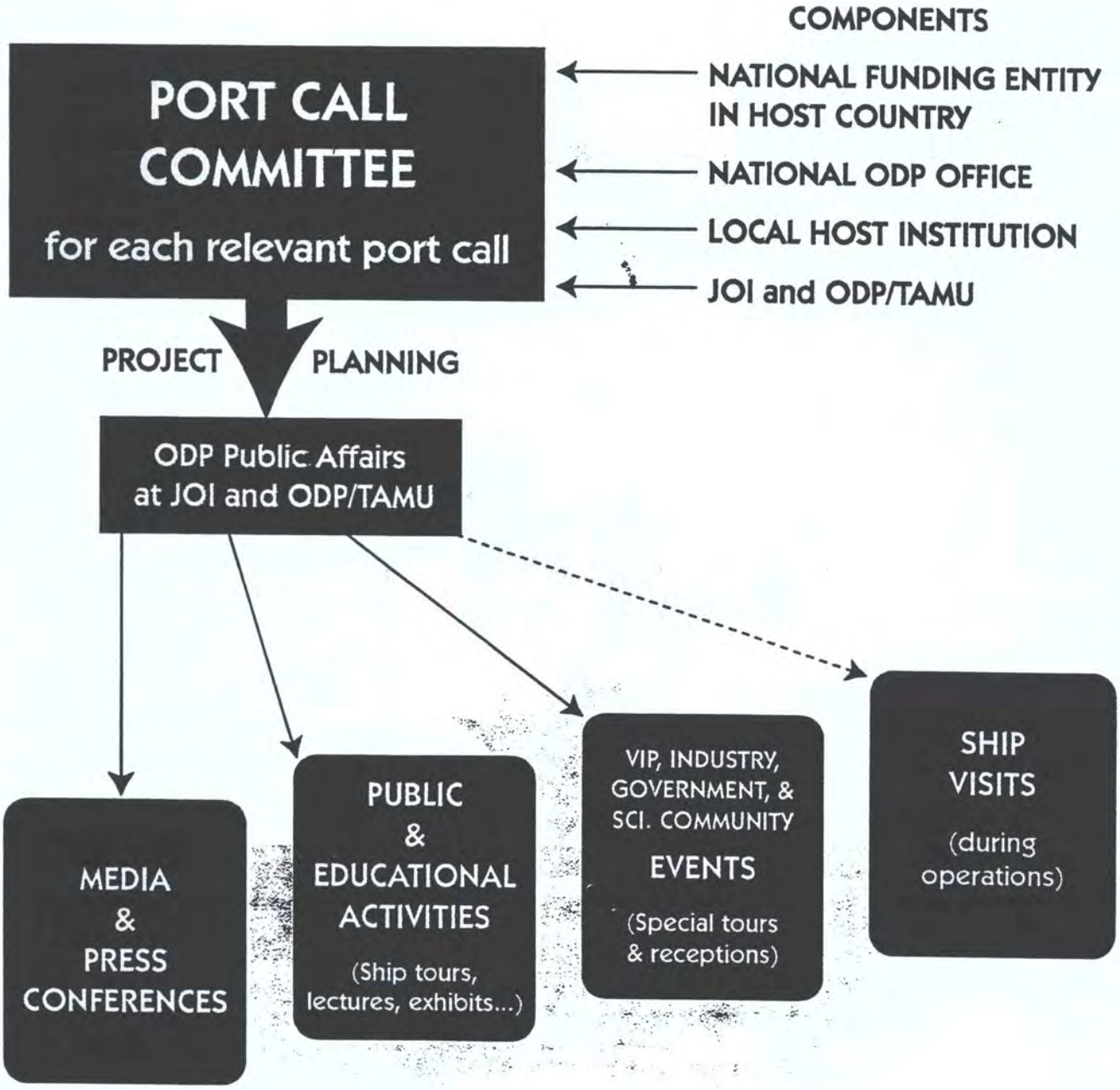
↓

Scientific and funding institutions of all ODP member countries

↓

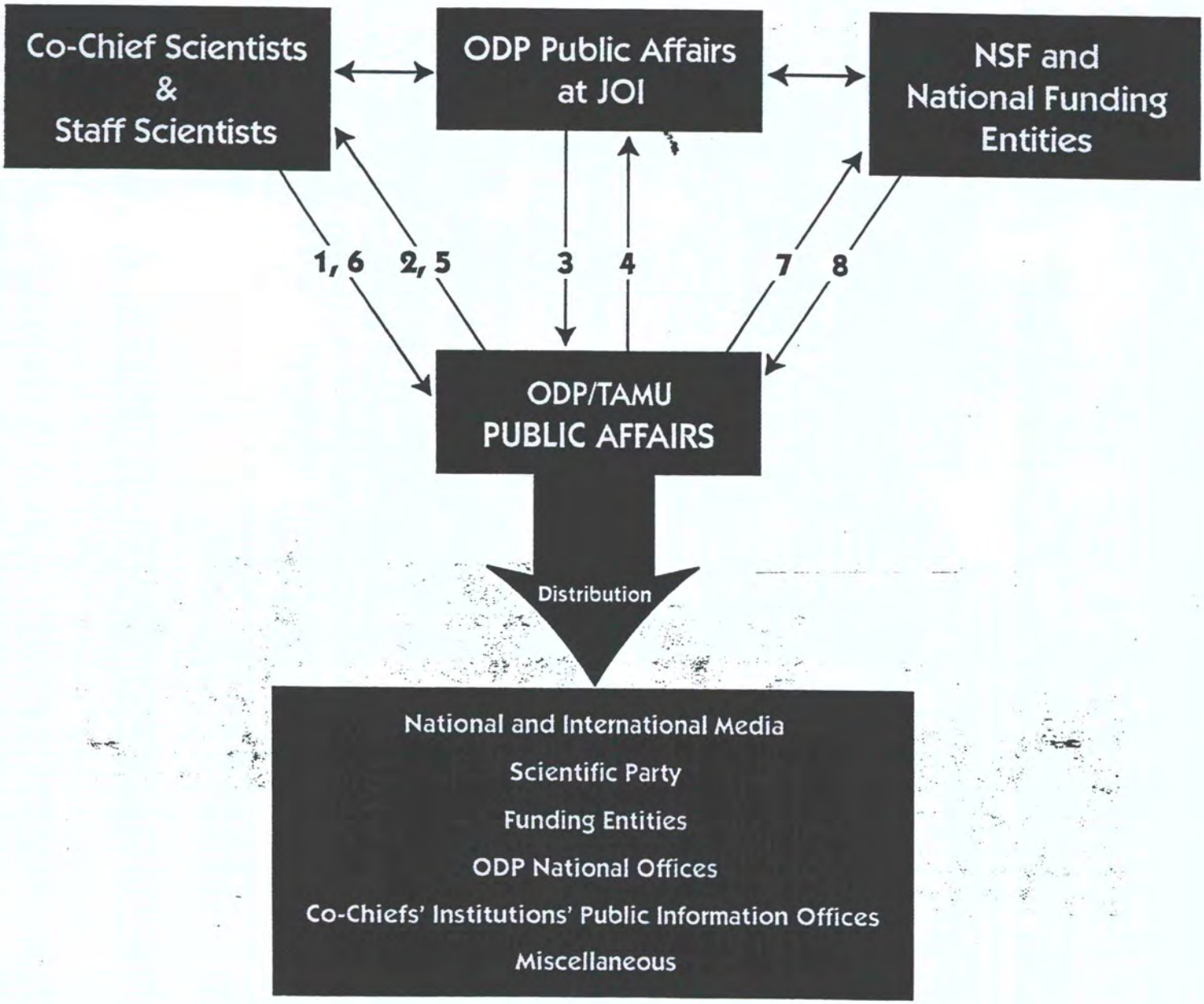
Program management and science delivery (JOI, ODP/TAMU, LDEO/BRG)

ODP PORT CALL STRATEGY

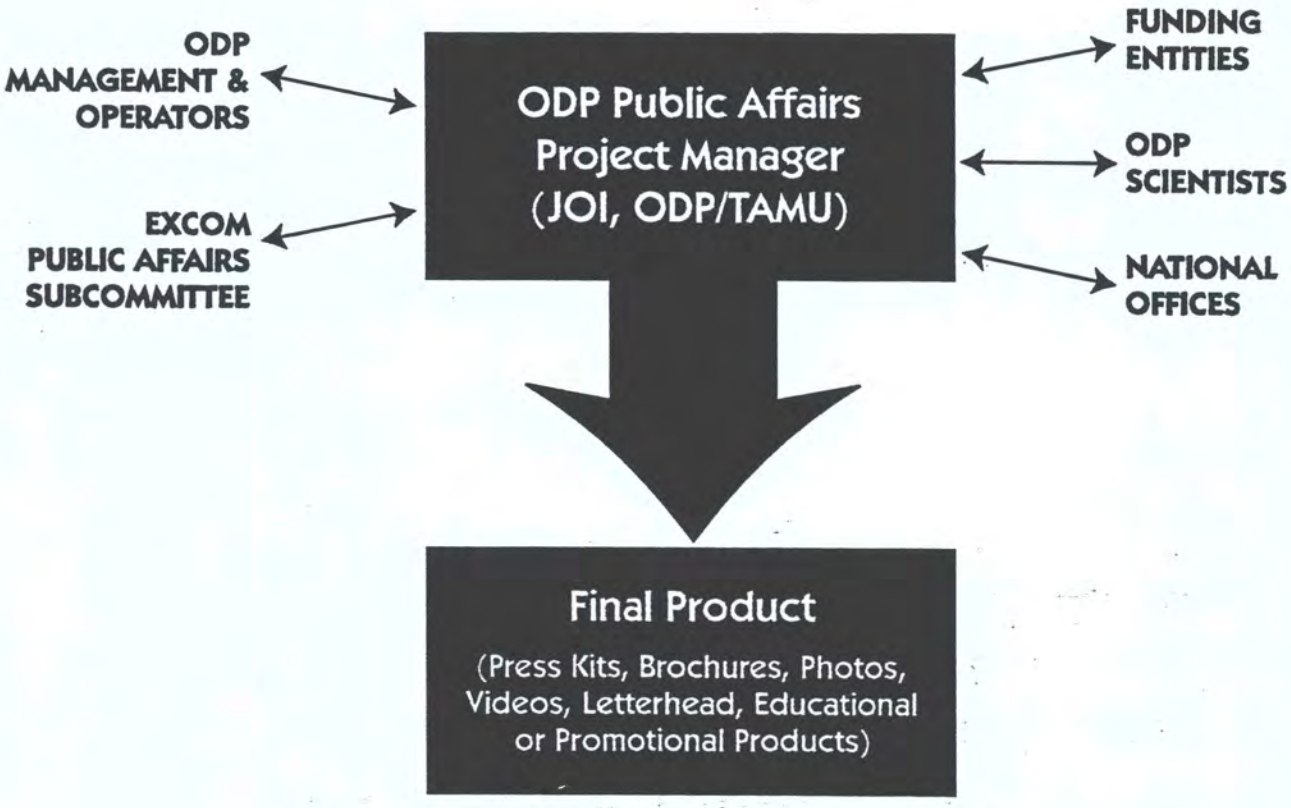


NEWS RELEASE POLICY AND PROCEDURES

SCIENCE PRESS RELEASES



ODP PUBLIC AFFAIRS MATERIALS and PRODUCTS DEVELOPMENT



Proposal for an

EXCOM PUBLIC AFFAIRS SUBCOMMITTEE

- Membership
  - Two U.S. and two non-U.S. EXCOM members

- Meeting schedule
  - Two hours in the afternoon/evening prior to each EXCOM meeting
  - Reporting to each EXCOM

- Mandate
  - Advise JOI on its annual Public Affairs work program and budget
  - Help identify and target key stakeholders
  - Advise JOI on international coordination strategies and partnership development

Item 4.2.4: JOI Report on JANUS Steering Committee

(a) JANUS Steering Committee Update

Milestone: Jan, 1997: Janus Phase I deployed on JR

- Steering Committee meeting, San Diego, Oct, 1996
  - set priorities for completion of JANUS Phase I
  - plan Phase II (visual core desc, digital images)

- December, 1996 PCOM
  - SC Chair Kate Moran reports to PCOM
  - PCOM responds with four motions:
    - » supports funding for JANUS completion (X-base)
    - » urges ODP-TAMU to address project management concerns (TAMU/Tracor contract amendment)
    - » advises ODP-TAMU, through JOI, on JANUS planning needs (done)
    - » supports JANUS database migration (RFP 14 Feb)

- SC meeting at Charleston port call, 14-16 Feb.
  - evaluate status of Janus deployment
  - plan greater interaction among SC, Tracor, TAMU
  - prepare user specs for remaining Phase I items
  - specify remaining training needs
  - define acceptance plan Phase I, prepare Phase II

- SC meeting at Halifax port call, June 1997
  - evaluate Phase I completion, Phase II initiation
  - prepare report to JOI on overall JANUS project development, implementation and delivery

Item 4.2.4: JOI Report on JANUS Steering Committee

(b) "Expressions of Interest" in Database Migration

- In Sept, JOI called for "Expressions of Interest" in migration of old DSDP and ODP data to the new JANUS database (see PEC IV recommendation)

- Four expressions of interest were received, from:
  - Southampton Oceanography Centre, UK
  - British Geological Survey, UK
  - Geological Survey of Canada; with GEOMAR (Germany) and University of Hawaii
  - UDP Consulting Services; with Oregon State University

- All respondents were assessed as qualified to work on database migration

- Based on this positive response, ODP-TAMU will issue an RFP for data migration, probably on 14 February, 1997
  - TAMU has started migration of Group 1, Legs to 171A
  - the next highest priority will be Groups 2A, 3 and 4A
  - subsequent priorities to be decided

Item 4.2.5: JOI Report on Publications Steering Committee

(a) Current Strategy for Move to Electronic Publication

Leg number	160	161	162	.....	168	169	.....	175	176	.....
Open Literature										
Scientific Results										
Traditional book										
500 page book										
CD-ROM										
Web abstracts										
Web										
Initial Reports										
Traditional book										
CD-ROM										
WWW										

(b) Publications Steering Committee - Mandate

1. **Ongoing evaluation of ODP publications strategy; recommend to JOI any changes that ensure the strategy is in step with scientific publishing and community needs**

2. **Recommend design and function of new formats for electronic *ODP Proceedings* volumes**

3. **Evaluate new formats for electronic CD-ROM volumes as well as a WWW version of the *Proceedings***

4. **Recommend a timetable for complete electronic publication**

5. **Develop a strategy to ensure an archival record of all *Proceedings* material.**

Item 4.2.5: JOI Report on Publications Steering Committee

(c) Steering Committee Schedule

December 1996:

- JOI established Steering Committee
  - Dave Scholl will be Chair
  - Ellen Kappel will be JOI liaison
  - input received from ODP-TAMU and JOIDES Office
  - the committee membership is now complete

February-July 1997:

- ODP-TAMU to develop new CD design
- ODP/TAMU to establish list server.
- ODP-TAMU to circulated information package, including IR 163/164 book and test CD, SR 151 book and test CD. All material posted on WWW. Questionnaire on test volume CDs .

April 1997:

- Steering Committee to meet in Washington, DC, 3rd and 4th

August 1997:

- Committee to carry out final review of new design.

Item 4.2.6: JOI Report on "Internationalisation" Initiative

(1) Korea

- KIGAM joined the Australia/Canada Consortium on 6 October 1996, bringing the new consortium to 75% operational

(2) Taiwan Universities

- Taiwan Universities joined the Australia/Canada/ Korea Consortium on 29 January, 1997, under the name "Chinese Taipei", bringing the new consortium to 92% operational
  - new name is the Australia-Canada-Chinese Taipei-Korea Consortium for Ocean Drilling

(3) China

- Discussions continue between NSF and other US Government Agencies on China's application to join ODP as an *associate member* at the one-sixth level

(4) Oman

- An internal consortium based on the Sultan Qaboos University are seeking support of other Gulf States for an *associate membership.*

(5) Intergovernmental Oceanographic Commission

- The IOC is writing to aid donors seeking funding

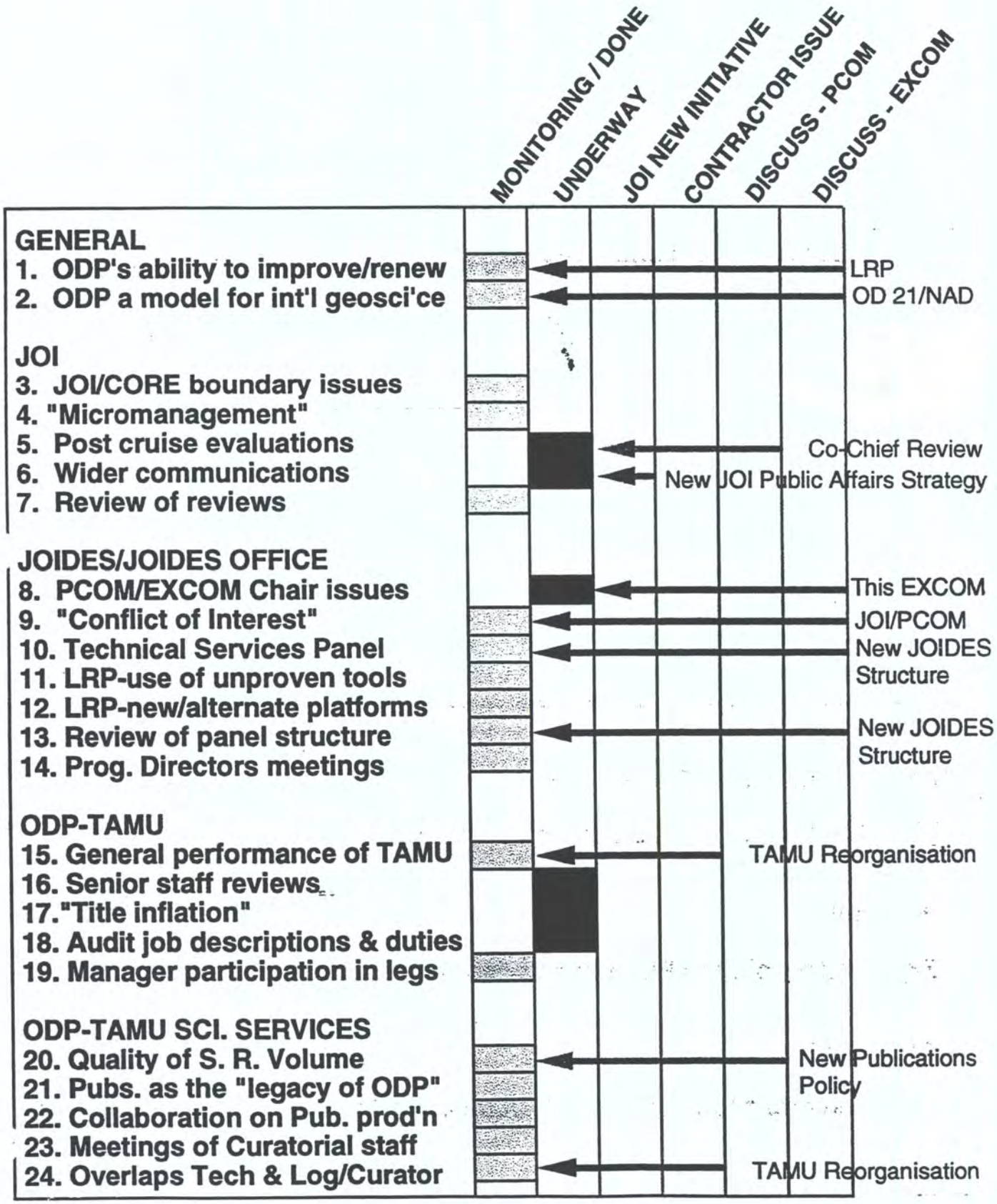
(6) Portugal

- Expected to join the European Consortium some time in 1997

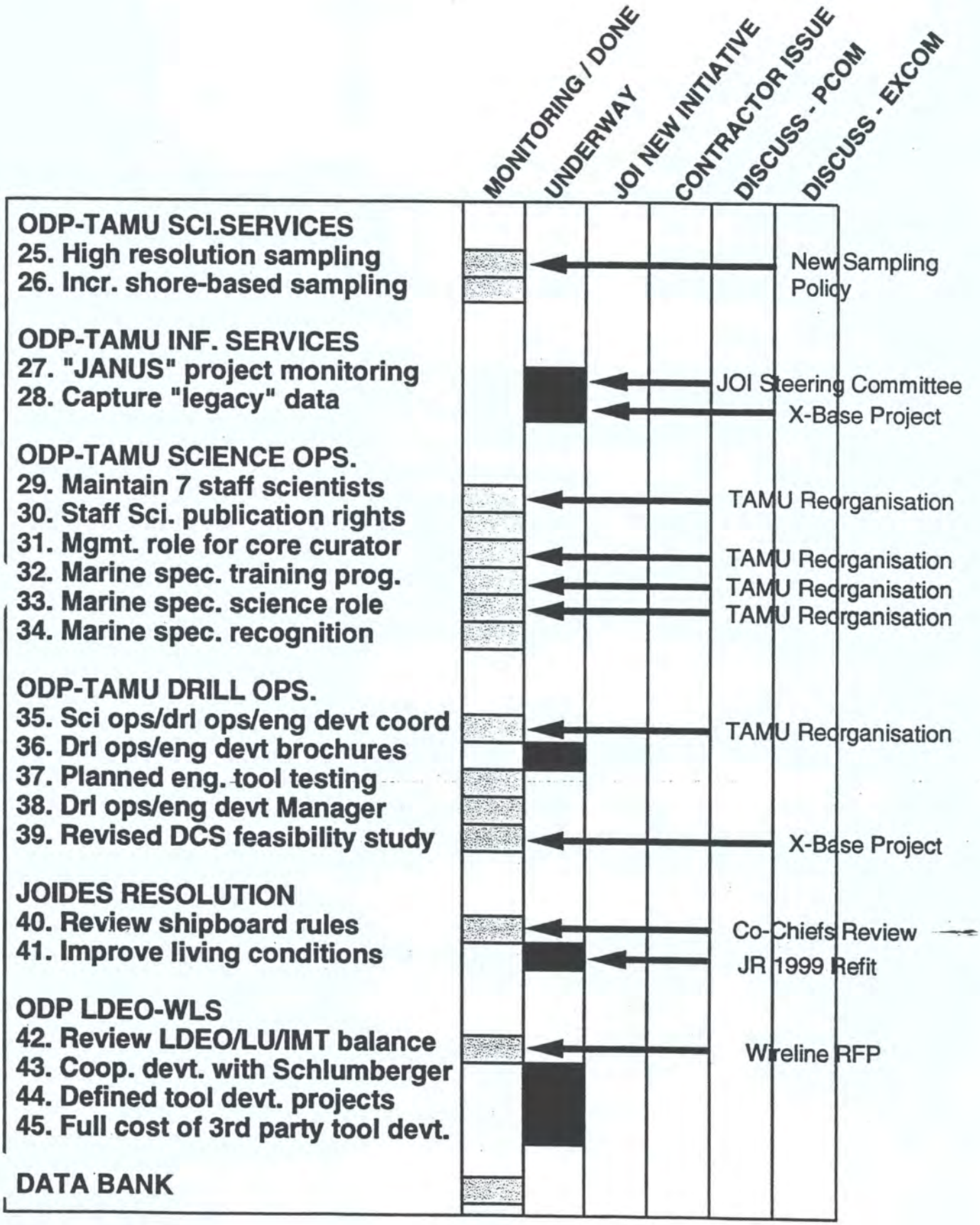
(7) South Africa

- Renewed effort to coincide with October, 1997 port call

UPDATE - PEC IV REPORT AND GENERAL RESPONSE



UPDATE - PEC IV REPORT AND GENERAL RESPONSE



Items 4.3.1 and 5.2: Budget Issues (FY 98) and Program Restructuring

Summary - EXCOM Motion 96-1-14:

- EXCOM, having endorsed the LRP, recognized the need for immediate and concerted actions to secure the necessary funds. The International Review recommended about 2½% a year real budget growth

- EXCOM requested:
  - JOI to examine the important new innovations in the program and detail their costs; *as a fundamental step towards addressing concerns from funders that all cost cutting measures have been examined prior to requesting additional funds*
  - JOI should also provide EXCOM with information to allow EXCOM members to advocate contribution increases with their respective funding agencies at the 2½% a year real growth level for 1998 to 2003.

JOI and Program Response:

- Carried out a management review in JOI, assisted ODP-TAMU in their organisational and management review, and issued RFP's for Wireline and Site Survey Data Bank

- Developed the FY98 draft budget, in consultation with ODP-TAMU, LDEO-WLS and PCOM, keeping to NSF target of $44.4 m for the 5th year. The outcome, comparing FY98 with FY94, is:

  - *an implied saving of $4.4 m, relative to inflation*
  - *an actual $2 m saving in A-base (running costs), or a cut in the A-base, relative to inflation, of 20%*
  - *addition of approx. $1.4 m to X-base "projects"*

Fox 4.3

GOAL:

TO HAVE IN PLACE AN ORGANIZATIONAL STRUCTURE AT ODP/TAMU THAT MAXIMIZES SERVICE DELIVERY TO ACHIEVE THE OBJECTIVES OF THE LRP:

- OPTIMAL MANAGEMENT OF RESOURCES
- EXEMPLARY SERVICES AND PRODUCTS AT LOW COST

BOUNDARY CONDITIONS:

- SERVICE DELIVERY UNINTERRUPTED
- SERVICE QUALITY MAINTAINED DURING TRANSITION
- NUMBER OF PRIME SERVICE REQUIREMENTS REMAIN THE SAME
- INCORPORATION OF LEG PROJECT MANAGEMENT
- NO "SACRED COWS"

DATA GATHERING PROCESS:

- INTERVIEWS WITH, AND WRITTEN COMMENTS FROM, STAFF
- COMMENTS FROM USER COMMUNITY AND ADVISORY STRUCTURE
- PROPOSALS MADE BY A MANAGEMENT CONSULTANT TEAM

CONCLUSION:

ODP/TAMU STRUCTURE NOT OPTIMALLY ORGANIZED TO ACHIEVE GOALS:

- FUNCTIONAL BALKANIZATION
- FUNCTIONAL REDUNDANCY
- CERTAIN TASKS DONE WELL BUT AT A COST IN PERSONNEL AND RESOURCES

NEW ORGANIZATIONAL MODEL:

- ALIGNMENT OF RELATED FUNCTIONS AND TASKS
- CONSOLIDATION OF EXPERTISE
- ENHANCED TEAM BUILDING
- STRUCTURE TO INCORPORATE PROJECT MANAGEMENT AND FUNCTIONAL REQUIREMENTS

MODEL CONSEQUENCES:

ELIMINATION OF ONE FUNCTIONAL DEPARTMENT (TECHNICAL & LOGISTICS)

74 FTES (160.1 AT START) AFFECTED

- 15 MODIFIED
- 40 POSITIONS REASSIGNED
- 9 POSITIONS ELIMINATED THROUGH REDUCTION IN FORCE
- 5 VACANT POSITIONS ELIMINATED
- 5 NEW POSITIONS CREATED

SAVINGS (SALARIES & FUNCTIONAL EFFICIENCIES): 500 TO 600K

Items 4.3.1 and 5.2: Budget Issues (FY 98) and Program Restructuring

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- **EXCOM requested:**
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  - **JOI should also provide EXCOM with information to allow EXCOM members to advocate contribution increases with their respective funding agencies at the 2½% a year real growth level for 1998 to 2003.**

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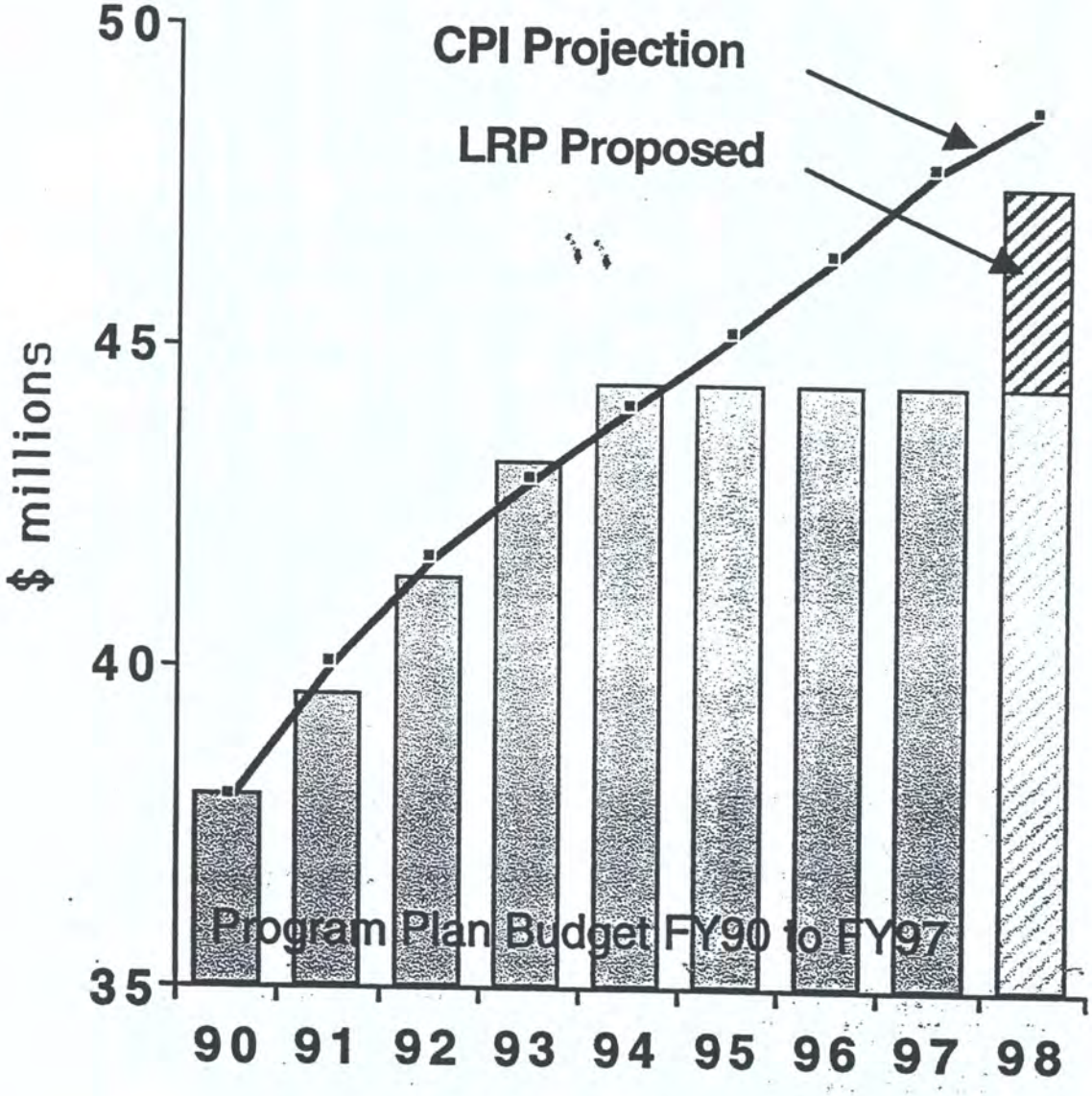
  - ***an implied saving of $4.4 m, relative to inflation***
  - ***an actual $2 m saving in A-base (running costs), or a cut in the A-base, relative to inflation, of 20%***
  - ***addition of approx. $1.4 m to X-base "projects"***

ODP BUDGET
Actual *vs.* CPI Projected



Item 5.2: Draft Budget Allocations for FY 98

Summary of Program Plan Budgets:

	FY96	FY97	FY98
TAMU			
HQ/Admin	2 000 000	1 858 000	1 950 000
Publications	2 106 000	1 999 000	1 870 000
Drilling/Engin.	3 917 000	3 584 000	4 950 000
Tech/Logistics	3 860 000	3 586 000	n/a
Science Ops*	1 017 000	2 047 000	4 110 000
Ship Ops	20 922 000	21 545 000	22 610 000
Info Serv/Curation	3 896 000	2 921 000	2 350 000
TAMU Total	37 718 000	37 540 000	37 840 000
LDEO	4 810 000	4 992 000	4 650 000
JOI/JOIDES/DB	1 872 000	1 868 000	1 910 000

(* Now "Science Services"; which includes curation in FY 98)

Draft ODP FY98 budget of $44.4 million is based on funding from NSF and 5 2/3 non-US members.

	Fixed Costs	A-Base	X-Base
TAMU	21 640 000	12 900 000	3 300 000
LDEO	2 190 000	2 060 000	400 000
JOI/JOIDES/DB	0	1 860 000	50 000
Total	23 830 000	16 820 000	3 750 000
		TOTAL	44 400 000

Item 5.2: Summary Draft FY98 X-base Allocations

No.	Proposal Title	Cost$ FY97	Cost $ FY98	Sum $ FY98
1	1999 Drydock Planning	0	180198	180198
2	Visual Core Descrition - JANUS II	150000	274412	454610
3	DCS Development/Active Heave Comp.	551000	561869	1016479
4	Pre-JANUS data migration - FY 98 Cont.	300000	262275	1278754
5	Core-Log Image Correlation Software	49250	66922	1345676
6	WWW Publication	100358	67790	1413466
7	Sampling Parties	29400	51319	1464785
8	Core-Log Integration Modules (1) Oracle link	65053	56559	1521344
9	Sthn Ocean Paleoceanography	0	98034	1619378
10	West Antarctic Penn (hardware)	0	69568	1688946
11	West Antarctic Penn (iceboat)	0	700000	2388946
12	Woodlark Basin	0	215880	2604826
13	SW Pacific Gateway	0	130127	2734953
14	Great Australian Bight	0	121744	2856697
15	Heave Compensator Evaluation - Logging	0	24625	2881322
16	Leg 176 (735B) - Re-entry Hardware	0	7700	2889022
17	Sthn Ocean Paleoceanography - GHMT	0	39472	2928494
18	West Antarctic Penn - WST	0	16931	2945425
19	Woodlark Basin - BHTV	0	13640	2959065
20	Leg 176 (735B) - VSP	0	34778	2993843
21	West Antarctic Penn - GHMT	0	47872	3041715
22	SW Pacific Gateway - GHMT	0	46672	3088387
23	Woodlark Basin - VSP	0	34778	3123165
24	Leg 176 (735B) - DLL (alt to ARI)	0	9926	3133091
25	Woodlark Basin - DLL (alt to ARI)	0	9926	3143017
26	Electronic Publications	0	197659	3340676
27	Development Engineering - Science Op.	0	203149	3543825
28	Marine Polution Equip. - Sthn Ocean Ops	0	161224	3705049
29	Performance Evaluation Committee - V (JOI)	0	50000	3755049
30	NERO - DLL (alt to ARI)	0	9926	3764975
31	High temperature tool redesign	0	26745	3791720
32	Atlas of Borehole Images - Year 1 of 2	0	33500	3825220
33	Woodlark Basin - GHMT	0	40672	3365892
34	Woodlark Basin - Azimuthal Resist. Imaging	0	20863	3886755
35	Re-curation	0	104623	3991378
36	NERO - BHTV	0	13640	4005018
37	NERO - Azimuthal Resistivity Imaging	0	20863	4025881
38	Leg 176 (735B) - BHTV	0	13640	4039521
39	Leg 176 (735B) - Shear Sonic	0	33527	4073048
40	Leg 176 (735B) - Azimuthal Resist. Imaging	0	20863	4093911
41	Micro-biological Facility/Core Sampling	0	500000	4593911
42	XRD Replacement	0	200000	4793911
43	Core-Log Integration Modules (2) Seismic	0	25713	4819624
44	Core-Log Integration Modules (3) Wavelet	0	19995	4839619

ODP/TAMU Supplemental Budget Information

TAMU-ODP's budget outline involves a base budget request for approximately $34,540,000 and special operating expenses (SOE) of $3,300,000. SOE can be broken into two categories: $2,365,000 for leg related activities and $935,000 for technology enhancements. Although fiscal year comparisons are provided in the attached budget information, the more accurate comparison is the cost of operating in the locations proximal to the U.S. in FY96 and FY97. FY98 increases are realized by moving the area of operations from close proximity to North America in FY97 to areas of operation in the South Atlantic and Indian Oceans in FY98, inflationary increases and anticipated high recovery legs. Movement to the regions far afield incurs a "distant ocean tax" (DOT). Easily identifiable DOTs can be found in increased travel, shipping and ship operations costs. We estimate a DOT of $920,000. For example, over $100,000 above the FY97 travel budget is required for execution of the FY98 science plan. An additional $78,225 is required to accommodate the extra day of travel in connection with the distance ODP personnel are required to travel. Shipping costs will be higher than in FY97. Long transits required as a result of the areas of operation will require increased fuel usage, ergo additional cost.

Adding to the increased cost for FY98 are industry products that are escalating at rates much greater than inflation. As a consequence, the cost of drilling supplies contains an inflation rate greater than the standard 1.5% used in most nonpayroll categories. For example, over the last three years sepiolite has increased in price by 160%, core liners by 10.7% and corks by 20%. There is no indication that costs will decrease. On the contrary, all industry predictions are for continuing increases. The travel industry is predicting an increase of at least 3% to 5% in domestic travel and 8% to 11% in international travel. For budget submission purposes, TAMU-ODP has escalated travel costs by only 5%. This after using the lowest, quoted fare available on the day the budgets were assembled, instead of the contractual authorized full fare economy.

Item 6.3: JOI Report on RFP's

1. Wireline Logging Services

- Both RFP's closed on 14 January, 1997
- An assessment panel was appointed by JOI,
  - *Stoffa; Orcutt; Mayer*
- Only Lamont *et al* responded to the RFP. The panel agreed that this response met or exceeded the technical requirements
- Based on assessments, the decision of the "source selection authority" in JOI is to award the contract for Wireline Logging Services to Lamont-Doherty Earth Observatory and partners (U Leicester and IMT)

2. Site Survey Data Bank

- An assessment panel was appointed by JOI,
  - Watkins (Joel); Eldholm; Detrick; and Lyle
- Three responses to the RFP were received
  - Lamont-Doherty Earth Observatory
  - Scripps Institution of Oceanography
  - University of Houston
- The panel ranked all responses as technically acceptable
  - 3 panelists gave Lamont highest technical rating
  - average rating of Lamont proposal was "good", tending towards "outstanding". The next highest proposal had an average rating below "good"
- Based on assessments, the decision of the "source selection authority" in JOI is to award the contract for the Site Survey Data Bank to Lamont-Doherty Earth Observatory
- EXCOM endorsement is invited on both outcomes

Appendix 7 EXCOM Motion 97-1-21: Background

EXCOM Motion 97-1- 21 *Background*

EXCOM has unanimously endorsed the scientific direction and goals of the ODP embodied in the Long Range Plan. Before deciding on support for the funding profile we evaluated the existing and proposed program in light of funding. We found that:

1. JOI, BCOM and the contractors have evaluated carefully the existing components of the program to determine whether there are efficiencies that could be introduced or elements of the program that could be discontinued in order to free funds for innovation and technical development. Substantial efficiencies have been realized over the past four years in order to undertake modest innovation and technical development in spite of decreased funding measured in inflation-adjusted dollars.

2. A major reorganization has been initiated at TAMU in the past few months resulting in further significant savings through a realignment of functions and reduction in personnel. Savings at LDEO have limited support for base logging operations across the board and have required reductions in the shipboard tool inventory. These savings have not been without risk- equipment upgrades have been deferred, training of personnel has been postponed, and valuable expertise has been lost through reductions in force and inventory levels of drilling equipment have been reduced. EXCOM is convinced that all cost-cutting measures that are possible and prudent have been realized and that savings and risks have been taken to the limit.

3. A review of the past four years also indicates that the flat budget ($ 44.4 M), i.e. a decrease in inflation-adjusted funds of more than 14%, has resulted in postponement of major technical advances that would have substantially enhanced the scientific innovation of the program for the 1993-1998 period.

These include:

- deferral of fluid sampling technology to address fluid flow initiatives;
- interruption of logging tool development;
- deferral of time series samplers of CORKed holes that delayed development of borehole observatories;
- deferral active heave compensation development, which has delayed further development of the DCS system;
- deferral of core -log integration software and technology that would have made full use of logging for climate, paleoceanographic and sediment studies;
- deferral of upgrades to hardware that would support the new relational database and electronic publication.

Appendix 11 OD-21 Status Report (8.3)

ıedule of the Ocean Drilling in the 21st Century

Event	FY 1996						FY 1997											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
/JAMSTEC										○ Program Proposal					○ MOF→Congress			
/JOI						○ Preli.PROGRAM U.S.SCIENCE PLAN POST-2003						9/1		○ ODP 1998-2003 OD21 INTER.				
DES/EXCOM					● EXCOM/ODPC					● EXCOM/ODPC						●		
er Engineering k Shop	★28-30,Oct.		●PCOM		●EXCOM Report													
ernational an Drilling ference NCORD)			●PCOM		●EXCOM Endorse					★CONCORD Mid.of July					●SCICOM Report	●EXCOM Report		
ering Committee CONCORD	●Japanese Committee	●31,Oct.Prep.Committee					●1st Committee 4/10-11 Copenhagen				○2nd Committee (Final Report modification) (Recommendation)							

Hodgoir
11-1-6

NSF BUDGETS
(Millions)

	1996	1997	1998 REQUEST	1998 CHANGE
TOTAL NSF BUDGET	$ 3,206	$ 3,325	$ 3,367	1.9%
GEOSCIENCES	425	446	453	1.5%
ATMOS. SCI.	144	150	151	0.6%
EARTH SCI.	87	94	95	1.5%
OCEAN SCI.	193	202	206	2.1%
RESEARCH	107	109	112	2.6%
FACILITIES	48	52	52	0.0%
ODP	40	40	41	3.7%

PCOM Meeting
December 9-13, 1996, Biosphere 2, Arizona

PARTICIPANT LIST

Members

K. Brown	Univ. of California, San Diego, Scripps Institution of Oceanography
R.M. Carter	James Cook University, Australia, Australia-Canada-Korea Consortium
H.P. Johnson	School of Ocean Sciences, University of Washington
S.E. Humphris (Chair)	Woods Hole Oceanographic Institution
H. Kudrass	Bundesanstalt für Geowissenschaften und Rohstoffe, Germany
R.L. Larson	University of Rhode Island, Graduate School of Oceanography
J.A. McKenzie	ETH, Zurich, ESF Consortium
C. Mevel	Laboratoire de Pétrologie, Université Pierre et Marie Curie, Paris
A. Mix	Oregon State University, College of Oceanography
G.F. Moore	University of Hawaii, School of Ocean and Earth Science and Technology
G. Mountain	Columbia University, Lamont-Doherty Earth Observatory
J. Natland	University of Miami, Rosenstiel School of Marine and Atmos.Sciences
J.A. Pearce	University of Durham, United Kingdom
W.W. Sager	Texas A&M University, College of Geosciences
T. Shipley	University of Texas at Austin, Institute for Geophysics
K. Suyehiro	Ocean Research Institute, Japan

Liaisons

D. Falvey	Joint Oceanographic Institutions, Inc.
T.J.G. Francis	Science Operator (ODP-TAMU)
D. Goldberg	Wireline Logging Services (ODP-LDEO)
B. Malfait	National Science Foundation

Guests & Observers

E. Davis	Pacific Geosciences Centre, Sydney
K.K. Ellins	JOIDES Office, Woods Hole Oceanographic Institution
P.J. Fox	ODP-TAMU
K. Moran	Geological Survey of Canada Atlantic, Dartmouth
M. Mutti	JOIDES Office, Woods Hole Oceanographic Institution
S.D. Scott	Canadian Secretariat for Ocean Drilling, Toronto
T. Tanaka	Japan Marine Science and Technology Center, Yokosuka
S. Takagawa	Japan Marine Science and Technology Center, Yokosuka
R. Zierenberg	University of California, Davis

Panel Chairs

M.M. Ball	US Geological Survey, Denver
P. Fryer	University of Hawaii at Manoa, Honolulu
J. M. Gieskes	Scripps Institution of Oceanography, San Diego
W.W. Hay	Geomar, Kiel
R. Jarrard	University of Utah, Salt Lake City
T. S. Loutit	Australian Geological Survey Organization, Canberra
J. Ludden	CRPG, Vandouvre-les-Nancy
A.H.P. Robertson	The Grant institute, Edinburgh
A. Skinner	British Geological Survey, Edinburgh
S. Srivastava	Geological Survey of Canada Atlantic, Dartmouth

PCOM-Motions
December 9-13, 1996, Biosphere 2, Arizona

PCOM Motion 96-3-1
PCOM approves the Agenda of the 1996 December Meeting with the changes noted.

Proposed: Larson, Seconded: Natland *Unanimous*

PCOM Motion 96-3-2
PCOM approves the minutes of the August 1996 PCOM Meeting in Townsville.

Proposed: Sager, Seconded: Moore *Unanimous*

PCOM Consensus 96-3-3
PCOM supports the concept of a Downhole Measurements lab extension.

PCOM Motion 96-3-4
PCOM notes with interest the proposal from Conoco that ODP continue to be involved (at no cost) in Phase II of the riserless mud circulation development. PCOM endorses continue ODP involvement in this development project.
PCOM is prepared to consider the scheduling of up to 14 days of testing of the prototype system sometime late in FY'98; provided all costs incurred are paid by Conoco/Hydril, and sufficient funds are generated such that ODP could acquire access to an alternative platform for at least an equivalent time. This will be in order to carry out a high-priority mini-leg that addresses a component of the Long Range Plan.

Proposed: Natland, Seconded: Moore *15 For, 1 Abstain*

PCOM Consensus 96-3- 5
PCOM reaffirms Motion 96-1-9 regarding the reallocation of time that may be available on Leg 174B. Any time will be reallocated on a 50-50 basis to Leg 174A and LoI 69 for the CORKING work, with the proviso that if there are required port changes, it does not impact the science time on other legs.

PCOM Motion 96-3-6
PCOM endorses the PANCH recommendation that all shipboard collaborative arrangements must be conveyed formally in writing to the Staff Scientist (Project Manager) by the end of the leg. Co-Chief scientists will ensure that all shipboard agreements are completed. Responsibility for adjudication of any ensuing conflicts should be dealt with by the CAB, and rests ultimately with JOI.

Proposed: Mevel, Seconded: Shipley *15 For, 1 Absent*

PCOM Motion 96-3-7
PCOM asks that JOI direct TAMU to evaluate the performance of a GI airgun for underway profiling on the *JOIDES Resolution*. Leg 172 is an opportunity to compare, during any of several scheduled seismic deployments, the quality of a GI gun vs. the water gun source that is currently

in use. Whether on this or some other leg, the test should go ahead only if a GI gun plus needed hardware can be procured on loan.

Proposed: Mountain, Seconded: Natland *Unanimous*

PCOM Motion 96-3-8

PCOM requests JOI to request from ODP-TAMU, a list of all major shipboard scientific equipment emphasizing the following:

a. Life expectancy
b. Availability of spares
c. Software requirements
d. Maintenance requirements

Using the above information as a guide, ODP-TAMU is also requested to produce a capital improvement plan for shipboard equipment. PCOM recognizes this will be a significant effort, but hopes that this information can be made available for the first meeting of the new SciMP.

Proposed: Larson, Seconded: Mevel *Unanimous*

PCOM Motion 96-3-9

PCOM applauds recent developments to improve all coring operations through technological development at ODP/TAMU. PCOM approves TEDCOM's recommendation to put DCS Phase III development on hold and apply currently identified DCS funding for FY '97 and FY '98 to conversion of the primary heave compensator to an active heave-compensation system. Procurement of the new system should follow review of the simulations requested by TEDCOM.

Proposed: Natland, Seconded: Kudrass *14 For, 2 Abstain*

PCOM Motion 96-3-10

PCOM endorses TEDCOM's recommendation on the test sequence for the hammer drill and drilling casing, but defers the at-sea test until Leg 179 (April-June 1998). James Natland is appointed a sub-committee of one to identify locations for testing, and report to TEDCOM and SciCOM in the Spring of 1997.

Proposed: Natland, Seconded: Larson *Unanimous*

PCOM Motion 96-3-11

PCOM is concerned that the success of the fundamentally necessary and expensive JANUS data base upgrade is being hampered by management-related issues at TAMU. PCOM recommends that JOI direct TAMU to investigate and correct any management related problems that are posing a serious risk to the successful completion of this project. TAMU should report to SCICOM at their April meeting on the steps they have taken to rectify these problems.

Proposed: Brown, Seconded: Larson *15 For, 1 Absent*

PCOM Motion 96-3-12

PCOM reaffirms its support of the JANUS Oracle database project and endorses the PANCH recommendation that funds be found to allow the completion of the initial database development (i.e., software interfaces for existing shipboard equipment, a.k.a., JANUS Phase I) and for a follow-on project to develop an electronic core description system (a.k.a., JANUS Phase II).

Proposed: Sager, Seconded: Brown *Unanimous*

PCOM Motion 96-3-13
PCOM recommends that JOI direct ODP-TAMU to facilitate ongoing evolution of the JANUS database by the following: (a) regularly sending JANUS software personnel from TAMU on drilling legs to evaluate and improve JANUS software and (2) include development of a JANUS interface into capital equipment replacement programs.

Proposed: Sager, Seconded: Moore *15 For, 1 Abstention*

PCOM Motion 96-3-14
PCOM supports the migration of existing data to JANUS. The migration of biostratigraphic data should be a priority.

Proposed: Moore, Seconded: Brown *13 For, 3 Absent*

PCOM Motion 96-3-15
PCOM recognizes the need for rapid communication between SciMP and the various steering committees set up by, and reporting directly to, JOI, which have mandates overlapping that of SciMP. PCOM authorizes SciMP liaisons to these committees where appropriate.

Proposed: Sager, Seconded: Brown *Unanimous*

PCOM Motion 96-3-16
PCOM endorses the recommendations of the JOI Sampling and Curation workshop as revised by PCOM.

Proposed: Larson, Seconded: Moore *14 For, 1 Abstain, 1 Absent*

PCOM Motion 96-3-17
PCOM reaffirms its intent that OPCOM be a SCICOM subcommittee of six, chaired by the SCICOM chair. The other five members, chosen by SCICOM, will be two other SCICOM members and three non-SCICOM members from the general ODP community.

Proposed: Larson, Seconded: Mix *Unanimous*

PCOM Motion 96-3-18
PCOM recommends that JOIDES Working Groups (WGs) be deleted from the new JOIDES Science Advisory structure and that their mandate be merged with that of Program Planning Groups (PPG). The revised mandate and purpose for PPG are as follows:

General Purpose

Program Planning Groups (PPGs) are small focused planning committees formed by SCICOM when there is a need to develop drilling programs or technological strategies to achieve the goals of the Long Range Plan.

Mandate

PPG will advise upon drilling/technology strategies and proposals for major scientific objectives that are not adequately covered by existing drilling strategies or proposals. Drilling proposals arising from PPG meetings must be submitted to the JOIDES Office by individual proponents or

groups of proponents. PPG will also foster communication between the ODP and other major geoscience initiatives.

Reporting

PPG will report to the appropriate panel in the JOIDES advisory structure as directed by SciCOM.

Proposed: Sager, Seconded: Pearce *15 For, 1 Abstain*

PCOM Motion 96-3-19

PCOM endorses the following statement of purpose, mandates, membership, reporting paths, meeting guidelines, and liaison assignments for the Scientific Measurement Panel (SciMP).

General Purpose

The Scientific Measurements Panel (SciMP) will contribute information and advice to the JOIDES community through the Operations Committee (OPCOM) with regard to the handling of ODP data and information, on methods and techniques of ODP measurements, and downhole measurements and experiments.

Mandate

SciMP will provide advice on ODP information related to scientific measurements made onboard *JOIDES RESOLUTION* and alternate platforms, within and around boreholes, and on samples collected by ODP and associated programs. Its specific mandates are to develop policies concerning said measurements and to furnish advice about scientific measurements , which will assist the Science Committee (SCICOM) and OPCOM in the formulation of annual and long term plans.

Specific responsibilities for the panel are publications, databases, curation, computers, shipboard equipment usage and needs, measurement calibrations and standards, and borehole measurements, equipment, usage, and needs.

Reporting Path

SciMP recommendations will be sent to OPCOM. The SCICOM chair will decide whether these are operational or scientific issues. If purely operational, the recommendations will go directly to JOI for action. If having scientific implications, the recommendations will be passed to SCICOM for consideration.

Membership

SciMP will consist of sixteen members proportionally representing the ODP partners (10 U. S. and 6 non-U.S.). The term of membership will be three years. Members should have expertise representing the three core areas of the panel mandate, namely information handling, downhole measurements, and shipboard measurements. Ideally, many of the panel members will have experience onboard the drill ship, *JOIDES Resolution*. With SCICOM approval, the panel may bring in additional information about its mandate issues by setting up ad hoc advisory committees whose lifetimes are mandated by SCICOM.

Meetings

SciMP will meet twice a year, mainly at the location of one of the Science Operators to encourage interactions between the Panel Chair and Operators. Other acceptable meeting locations include port calls of the *JOIDES RESOLUTION* and other locations appropriate to the Panel mandate. These meetings will be held prior to OPCOM meetings so the recommendations will be quickly acted upon.

Liaisons

SciMP should have non-voting liaisons from SCICOM, JOI, the Operators (ODP-TAMU and LDEO-BRG). A liaison to TEDCOM is recommended for collaboration on development issues. Liaisons to other JOIDES advisory bodies may be sought with the approval of SCICOM.

Proposed: Carter, Seconded: Johnson *Unanimous*

PCOM Consensus 96-3-20
PCOM will set up a PPG entitled the Deep Biosphere Pilot Project PPG.

PCOM Motion 96-3-21
PCOM will set up a PPG entitled "Long-Term Observatories" that is concerned with long-term instrumentation both in and around the boreholes.

Proposed: Larson, Seconded: Mevel *15 For, 1 Abstain*

PCOM Motion 96-3-22
PCOM rescinds PCOM Motion 96-1-9, regarding the reallocation of time that may be available on Leg 174B as a result of not being able to do engineering tests on a 50-50 basis to leg 174A and LOI 69, in the light of new FY'98 schedule information and operational constraints.

Proposed: Pearce, Seconded: Brown *7 For, 2 Against, 3 Abstain , 4 Absent*

PCOM Motion 96-3-23
PCOM approves the following program for FY'98 and beyond:

Leg 176 Return to 735 B
Leg 177 Southern Ocean Paleo Oceanography(464)
Leg 178 W. Antarctic Peninsula
Leg 179 Transit and NERO and Hammer Drilling
Leg 180 Woodlark Basin (447)
Leg 181 SW Pacific Gateway (441)
Leg 182 Great Australian Bight (367)
Leg 183 Kerguelen (457)

To assure appropriate weather conditions in the Southern Oceans, Leg 174B is to be shortened 10 days by delaying hammer drilling tests.

Proposed: Shipley, Seconded: Sager *12 For, 0 Against, 4 Abstain*

PCOM Consensus 96-3-24
PCOM, noting that logistical constraints will limit drilling and logging time off the West Antarctic Peninsula (scheduled as Leg 178) to about 37 days, recommends focusing on high priority objectives in this leg by:

1. Eliminating sites in Bransfield Strait from the drilling plan.
2. Increasing operations in Palmer Deep to include a short seismic survey, and quadruple APC coring at Site APSHE-13A (and/or its alternate) with penetration greater than 50 m if possible within the limits of seismic imaging and safety considerations.
3. Using ODP/TAMU estimates of time required for drilling, logging, survey, and transit.
   PCOM also notes that budgetary constraints preclude LWD operations on this leg.

PCOM Consensus 96-3-25
PCOM thanks the Antarctic DPG for its tremendous effort, on short notice, in developing a coherent and comprehensive drilling program for the Antarctic. Acknowledging this accomplishment, PCOM disbands the Antarctic DPG.

PCOM Consensus 96-3-26
PCOM will send a liaison to one of the meetings of the Australian Consortium to look into developments in over-the-side rock drills, and to determine the type of relationships there should be between them and ODP.

PCOM Consensus 96-3-27
PCOM, in response to a letter from K. Miller, agrees that on-shore drilling done in conjunction with Leg 174A be designated as Leg 174X. Leg 174X cores will be stored at Rutgers at no cost to ODP.

PCOM Consensus 96-3-28
PCOM will send a liaison to the meetings of the International Continental Drilling Program (ICDP).

PCOM Motion 96-3-29
PCOM would like to express gratitude to both the Thematic Panels (LITHP, SGPP, OHP and TECP) and Service Panels (IHP, DMP, and SMP) for their hard work and valuable contributions to the drilling program under the present structure. We anticipate continuing interactions with many of the members of these panels within the new organization structure. PCOM expresses similar gratitude to those members of panels that will be continuing in the new structure (SSP, PPSP, TEDCOM).

Proposed: Johnson, Seconded: Larson *Unanimous*

PCOM Motion 96-3-30
PCOM thanks Tom Shipley for his years of service on PCOM, noting that this is the end of his second term. His long experience in DSDP/ODP yielded insightful comments on critical issues. We hope to see him continue in ODP/OD21 in the future.

Proposed: Moore, Seconded: Brown *Unanimous*

PCOM Consensus 96-3-31
PCOM thanks Tim Francis for his long and continuing service to ODP, first as the UK' s representative to PCOM, and more recently as ODP/TAMU's liaison. We know that OPCOM will start off on the right foot as Tim continues in that role to take the science dreams of JOIDES and "make them real".

PCOM Consensus 96-3-32
The PCOM Chair notes that a number of long-serving PCOM members will not be carried forward as members of the new SciCOM.

PCOM Chair greatly appreciates the support these and other PCOM members have offered at this difficult time of transition to the new system.
The quiet logic of Kiyoshi, gallic flair of Catherine, wisdom of Alan, pungent comments of Tom, dogged determination of Will will be greatly missed by the SciCOM progeny. We thank them for their unremitting hard work on behalf of ODP, and wish them every success in their future PCOM-free lives.

PCOM Consensus 96-3-33
PCOM thanks Greg Mountain and Columbia University for efficiently hosting its Annual Meeting, and for developing unique field experiences ranging from the microbes of Biosphere II to the distant galaxies viewed from Kitt Peak. PCOM notes Greg's exceptional ability to orchestrate this meeting in a remote location, and to make management of complex meeting logistics look simple.

PCOM Meeting
December 9-13, 1996
Biosphere 2, Arizona

A. Welcome and Introduction

1. Introduction of PCOM Members, Liaisons and Guests

Humphris welcomed all to the final PCOM meeting and thanked Mountain for organizing the field trip. She introduced the newcomers and asked everybody around the room to introduce themselves.

2. Logistics of the meeting

Mountain explained the logistics of the meeting and introduced Bill Harris, director of BIO2. Harris explained that Columbia University took over management of the facility in January 1996. This effort, spearheaded by Wally Broecker, is a remarkable and timely challenge that will make a serious investment in education, especially at the undergraduate level. This fall 30 students were enrolled in programs and BIO2 hopes to expand to 100 students. In addition, the habitat facility has been decoupled and is now open to the public; 200 visitors a year came through. Harris said he wants to use BIO2 as a conduit to the public to help them understand the value of science and its contribution to society. A public icon such as BIO2 can be very important in conveying the value of science to the public. The Biosphere structure is a remarkable facility, which cost over $150 million. Columbia University will do some additional renovations, but more scientific input is needed before they go ahead. He noted that Donald Temple is visiting from the DOE and is looking at the engineering aspects of the facility to determine the capabilities so that changes can be made. There is an unique opportunity to use this facility, even internationally. Harris wishes to reassure the public that their investment in BIO2 facility will payoff.

Mountain apprised PCOM of Marc Langseth's serious illness. Natland will compose an e-mail message from the committee to Langseth.

3. Approval of the Agenda

Humphris requested feedback on the Agenda Book and commented on its reorganization. An additional item under PCOM correspondence is a letter from Dick Von Herzen, distributed at the meeting. The report of TEDCOM was also moved forward as the Chair of TEDCOM had to leave early unexpectedly.

PCOM Motion 96-3-1 PCOM approves the Agenda of the 1996 December Meeting with the changes noted.

Proposed: Larson, Seconded: Natland *Unanimous*

4. Approval of the Minutes of August 1996 PCOM Meeting

PCOM Motion 96-3-2 PCOM approves the minutes of the August 1996 PCOM Meeting in Townsville.

Proposed: Sager, Seconded: Moore *Unanimous*

B. Reports of Liaisons

1. NSF

Malfait reported on the NSF budget (Appendix 1), approved prior to October, and pointed out that the total budget did not go up very much with respect to 1996. The NSF US Science Support (USSSP) funding went up a little, to $5.7 million. The money will be needed to support US participation at the joint Japan/JOIDES CONCORD Meeting. Regarding the ODP budget (Appendix 2), the ODP program plan funding was approved at $44.4 million, of which NSF will contribute 62%. The rest is provided by the other members. The budgets for FY '98 and FY '99 are being considered together because of the costs associated with the upcoming dry-dock of the *JOIDES Resolution*. TAMU will update on dry-docking later in the meeting. The dry-dock will require $6 million in funds which must be found outside of the existing ODP budget.

Malfait reported on the timing of the decisions for ODP Phase III (Appendix 3) and said that one of the major issues is the number of partners who will continue their participation in ODP. In that respect, the next year will be very busy as important decisions will be made by the ODP Council (ODPC). ODPC meets in February and has requested specific items from JOI and JOIDES. In addition, the LRP implementation plan (to which JOI will add funding scenarios) will be considered by the ODPC, and JOI has been asked to explain how funds will be brought into the program. By February, partners have been asked to declare their preliminary intent to stay in ODP. In April, JOI will be submitting a 5 Yr. Program Plan to NSF which will be used to seek National Science Board approval for the US to continue in the ODP. A final decision from partners declaring their continued participation in ODP will be required in June/July. In July, there will be a decision from NSF regarding dry-docking and the 1999-2003 program. In August the National Science Board will meet to approve the funding for 1999-2003.

Malfait reported also on the following items:

- China's participation in the ODP is still under review at the State Department.
- The US Science Support Program's review is complete, and ODP received a very positive response from the Science Board, which approved the funding for 97-99.
- Initial environmental assessment of Antarctic drilling is going on in the expectation that PCOM may schedule a leg of Antarctic drilling in FY '98.
- The FUMAGES meeting held in Oregon went well, and about 50 marine geoscientists from the US attended. They were asked to identify long-term trends in the marine science field. One outcome of the FUMAGES meeting was the recognition of how important and vital ocean drilling is in addressing problems in marine science.
- NSF is still seeking a replacement for the position left vacant by Sandy Shor.

2. JOI

Falvey reported on six major topics.

(a) RFPs - Falvey commented on the RFPs for the WLS and SSDB, which have been publicized and said that responses will be accepted through mid-January. These will be later

assessed by a subcommittee of EXCOM. A draft of the RFP for the next JOIDES Office, which will be a non-US one, has been prepared. EXCOM will review this in February as they wish to address certain issues, including the term length of the office and the SCICOM/OPCOM Chair. Each non-US JOIDES member may submit a bid for the JOIDES Office. Falvey noted the key components of the RFP (see Appendix 4).

(b) Internationalization Initiative - Falvey reported that he understands that Taiwan and the People's Republic of China have agreed to Taiwan using the name of Chinese Taipei so that both countries may participate together in ODP, but he added that no-one in Washington has heard of this agreement. Oman is also interested in joining the ODP, and many government agencies in Oman have voiced support for ODP. Oman wishes to take the issue of membership in ODP to the Gulf Cooperation Council in order to get wider support. Portugal is expected to join ESF in 1997. The effort to involve South Africa in the ODP will be renewed with the Cape Town port call in December 1997.

(c) Database Migration - JOI sought expressions of interest to assist TAMU with the database migration effort. Four responses were received, and all have demonstrated that they are qualified, have the required experience with Oracle data bases, and have highly qualified individuals on staff. A conference in TAMU to address database migration will occur in early 1997.

(d) Nansen Implementation Workshop- In October '96, Falvey attended a Nansen Implementation (NAD) workshop in Russia. The purpose of the workshop was to develop a proposal for scientific ocean drilling in the Arctic Ocean. A draft implementation plan is in circulation, and states that NAD will be seeking a close collaboration with ODP so as not to duplicate facilities of the two programs.

(e) Subsurface Biosphere Workshop - JOI will be sponsoring with InterRIDGE and others a Subsurface Biosphere Workshop in March in Washington, D.C. This will be advertised in the USSAC Newsletter.

(f) US Nominations to SCICOM - JOI/USSSP is seeking nominations for members on SCICOM. A nominating committee has been set up, that will make recommendations to JOI Board of Governors.

Carter asked what level of membership would be involved if the Gulf States show interest. Falvey responded that at this point a 1/6 level is being considered but that this may increase to 1/3 if larger states, including Saudi Arabia, join with Oman and smaller states to form a consortium. Sager asked what is the Korean level of participation. The answer is 1/12. This is why Chinese Taipei is under consideration as a potential 1/12 member. Natland inquired about the replacement of people who rotated off USSAC. Falvey described how replacement of USSAC members will be handled for October 1997. Sager asked about how the replacement of people rotating off PCOM will be handled. Falvey explained that the 7 Members of current PCOM who are not rotating off will have their names put forward and will be considered with other candidates for membership on SCICOM. Sager suggested that those who do not want to continue to serve should indicate this now so as to avoid consideration. Falvey noted that the nominating committee will be doing more than just putting forward names. USSAC has suggested that an optimum number of replacement members is 4.

3. ODP-TAMU

Francis declared that he attended 29 PCOM meetings, and this will be his last. He reported on the following items.

(a) Leg Operations-

- **Saanich Inlet** - This was very successful, and was completed in only 48 hours on site. Maximum penetration was 105 m at the southerly site, and 118m at the northerly site. The tops of the cores were gassy. The cores show varved sediments and Mazama ash was encountered in all cores. The scientists are very pleased with the results.
- **Leg 169** - Several operational items worthy of note were mentioned. One month into the cruise, a medical evacuation was required for the DP operator. In the middle of leg, the cost of fuel in LA was found to be cheaper than in San Diego so the ship was brought into LA for refueling before going to San Diego. This action removed 30 hours from the science of the leg. A shallow water beacon positioning test was carried out during the leg: the ship was held to within 8% of position in 100 m of water. The biggest item was the loss of about 2200 meters of drill pipe while tripping out of the last hole, which cost the program $367,000. The cause was human error due to a problem with latching. Francis showed an overhead on which all downhole losses were shown: Leg 169 loss is fourth in terms of size (Appendix 5). This is the first time that such a loss has been due to human error, as the others have resulted from mechanical failure. Problems were encountered in San Diego by 5 non-US scientists who were threatened with fines of $3000 for not having the right visas. ODP commingled funds cannot be used to pay such fines. Francis wished to alert PCOM that a similar situation could potentially arise on 171B and 174A, and it is necessary to alert non-US participants of those legs. Francis suggested that non-US scientists should consult ODP travel for advice before sailing.
- **Leg 170** - Francis reported that the port call was a very busy one. The installation of a new radar delayed departure of the *JOIDES Resolution* by 12 hours. Soon after the start of the cruise, there was another medical evacuation requiring that the ship be diverted to Mazatlan, resulting in the loss of about 13 hours. He noted that these medical evacuations are not a problem around North America but can be a problem in more remote locations. As a consequence, TAMU is investigating better screening of participants and crew for legs in remote locations.
- **Leg 174A** - Subsequent to the PPSP meeting, Site 7B was disallowed because of the shallow water depth (less than 75 meters). Both the TAMU Safety Panel and PPSP were satisfied with respect to the hydrocarbon situation . TAMU consulted SEDCO-FOREX about Site 7B, but they were unwilling to relax the shallow water limit as Site 7B is in 66 meters of water.
- **Leg 175** - Francis said that eleven of the sites south of the Walvis Ridge were approved, but none north in the Angola Basin were approved. These sites are closer inshore and near a prolific area of oil production. This Leg will undergo another review at the February PPSP meeting at Scripps. Sites proposed with drilling depths to 400 m may be approved, but restricted to 100 meters penetration.

(b) Co-Chief Reviews- A number of comments emerged from the Co-Chief Review meeting, held at JOI in November: the highest number were about the gym, and next was the problem of lab space on board *JOIDES Resolution*. Changes could be made at the next dry dock, and Francis showed a proposed extension to the Downhole Measurements lab on the top deck of the lab stack (see Appendix 6). This is an old design that dates back to 1993 when the plan was under consideration for the December '94 dry-dock. This renovation was not carried out

because the cost of $400K was prohibitive. This plan is again under consideration for the 1999 dry-dock. On Leg 168, 4 reentry holes were drilled and there was a problem with insufficient space to lay out all the material for the CORK cabling, and this raised concerns about damage to CORK cabling. Francis asked PCOM to provide TAMU with advice on the plans for a proposed extension to the Downhole Measurements lab and the need for space to lay out all the material for the CORK cabling.

Also under consideration is a containerized microbiology laboratory at a cost of about $300K. Francis showed a list of items that would be needed to outfit a basic microbiology lab. TAMU staff scientist John Firth put together the materials list with input from microbiologists, including John Parkes in UK. The problem of the location is now under consideration. One possible location is where the engineering van is placed when needed for complex legs. Then the question is raised as to where would the engineering van go when needed? TAMU is running into problems with space on the *JOIDES Resolution*. The Co-Chiefs questioned the need for the microbiology lab and favored a phased approach to the establishing of such a facility. TAMU needs advice from PCOM.

(c) Antarctic Drilling- Francis reported on preparations for Antarctic Drilling, and specified that the term comprises everywhere south of 60 degrees south. Last September he attended meetings at NSF to talk about this. Items included the process of getting permission to drill there and MARPOL requirements for ships operating in the Antarctic. The process to get clearance includes an environmental assessment of drilling in Antarctica. TAMU has already written a document which will be soon distributed. This will probably be published in the Federal Register, then NSF will appoint an individual who will make a finding. As ODP is technically a US program, ODP has to apply for environmental approval to drill there through US rules. The *JOIDES Resolution* at present does not comply with MARPOL regulations as they apply in the Antarctic, i.e., garbage handling and release of oily waters. He estimates it will cost $150,00 to bring the ship up to standard. A proper incinerator will be needed to replace the burn basket. Garbage will have to be compacted and stored until a port is reached. Also there is the need to change the drainage system to the rig floor to collect oily water. Non-US participants must comply with their own national legislation; e.g. a Swedish citizen needs a special permit to go south of 60 degrees.

(d) Reorganization at TAMU- Francis reported about restructuring at TAMU and said it took place with the objective of making service more efficient and cost effective. Management consultants were hired in early summer. The new structure, effective on December 2, comprises two sorts of deliverables: services and operations (see Appendix 7). The major change in this structure is that the Technical and Logistics Support department has been eliminated. Staff scientists will start acting as Project Managers from Leg 176. This change will give more responsibility to staff scientists, although in some special cases, the Project Manager will be an engineers. Fifteen positions have been modified, but only nine of these people have lost their jobs. Five new positions have been created. In total, fourteen positions have been eliminated. Francis said this will result in a saving of 280K per year.

(e) DCS Development- Low friction seals were not installed in San Diego because of problems with the vendor. That was postponed initially to Charleston, then again to Halifax. It has been proposed to change from a passive to an active heave compensation system. This change can remove up to 90-95% of the heave. This was discussed by TEDCOM in Japan and then at a subcommittee meeting in College Station in early December. As a result, Proposal 509 for a DCS Engineering test is withdrawn.

(f) Conoco-Hydril "Riserless Drilling" joint-industry project- Francis said that Phase I-feasibility studies started in October 1996, with more than 10 industry members participating. ODP-TAMU is participating as a non-paying member but have signed a confidentiality agreement. Phase II-prototype design and testing will possibly start in May 1997. Conoco has expressed an interest in using the *JOIDES Resolution* for prototype testing for two weeks in mid-1998.

(g) *JOIDES Resolution*- the official name change of the ship took place on 11November.

Moore asked the mechanism for providing advice to Francis regarding the microbiology lab. Humphris said to make recommendations through JOI or participate in the Subsurface Biosphere Workshop. Johnson pointed out that the advice from the Workshop will not provide an objective answer, and he thought that an objective answer should come from SCICOM after they consider all the input from various sources. Humphris noted that the Workshop is open to international participation, but Mevel and McKenzie were not aware of it. Larson noted that these are open to the public but funds to support participation will be available only for US participants. McKenzie said that at the European Marine and Polar Science Meeting meeting in Southampton, the deep biosphere was discussed, and that ESF and MAST would like to hold a European workshop in early spring (possibly May), addressing similar issues. Pearce said that lots of different groups are organizing workshops and asked how this will influence SCICOM establishing a PPG? Humphris noted that we will return to this later in the meeting. Fox said that money for a microbiology lab will need to come from sources other the $6 million that Malfait mentioned. Carter noted this effort is related to a new Pilot Project in the LRP and it will involve a new user community. He asked whether these new user groups can be requested to provide funds for this new facility. Humphris asked Francis when he will be detailing plans for the refit. Francis said it is on-going. Fox added that by the spring or summer of this year, feedback on refit items during the dry-docking is needed. Humphris suggested that this be given to the new SciMP as an action item. This way SCICOM can provide some recommendations at their August meeting. Moore noted that DMP looked into this last year and PCOM endorsed their recommendation last December. Brown asked whether it is possible to put the biology lab in the same area with the new Downhole Measurements laboratory extension. Fox said that it is possible, but they might be separated by walls.

Regarding the restructuring at TAMU, Sager asked how TAMU will deal with the fact that the people who were let go took away extensive logistical experience. Francis said that there was a lot of duplication previously and he feels that TAMU can cope with the change. Mevel asked whether staff scientist turnover will affect their role as Project Manager as they may not be at TAMU for the entire project. Fox noted that it will mean about an 18 month-2 year commitment and thus is not too long.

PCOM Consensus 96-3-3
PCOM supports the concept of a Downhole Measurements lab extension.

PCOM Motion 96-3-4
PCOM notes with interest the proposal from Conoco that ODP continue to be involved (at no cost) in Phase II of the riserless mud circulation development. PCOM endorses continue ODP involvement in this development project.

PCOM is prepared to consider the scheduling of up to 14 days of testing of the prototype system sometime late in FY'98; provided all costs incurred are paid by Conoco/Hydril, and sufficient funds are generated such that ODP could acquire access to an alternative platform for at least an equivalent time. This will be in order to carry out a high-priority mini-leg that addresses a component of the Long Range Plan.

Proposed: Natland, Seconded: Moore *15 For, 1 Abstain*

4. ODP-LDEO

Goldberg reported on the following items:

(a) logging results from recent legs (see Appendix 8).

(b) INMARSAT SeaNET System -The system transmits with a high speed data capability allowing data to be sent to LDEO, where it is processed and returned to the ship. It was tested on Leg 170 and all potential problems were dealt with in advance so that the system worked flawlessly. (See Appendix 9 for specifications). The current VSAT system will stay on board as the primary system for backup and for testing of cc-mail by TAMU.

(c) Upcoming logging operations (see Appendix 10).

(d) Projects and activities - The Data Migration Project proceeds well. Completion of stage 1+ was reached in November 1996. The next target is March for the remaining holes. Upcoming projects and activities for 1997 include further enhancements to the web interface, as well as work on data types not currently in the database (e.g., FMS, LWD, BHTV). Goldberg also reported on the status of CLIP, which is moving ahead well. It was used extensively on Leg 167. The development of both CLIP and Splicer will continue into 1997. Goldberg said that there will be a Splicer demo at the AGU ODP booth, which is joint with TAMU and JOI. Goldberg reported on the core-log correlation project which started last October and was jointly funded to Leicester and LDEO. Testing of image scanning software is underway, with a possible deployment of the system on Leg 173. Tests made so far have given good results. Images scanned with the device have a resolution of 10 pixels per mm, which is excellent for this purpose. Another package, Diamage, allows correlation of a scanned piece of core with log data. Goldberg showed an example from Leg 166 with highly and less reworked intervals in carbonate-rich sediments, where different correlations were done with Gamma Ray, FMS and resistivity. These types of correlations will be the base of an Atlas they plan, and he will refer to this project later on in the meeting.

Sager asked whether only one of the three different core log-image correlation programs will be maintained. Goldberg said this is not necessarily true. Sager felt that it is not an efficient use of resources to run different applications to do same thing. Goldberg said that they are still in the test phase.

C. Review of FY '97 Schedule

1. Update on Hammer Drill-In Casing

Francis reviewed the FY '97 schedule, and mentioned the letter he wrote to Humphris regarding scheduling in high latitude legs (in Agenda Book). The letter reviews the history of what has happened to legs scheduled in that area at different times of the year. As a consequence, TAMU must be more cautious and is obliged to schedule the ship at the optimal time.

Francis reported that TEDCOM is very optimistic about the hammer drill-in casing, but there are some technical problems that need to be resolved. These are:
(a) pumping capacity - hammer drilling will require much more pumping capacity on the ship. The integrity of high pressure lines has been already checked, but the ability of pumps to pump these vast amounts of water still needs to be tested. The answer to this will be known within a week.
(b) weight-on bit - another issue is the weight-on bit needed to activate this 12.25" hammer needs to be below a certain amount (~4 tons). Whether this is possible will be determined in January '97.
(c) land test - a land test will take place in January in Norway, and the results will be known in mid- February.
(d) design - the design part has not started yet, but it should be no problem.

Humphris said she asked ODP-TAMU to come to this meeting with a specific recommendation on the issue of whether a test in FY '97 should stay in the schedule. Francis said he cannot answer until after the land tests. Francis suggested that if it was not ready for Leg 174B, there will be a transit across the Indian Ocean during which the ship would go past Sites 735 and 757 where a test for hammer drilling could be made. He recommended that, if Leg 178 is going to be the Western Antarctic Peninsula, then hammer drill-in casing be postponed to 1998, and all the days saved on Leg 174B be used to bring the schedule forward so that Leg 178 is in the best weather window. Humphris said she is interested in TAMU's view for FY '97, and whether they will be ready for hammer drilling on Leg 174B. Francis said TAMU cannot say until February if it will be ready. Humphris said that February is very close to the beginning of that leg. Francis said that it is not possible to change the schedule on short notice for the impact on the scientific party.

Mevel questioned the idea of testing at 735B and said the MARK area was chosen for the test as it is the right environment. Francis said that this suggestion is motivated by weather windows for FY '98 drilling. Goldberg expressed two concerns: (1) the Charleston port call is longer in order to load pipe: does this preclude any other port activities? There is then the implication that the wireline logging compensator will not be loaded, and postponed by another leg. (2) Has Leg 174A changed in its duration in any way? Francis replied that this is unchanged. Natland commented that TEDCOM asked the same question posed by Humphris and, although there is a difference of opinion with TAMU, they recommended that the test proceed. The stopping points: are 1) the bench test on 6-10 January, and 2) hammer field tests on 20-24 January. Mevel said PCOM already voted on a contingency plan at the spring meeting. Humphris pointed out that there are two separate issues. First, there is the issue of adjusting the schedule to fit the weather window for the Antarctic. This will depend on what PCOM decides to schedule. The second issue is that there is already a recommendation in place for the use of the time if the hammer drill-in casing test is postponed. In addition, there is a DMP recommendation to use the time for the LWD test proposed in LOI 72. In terms of whether the alternatives could be ready - New Jersey is not a problem, and the proponents of the Barbados CORK say they would be need to know by the third week in January. Francis said that if a CORKing program was going to replace the hammer drilling, Tom Pettigrew would have to do the engineering for the CORKing program, and he is also doing engineering for hammer drilling. Humphris asked Falvey how important the PR activities at the New York port call are.

Falvey said NSF felt that this is critical to renewal activities, and he passed this information on to OPD-TAMU.

Humphris confirmed that there is a recommendation from the spring 1996 meeting on how to split any time that might become available, but she is concerned that if TAMU is not ready with hammer drilling, they also may not be ready to do the CORKing, as it involves the same engineers. Humphris suggested this discussion be deferred until there are cost-estimates available, and the FY'98 schedule has been discussed. Natland put forward a motion supporting the TEDCOM recommendation for the schedule of testing of hammer drill-in casing that culminated in sea tests on Leg 174B. The motion was not seconded.

PCOM Consensus 96-3- 5
PCOM reaffirms Motion 96-1-9 regarding the reallocation of time that may be available on Leg 174B. Any time will be reallocated on a 50-50 basis to Leg 174A and LoI 69 for the CORKING work, with the proviso that if there are required port changes, it does not impact the science time on other legs.

D. FY '98 Science Program

Humphris pointed out that before addressing the FY'98 schedule, it is necessary to review conflicts of interest. Conflicted PCOM members are Carter, Moore, Suyehiro, Larson. People in the room other than PCOM members who are conflicted are Gieskes , Hay, Goldberg, Moran. Humphris pointed out that conflicted members can stay in the room during general presentation of the ranking unless there are major objections. When discussion is leading to a vote, conflicted PCOM members will be asked to leave the room, as well as any other conflicted people. Shipley requested a ruling on whether he is conflicted as he participated in the collection of data that led to the Nankai Trough proposal, but he is not a proponent. Humphris declared him not to be in conflict.

1. Thematic Panel Chairs Presentation of Prospectus

Ocean History Panel (OHP)

Tom Loutit reviewed OHP highly ranked proposals (464, 441, 367) and said he would leave discussion on Antarctic areas to Bill Hay who will present the ADPG report. The panel's view to support their ranking can be summarized in the saying that "the past is key to future", and Loutit reviewed the themes of the ODP LRP pertinent to the highly-ranked proposals.

- **Southern Ocean Paleoceanography (464)** - This proposes a transect of holes from mid to high-latitudes across the polar front zone, with water depths of 2-5 km intersecting all deep and bottom water masses. It allows very high resolution studies because of high sedimentation rates, plus a look at long-term change, because of the age range of the targets from Eocene to present. The panel felt this will cover topics and areas of interest to the program, and sites proposed here fill important gaps in both time and geographic objectives. Specifically the objectives are to to look at high-resolution, late Neogene paleoceanography, and to look at the long-term Cenozoic history of the Southern Ocean. This has been a long-term plan of cooperation between US and Germany, the sites objectives are clear, well

formulated and achievable. If scheduling is in the right time window, chances of success are very high.

- **Southwest Pacific Gateways (441)** - This proposal looks at the Deep Western Boundary Current (DWBC) east of New Zealand and proposes a series of sites to investigate the history of the deep west boundary undercurrent. There are many more objectives than just the evolution of the DWBC, including relationships between plate tectonics,eustacy, and circulation, thereby addressing objectives of interest to other panels as well. In addition, six hypotheses to be tested are clearly stated, including: 1) that a four-layer ocean model has applied since the early Miocene, 2) that rates of production of deep water masses and the paleoflow of the DWBC has varied between glacials and interglacials. The proposal is scientifically mature and wants to test hypotheses that have been considered important by the panel before. The only issue at this time is that some Site Survey data are still missing which should complete all the data that are required
- **Great Australian Bight (367)** - The objectives of this proposal are split between OHP and SGPP, and it was ranked number 3 by both. The Great Australian Bight provides the opportunity to look at the evolution of cool water carbonate environments, facies, and biota, as well as the evolution of water masses in that region as Australia has moved to the north. This program is also designed to look at sea-level variations and the stratigraphic response. If shallow water drilling can be achieved, the Miocene sea level synchroneity story can be tested by looking at some of the same surfaces dated from Leg 150 and Leg 166. Accumulation rates for this area are low, but there is a good possibility for correlation. OHP felt this was best proposal ever in the system in terms of presentation and readiness, and the responsiveness of the proponents.

Mix commented that 464 provides a test of two views on how the ocean works: does the ocean circulate though buoyancy forcing, or does the ocean circulate through wind forcing? In the case of wind forcing, the view is that in the Southern Ocean, there is infinite fetch around the Circumpolar Zone which changes sloping isopycnals and draws water out of the interior of the rest of ocean by geostrophy. The proposed depth transect crosses all relevant ocean masses, and will determine ocean circulation where wind forcing should be expected. Kudrass said that another element of interest is the shallow water changes in arctic and subtropical forms, and there are three holes with high resolution, addressing exactly the question of how these water masses moved during that time.

Mountain asked Loutit about the depths of the proposed drill sites for 367. The shallowest water depth is 200 m. Mountain commented that this is a good beginning for the sea level story for this kind of margin, with the hope that there will be shallower sites drilled at some point. Even if sites are not ideally located for reconstructing sea level history, it is important as it opens window for future studies on sea level in the area. Sager questioned whether GAB is the best place to study sea level changes as there have been a number of other carbonate legs proposed or drilled. Loutit answered that this is best place for evolution of cool water carbonates, and the architectural response of a margin in a cool water setting. Regarding sea level, this is one of the margins that needs to be looked at for sea level history and stratigraphic response.

Sedimentary and Geochemical Processes Panel (SGPP)

Bill Hay, panel chair, presented the highly ranked proposals of SGPP.

- **ADPG 1** - This proposal address a fundamental scientific problem: when one compares the two proxies for sea level changes, $\delta^{18}O$ and coastal onlap curves, they are out of phase. The best way to resolve this is to asses how much ice was on Antarctica during the critical time intervals. Five critical areas have been proposed by the ANTOSTRAT group,; these areas have been identified to represent outflows of the major ice streams draining the W. and E. Antarctic ice sheets and the Antarctic Peninsula. The Antarctic Peninsula has been selected to be the first leg for two reasons. First, it is located at the lowest latitude and should be the most sensitive to climatic variation. It should have a good climatic record as it has a relatively thick sequence of glacial material. Second, it also has an excellent series of drifts, which arise as the ice sheet dumps material at the edge of the shelf, and sets off slumps and turbidity currents. The slumped material is then deposited downstream. The resulting drifts should provide detailed sedimentary records at times when the ice is at the margin, resulting in a sequence stratigraphy related to ice history. This is a working hypothesis and needs to be tested. This first leg in Antarctica is designed to determine the nature of slope, shelf and rise sediments, look at drift sediments, and look at a Holocene section. Questions include: does the Antarctic Peninsula become completely deglaciated from time to time (presence of terrestrial pollen or not), how many cycles are there per unit time, is this in synchroneity with Northern hemisphere glaciation? This area should be very sensitive to climate change.
- **Nankai Trough (445)** - This is one of two classic end-members for wedge areas (the other is Barbados). This proposal is to study the sedimentary prism and it focuses on fluid flow within materials of different characteristics along two transects. The eastern transect has low wedge taper, the western transect has high wedge taper with reverse polarity representing changes in porosity and pressure. Fluid modeling for both transects has been done, and drilling is proposed to test them quantitatively. Two legs are proposed: the first to recover core, and the second to recover more core and emplace CORKs. Fluid flow can be followed using changes in components in fluids, such as chloride; modeling has already tried to reproduce the chloride distributed at Site 808.
- **Great Australian Bight (367)** - Drilling in the Bahamas has elucidated how warm water carbonates respond to sea level changes. SGPP had already envisaged a comparative study of cool water carbonates. These carbonates have lots of analogies with Paleozoic carbonates. The sedimentary architecture of GAB is one of ramps, which seems to be characteristic of carbonate platforms through much of geological history. It is a unique situation that will have a unique sea-level response, and will be interesting to see if there is a correlation with the Bahamas.
- **Mariana-Izu (472)** - This is a mass balance exercise to look at crustal fluxes in subduction zones in the simplest possible situation where everything is being subducted and there should be no complications due to refluxing. The potassium content of the volcanic rocks at Izu and Mariana are different, so the question is why this occurs in such a simple system. This can be answered looking at materials being subducted along flow lines. Two sites will allow the calculation of a mass balance.

ADPG 1- Mix commented that proponents of ADPG1 need to consider some realities about the timing. The proponents want 60 days of drilling with a start and end in Punta Arenas, but this is not possible as Cape Town is the choice because the ship has to go in that direction. They will possibly lose 10 days or more, and it is important to evaluate whether the science is viable taking that reality into account. Was logging included in time evaluations? This is

important as there is likely to be low recovery in tills on the shelf sites. Goldberg commented that logging plans are in the proposal but he did not know if this estimate includes those times. Mix asked if a viable climate record can be generated from volcanic turbidites, planned to be recovered at the Bransfield Straits site, and commented that the same site is in proposal 453 with tectonic objectives. Hay said that that is the site the group wanted as it was considered the best place to achieve best climate record. Humphris commented that proponents of 453 were invited to attend the ADPG, but were unable to go. Kudrass agreed with Mix's comments, and commented that deep sites should be moved to the highest priority if possible. Four sites are on the shelf; the third one should be moved further out so achieving a record from drift sediments that can be traced back to shelf. Mountain commented that it is not possible to determine whether the whole of Antarctica was ice-free purely from the presence of pollen. Hay responded that the only area that would be known for is the Antarctic Peninsula but it is climatically the most sensitive. Mountain also agreed with Mix that climate signal is lost in volcanoclastic sediments. Sager questioned how a record from glacial/deglacial can be achieved if the deposition is not understood. Hay replied that a well-developed model exists, but has not been tested. Kudrass commented that this has been tested in part, but needs to be refined. Brown pointed out the disjunction between the onlap curve and the oxygen isotope curve. He felt the Antarctic Peninsula is not the area to get the best record to resolve this, as it seems to be the least sensitive area to these changes on the Antarctic land mass. Hay replied that SGPP felt this was the best place to start as the records will be complete back to the Pliocene, and this record will reveal whether there is variability in the record, and the timing of this variation. Natland asked which sites are included in SGPP rankings, as ADPG started as a combination of different proposals. Ellins clarified the history of the ADPG proposals. Pearce commented that the original DPG had a different combination than this program. Humphris commented that Hay had presented the list of sites that are SGPP's top ranked proposal, and they are dominantly W. Antarctic Peninsula, a Bransfield Strait site, and one in the Palmer deep.

Nankai Trough- Brown pointed out that there are some distinct differences between the western and eastern transects. The eastern transect has a negative polarity reflector at its base, possibly relating to a change in porosity. This is due to the lack of sand bodies down in the lower sections so it does not dewater and keeps higher pore fluid pressures and therefore has lower taper. However, in the western section, there is some sand which drains the basal shear zone in the wedge. This leads to higher basal stresses and the higher taper. Drilling will allow testing of this hypothesis. Sager commented that this was another in a series of wedges that have been drilled, and asked what is the overall plan, and whether this is a key place. Hay responded that the architecture here is simple enough that it provides the best chance of coming to a quantitative solution. Kudrass thought this was a two leg program, but asked if it could be reduced to one leg. Hay said proponents would prefer not to put CORKs in, but get sufficient data to be as quantitative as possible. Mevel asked how the other proposal in the system to drill in this area (French-Japanese), which is still immature, fits in the project. Moore said it deals more with emplacement of an oceanic crustal sliver, so it is really a proposal with different objectives.

Great Australian Bight- McKenzie said this proposal provides a unique chance to look at this environment and it is fundamental to study controls on cool water carbonates systems.

Tectonics Panel (TECP)

Robertson presented the highly ranked proposals of TECP. The large number of TECP-related proposals is due to the fact that the ship will go again to the West Pacific. He pointed out that several proposals in the systems are addressing themes of interest to LRP.

Woodlark Basin (447) - This is a key initiative in the Long Range Plan, and is dealing with rift and extensional boundaries processes. The main objective is to characterize the *in situ* properties of an active, low angle fault zone, and to determine the vertical motion history of the downflexed upper plate and the unloaded lower plate. Woodlark is ideal as it is a young and active system. Drilling will focus on two traverses across the boundary. This will be used as a fundamental model for rifting processes that will be widely applicable. The proponents want to see a CORK installed at one site, but is not essential to achieving the objectives. A two-leg program could be designed to accommodate CORKing if it could not be accomplished the first time.

- **Tonga Forearc (451)** - This proposal is also mature and ready to go, and there is also strong interest from LITHP. This proposal addresses the study of fundamental processes connected with subduction geodynamics, arc evolution, and deformation processes at a convergent margin that is not undergoing accretion. There are several linked objectives of interest for both LITHP and TECP. The proponents wish to investigate the history of the arc and forearc on several traverses to look at the temporal evolution involving oblique opening and oblique collision of the seamount. There is extensive site survey data and a successful cruise this summer has added important results. Proper packaging of the final leg still requires fine tuning.
- **Taiwan Collisional Arc (450)**- This proposal, dealing with collisional processes in orogeny, is closely related to the LRP. In this area, a major magmatic arc system is in the process of progressive diachronous collision with the continental margin of China. Hence this provides the opportunity for fundamental insights into the way arcs collide with, and are then accreted and incorporated into, continents. This proposal is mature and ready to go, and a strong proposal. TECP is very interested in the tectonics aspects and fluid flow as it offers fundamental insights into how arcs collide and accrete with a continent.
- **West Pacific Seismic Network (431)** - TECP is mostly interested in structural and tectonic aspects that aim to fill gaps of coverage in W. Pacific zones, thereby yielding information to resolve fundamental tectonic problems of this area. These sites are also highly relevant to seismic hazards.
- **Nankai Trough (445)** - Hay presented SGPP's interest in the fluid flow aspects but there are also structural interests. This location is ideal to produce accurate cross sections where the wedge can be restored to learn how wedges evolved through time. Modeling has been carried out to evaluate the nature of structures within the decollement and other parts of the accretionary wedge. Drilling would provide ta test of the model.

Woodlark - Shipley commented that Woodlark is one of the few areas to study active extension. Natland asked what penetration of the fault would reveal. Roberston replied that it would provide a detailed lithology, and the logs would help characterize the physical and hydrogeological properties of the decollement zone. Pearce asked if there is any chance to look at magmatism as well. Young rocks were recovered from Moresby Seamount, as well as some older rocks recovered by dredging, but characterizing this is second priority. Brown said a key question is how low angle faults can move without high pore fluid pressure. Roberston said that proponents would love to see CORKing, but he thinks is not fundamental to characterizing this

environment. Shipley said that CORKing could happen at a later stage, but then it takes only three days, although it requires triple casing.

Tonga - Natland commented that two sites are close to older ones on the Pacific plate, and he asked what specifically will be learned from the new ones. Roberston said TECP wants to see the age, stratigraphy and deformation history to compare with other sites. Pearce said that the new ones are structural reference sites to determine the nature of forearc sediments before the ridge hits. Larson commented that the dating will be very hard as biogenic material is absent. Sager asked what is new here compared with Mariana rifting. Robertson said that here the theme is interaction with the Louisville Ridge, and the margin is undergoing subduction erosion and loss of materials.

Taiwan - Shipley commented that it is not quite ready for drilling.

Lithosphere Panel (LITHP)

Ludden went through the top five ranked proposals. He pointed out the LITHP ranked DCS as 0 because they didn't want to rank it with the other proposals, but wanted to indicate that they were willing to sacrifice a Leg if necessary to test it. ADPG was discussed but not ranked. Ludden chose not to discuss the specific aspects of each leg, but rather focus on why the panel felt they wanted to drill them.

- **Kerguelen (457)** - There are two main models that exist to explain the formation of LIPs: 1) the ridge-plume interaction model, and 2) anomalous events that fall outside of our current ideas on mantle convection. LIPs can be considered as mantle mixing experiments when pre-LIP, during-LIP and post-LIP mantle can be investigated using isotopes. LIPs are important in the growth of continental crust, so there is a need to understand their formation. In addition, they may have had a major environmental impact. The strategy for understanding LIPs is completing transects to understand the time/flux history of a LIP, followed by some deep holes.
- **ION (431+ NERO)** - This proposal offers the potential to use borehole seismometers to image deep mantle convection. LITHP strongly supports drilling of these sites, some of which could be done during transits.
- **Tonga (451)** - Themes of interest to LITHP are the initiation o subduction, the nature of early arc volcanism, the origin of supra-subduction zone ophiolites, and physical and chemical controls on arc magmatism. Using ICP-MS, it is now possible to use the volcanoclastic record to characterize the evolution of an arc. Another objective is to test the ophiolite model.
- **Mariana-Izu (472)** - LITHP is trying to understand global thermal and geochemical fluxes. A new group, GERM (Geochemical Earth Reference Model), is trying to understand fluxes between Earth's major reservoirs. Mariana-Izu is part of a series of experiments aimed at looking at fluxes at margins, understanding the nature of altered crust in subduction systems, and the input and output and recycling of various components. Ludden also pointed out that there are some distinct chemical differences between the Izu and the Bonin Arc, suggesting differences in material going down the subduction zone.

Kerguelen - Sager commented that LIPs are one of those first order problems where ODP drilling can make a big difference in the next 5 years. He felt the proposal is ready and it is time to schedule it. Natland was interested in knowing how drilling is going to extend what is already known with a series of short penetration holes. Ludden said the purpose is to better constrain

the various components in terms of volume/flux relationships between the various reservoirs. Sager added that there were huge eruptions in a short time, they have different ages, but there is question of how to date them. However, we need to get a handle on flux of magma. Pearce asked why not drill a LIP in a more geographically convenient location. Larson said that Kerguelen and Ontong-Java are the two biggest volcanic events remaining in the ocean basins. The timing of these two LIPs is fundamental. They are close in time and exhibit some bimodality in their ages: an initial pulse, a hiatus for 30 Ma, then a second pulse. It is important to characterize age/volume relationships by drilling holes. Ludden said that this should be considered the first of several studies of LIPs that will occur over the next 10 years.

ION-NERO - Mevel said she talked to Montagner who will propose a cruise to emplace a seismometer for a year, starting in 1999. Johnson raised the question of whether a seismometer in a deep hole is better than on the sea floor, but nobody really knows whether the signal/noise ratio will be better. Mevel said that Montagner reported noise had decreased after five days in an Atlantic experiment, suggesting that hopefully after one year it would be even better. Larson asked Suyehiro how coupling is provided between the seafloor and the instrument. Suyehiro responded that different countries use different systems. Johnson said that historically these types of experiments were tied with the magnetics community, who were going to install magnetic observatories, but this aspect has been removed. Mevel said that the magnetics community does not want to put instruments in deep holes, but rather on the sea floor.

Tonga - Pearce said that good summaries were given already by panel chairs. He felt that the link to mantle dynamics needed to be pointed out. Natland pointed that he appreciated the fact that the proposal talks a lot about rocks and parameters that can be measured and linked to structural evolution.

Izu-Mariana mass flux - Natland said there are two major objectives: 1) to constrain geochemical mass balances, and 2) to find out what the Mesozoic sediment and crust is like before it is subducted. Pearce supported the proposal, but was puzzled in that the goal was to contrast the Izu-Bonin and Mariana arc, even thought there is no site where the crust would be subducted beneath the Mariana arc. Larson said that the main crustal component that is missing is the Jurassic component, and the only place that it is guaranteed to be recovered is Hole 801C. Brown commented that the inputs are very heterogeneous, and only two holes will be used to characterize vast areas of crust. Natland said the calculation does not rely only on two sites but also on dredge hauls. It is important to realize that we are at the beginning stages of characterizing the inputs. In addition, it is not just a matter of looking at solids, but also at fluids, which could be coming out of the subducting slab. Brown questioned whether more holes are needed because of various alteration processes. Mevel said that the geochemical community wants to take a global fluxes approach, and this is one step forward. Fryer said that the most compelling argument is that because there is so much information on sedimentary cover and we know there are complexities in crust near ridges, going far enough away from them will give a critical part of the entire story. Deeper penetration is needed to address variability in that part of crust. That is the first order question, then other shallower holes can be drilled to address the heterogeneity issue.

2. Site Survey Considerations

Srivastava reported on their review of proposals included in the Prospectus. In summary, all highly ranked proposals have rankings better than 2B, with the exception of Kerguelen (see

Appendix 11). Ellins commented that the French cruise to Kerguelen has not been scheduled yet, but reported that Dominique Weis said there are enough proposed sites that they can eliminate some of the sites if the data are insufficient.

3. Logging prospectus

Goldberg referred to the prospectus in Agenda Book, and said it contains 17 proposals that were reviewed by DMP and proponents. NERO was added later, and a Prospectus for it was distributed at the meeting. With the intent of reducing the work load, LDEO recommends moving the building of the Logging Prospectus to the proponents, as part of the proposal process. New tools are used in several of the proposals. Goldberg gave a presentation on the ARI tool, which is a resistivity imaging tool that substitutes for the laterolog. This is an oriented imaging tool providing 1m-scale resistivity images that can pick out lateral heterogeneity. This tool was recommended for a number of the tectonic legs and high-resistivity basement holes. Goldberg showed spreadsheets of special tool deployments, showing tools requires and the costs associated with each (Appendix 12). VSP was recommended for Legs with sequence stratigraphy objectives.

Sager said that PCOM wanted to know how much extra cost is involved, and pointed out that it is important to consider this to be aware of limitations related to costs. Humphris said that it is clear that the Program cannot afford three legs of LWD in one year. Hay commented that ADPG was not aware that LWD was requested. Sager said that for Woodlark Basin, LWD was advisable, but not necessary; the same is true for Nankai. Humphris said that by one order of magnitude, this is the most expensive logging activity we have and that, in determining the schedule, PCOM should bear in mind that Antarctica does not need it (as the ADPG was not even aware of it), and that LWD would be beneficial for Nankai but is not necessary. The need for the Engineering tests is obvious. Shipley asked why is this obvious and said the LWD Engineering leg needs to be discussed. Brown asked if there is any way to make LWD cheaper. Goldberg answered that it is possible, but is dependent on leg length and number of holes drilled. McKenzie asked if the GHMT tool is really necessary for all those legs. Goldberg said that if it became a routine tool, the costs would go down a bit.

4. Logistics and Budgetary Considerations

Francis showed a matrix which summarized logistical and budgetary constraints (Appendix 13). He reviewed the sources of information for weather windows, ice, and tropical cyclones (which would affect legs such as Nankai). He said that another factor to be considered is heave conditions. Since the experience of Leg 173, limitations have been established for shallow water drilling. There is a limit of 1m for 75-300 m water depth, and 2 m for 301-650 m water depth. Costs are based on extimates above a "standard leg". Support vessels for Antarctica for Leg 113 cost $1.197 million and $0.868million for Leg 119.

Francis went through the proposals reviewing what is needed for specific legs, and what is the best time-window. For the South Atlantic paleoceanography leg, the best time is December-February, but there is no ice problem. For the West Antarctic Peninsula, the best month is March for ice conditions, but for the weather is December-February. An ice boat will be needed. The area is exposed to large swells, and there are four sites in shallow water so there might be heave problems. DSDP sites in the area had big swells, and gave up because the swells were too big. Francis said the ship has to leave the area before the end of March.

For Kergulen, Francis pointed out that it is in an area where in July and August average wave height is very high, and the risk of having very high waves is too dangerous. However, an ice boat is not required. There will be some heave problems in two of the shallow sites that may preclude them. He questioned whether it is sensible to be considering a deep hole in an area of the world where the chance of rough seas is high.

Francis said that summer cyclones could be a possibility for Woodlark, although it is probably close enough to the equator that it might not be a problem. The best time to schedule SW Pacific Gateways is from October through February, and if sites in the north were drilled first, the leg could even be scheduled starting in September. To avoid summer cyclones, Nankai should be scheduled from March to June. However, a major problem associated with this location is the presence of the Kuroshio current. Francis questioned the wisdom of planning legs with long casing strings in areas with strong currents, as high currents can induce vibrations. Natland said that current intensity fluctuates and meanders in and out, and this could be taken into account when planning. Moore reported on some work to be presented at AGU by the Japanese. They spent the last three years doing weekly transects with ADCPs and calibrating that to satellite data. They feel they can predict the exact meandering of the current. Francis said that West Pacific Geophysical Network has to be scheduled in May-June to avoid tropical cyclone season. Great Australian Bight has to be scheduled from November through March to avoid high waves. In addition, there are some heave problems on some shallow sites that have to be considered. Cyclones have to be avoided by scheduling Tonga from May to December. For the Taiwan area, even if it is not scheduled this time, Francis pointed out that it is also is necessary to avoid the cyclone window, as well as current problems similar to Nankai. Fox added that another point to be considered regarding costs is the "distant ocean tax". The costs of operating in the Pacific are approximately $2 million higher, due to logistics, travels costs, transit, fuel costs, etc., and these additional costs are not in the figures estimated for drilling. Larson pointed out that avoiding typhoon season is very important, and he felt that mid-March to early August is a reasonable time window. Mountain said that the information compiled by Francis provided useful and necessary information to help make a good decisions.

5. FY '98 Science Program Discussion

Humphris asked if there was any further input on proposals before conflicted people are asked to leave. Mahlon suggested that PCOM does not need to consider safety when scheduling, as PPSP can do this after the schedule is decided. Falvey discussed costs of general operations for '98, and said they will be much higher than in the past by approximately $2 million. Falvey showed the list of projects for FY'98 that included the dry-dock, continuation of projects already underway, and proposed leg-related projects (e.g., LWDs, special logging tools, ice boat, etc.). With the most optimistic schedule scenarios, there is a likely budget over-run of $900K. He put the cut-off at $4 million, which implies that drilling an Antarctic leg will result in insufficient funds for both Somali Basin and Woodlark. Carter asked if there were any other funds that could be tapped to support an ice boat. Hay responded that he didn't know. Carter also pointed out that for proposal 441, July-August is another weather window. Humphris said that PCOM needs to come up with a couple of scheduling scenarios, and then the implied costs will be evaluated. Kudrass asked how the additional $2 million related to operations in distant oceans mentioned by Fox fit into Falvey's budget. Fox responded this was embedded in the A-base costs, and that the "distant ocean tax" may be reduced by about $5-600K due to the reorganization and some cost savings.

Humphris opened a discussion on other proposals within the Prospectus. Natland wanted to discuss the Somali Basin proposal, as he was watchdog for it, and it got no mention from the panels. He felt it provides the opportunity to move beyond the LRP and that it addresses important Mesozoic objectives. Large portions of DSDP dealt with Tethys objectives (black shales, etc.) and he felt that, with the technology now available, there is a better chance to achieve the objectives. He called on to Larson to repeat his words spoken at USSAC. Larson said this proposal is important to asses the connection between the two types of Mesozoic oceans: the Tethyan North Atlantic Ocean and then everything else. The facies differences are remarkable: the Tethyan had a very carbon- and carbonate-rich ocean, whereas the Pacific is carbonate-poor. Somali Basin is the best place to understand the difference between those two systems. McKenzie said that the reason this proposal was rejuvenated by SGPP was because PCOM asked panels to identify proposals with deep holes where good science can be done. Loutit said the reason why Somali was not ranked highly by OHP is because there was no site survey, but the science for Mesozoic objectives is valid. Francis pointed out that the LRP states that in phase 3 a number of deep holes will be drilled, and it would be good to start early to achieve some experience. Robertson said TECP supports deep holes, but other sites should be considered. Falvey said that all other areas will have source rocks, while in the Somali Basin this risk is very low. Riser and BOP would be needed for deep holes other than Somali.

Humphris asked the conflicted members to leave and reminded the remaining PCOM members of the motion addressing voting on proposals (PCOM motion 96-1-9). The first step is to go through the proposals in the Prospectus and to eliminate those that are not feasible for one reason or another. The next step is to try to rank the proposals on the basis of science. That way the new SCICOM will have a scientific ranking, thereby smoothing the transition to the new structure. Some proposals may not get into the schedule because of logistical or budgetary constraints. Kudrass said that if you start to exclude proposals then it will kill the long term perspective. Humphris said that there are a lot of highly ranked proposals, but not all can be scheduled, but PCOM should pass on to SCICOM a list of highly-ranked science. Humphris suggested that PCOM nominates which proposals should be considered for scheduling. At this stage, based on the previous discussions, ADPG2, ADPG3, DCS Engineering Leg, and LOI 72 were taken out of consideration. Either a consensus of a vote was called for on each proposal with the following outcome:

Proposal Title	**Vote to consider for the FY '98 Schedule**
079	4 yes, 8 no
367:	yes by consensus
431:	yes by consensus
441:	yes by consensus
445:	yes by consensus
447:	yes by consensus
450:	no by consensus
451:	yes by consensus
464:	yes by consensus
457:	yes by consensus
472:	yes by consensus
495:	no by consensus
508:	yes by consensus

ADPG 1 (452, 453, 503, 483)	yes by consensus

Proposal 079, 450, and 495 were dropped from consideration at this stage. During this process, the following discussion took place. Natland asked for clarification on LOI 72 and wanted to know whether it is five day exercise? Humphris confirmed this and said that it was considered as a contingency for FY '97. Natland asked if it could be in FY 98. Goldberg asked to comment, and said it could be deployed on Nankai as a part of the package, or the tool can be deployed as a test somewhere else in a hard rock environment. It was originally proposed for the MARK area in the FY '97 scenario as a generic testing leg of an LWD tool. At Nankai it would be deployed as part of the tool package plan, not as a test. Goldberg clarified that the test would be on hard rock and it could be at 735B or NERO in FY '98. Natland reminded PCOM of the cost implications associated with which port is chosen, as the tool must be shipped to and from the ports. Humphris proposed that it be removed from consideration; this was passed by consensus. Pearce noted that Southern Gateway is not highly ranked. Humphris noted that PCOM did not discuss the proposal at all. Mountain (watchdog) noted that there is some controversy because of the differing objectives (paleoceanography and tectonics) and that it would not hurt to cross this proposal off the list as the proponents need to revise it. This was agreed by consensus. Natland reiterated the importance of Somali Basin for a deep hole and the geographic placement of this site. Humphris suggested that it could be taken out of the ranking and then a specific statement as to its importance as a potential site for a deep hole could be made. McKenzie disagreed and said that would eliminate the chance to ever drill it. Natland asked about the goals and objectives of the engineering group at TAMU for this leg. Francis responded that the primary goal is to see that the system works. Fox added in light of the discussion on the need for riser drilling, engineers at TAMU want to test the capabilities of the TAMU system. Francis said the *JOIDES Resolution* has never been tested to its limits. Pearce noted that it is not site survey ready, and the proposal was not looked at by SSP. Natland noted that a site was already drilled very close to the proposed one, and that a site could be located on an MCS line. Brown said that the science is not up to doing this kind of hole. He wanted to see better science for the money spent and preferred consideration of another site. Since a consensus could not be reached, PCOM voted, and it was dropped from further consideration on a vote of 4 to 8.

Regarding Mariana Izu, Mountain noted that this is one proposal that has a ranking from all four panels and is truly multidisciplinary, but he questions whether it is an efficient use of ship time to have competing objectives on the same leg. PCOM agreed to keep it in contention. A ballot was then held on the eleven remaining proposals. PCOM members ranked the proposals from 1 (high) to 11 (low) on signed pieces of paper that were kept as part of the records for the meeting. The results are as follows:

Ranking	Proposal	Score	St. Deviation
1	464	2.83	2.5
2	447	4.58	2.7
3	457	5.33	3.6
4	472	5.75	2.5
5	367	5.83	3.5
6	ADPG 1	5.92	3.4
7	441	6.33	2.2

8	431	7.00	2.7
9	451	7.42	3.0
9	508	7.42	3.4
11	445	7.58	2.7

Fox commented that PCOM cannot include both Kerguelen and ADPG 1 in the first year. Humphris added that PCOM cannot schedule two high latitudes legs without moving the schedule back because of weather constraints. Francis noted that Kerguelen cannot follow Southern Ocean Paleo, as it will be too late in the season to work at Kerguelen. Fox noted that NERO could be done on a transit across the Indian Ocean. Humphris wanted PCOM to give operators and JOI a clear indication of what they really want in the program, because there are many drillable proposals, and the standard deviations show that many group together in the ranking. Sager said strong guidance is required from PCOM because there is a clear top and clear bottom ranked proposal and all the rest are grouped together. In addition, he noted that this is not a strict scientific ranking because one cannot help consider geography. Humphris requested that TAMU come up with some scenarios for the FY '98 schedule that incorporate highly ranked proposals and show how the high ranked, high latitude proposals could be accommodated in the future.

E. JOIDES Panel Reports and Action Items

1. Panel Chair Reports

PANCH

Loutit reported on a series of recommendations from the PANCH meeting:

- The new JOIDES Science Advisory Structure- OPCOM should have two main objectives: 1) resolve short-term scheduling issues (1 meeting/year) and 2) advise SCICOM on long-term technical requirements (1 meeting/year);
- PANCH emphasizes the need to maintain continuity and consistency in the evaluation system for proposals that have already been highly ranked by thematic panels prior to the transition to the new advisory structure;
- PANCH endorses the IHP recommendation that JANUS Phase II be implemented as soon as possible, including:
  - integration of structural (and related sedimentary) data acquisition
  - the migration of biostratigraphic data to the JANUS system
  - the continued integration of CLIP into JANUS;
  - improved quality digital imaging for the hard rock community
- Core/sample Curation- PANCH endorses the effort to develop new guidelines for sampling and curation and asks that these guidelines be made available to the ODP community as soon as possible during 1997;
- Shipboard collaboration approval- All arrangements must be conveyed formally in writing to the Staff Scientist (Project Manager) by the end of the leg. Co-Chief scientists will ensure that all shipboard agreements are completed. Responsibility for adjudicating of any ensuing conflicts that can not be dealt with directly by ODP-TAMU rests ultimately with JOI. Questions were raised as to what the issue was. Fryer clarified and said that this is in response to some problems that have recently occurred on board the ship involving scientists

who informally agreed to collaborate and later on changed their plans. Humphris explained that in the PANCH recommendation, it is suggested that a record of such agreements be kept with the Staff Scientist, with the Co-Chiefs having oversight.

- 5 Yr. Plan- PANCH recommends that PCOM consider repackaging the presentation of the plan in the following manner:
  - put less emphasis on post 1998 schedule by removing dates;
  - emphasize key concepts/ideas and sequence/duration of generic legs post-1998;
  - insert graphics into text and use them more effectively.
- – PANCH should continue to meet prior to the SCICOM once per year.

PCOM Motion 96-3-6 PCOM endorses the PANCH recommendation that all shipboard collaborative arrangements must be conveyed formally in writing to the Staff Scientist (Project Manager) by the end of the leg. Co-Chief scientists will ensure that all shipboard agreements are completed. Responsibility for adjudication of any ensuing conflicts should be dealt with by the CAB, and rests ultimately with JOI.

Proposed: Mevel, Seconded: Shipley *15 For, 1 Absent*

SGPP

Hay reported that their fall meeting was in Nancy, France. He noted that the proposal to drill in the Barents Sea was confusing to the panel as it appeared to propose to do what had already been done. He was unclear as to whether it was being proposed that a Russian ship be used for this endeavor, and he felt that this should go to JOI for assessment.

Regarding the SGPP responses to queries from PCOM, Hay said that of the four people that SGPP selected to attend the interim SSEP, three certainly will be able to go. He also urged PCOM to find a fluid flow person to serve on the panel, and Jean Bahr was considered as a possible candidate by SGPP. SGPP did not suggest anyone to serve on the JOI Publications Steering Committee as Bjorn Buchardt has already been nominated as a member of the committee. Humphris noted that Buchardt's name was sent by the JOIDES Office to JOI. Hay said that suggestions for PPGs were listed in the Panel Minutes.

SGPP presented four motions:

- Publications: SGPP is concerned with the plan to drop any printed version, and asks that some kind of printed copy be retained.
- Antarctic DPG: SGPP endorses the study of Antarctic glacial history and supports a first leg as a test of the concept, but does not necessarily agree with the proposed order and schedule of subsequent legs as given in the DPG report.
- Antarctic DPG: SGPP is not clear that 452-Add 2 in its entirety is consistent with the main objectives of the Antarctic Program to study glacial history and sea level change, and requests from ADPG a drilling plan with a description of the goals for all of the sites.
- CORK: SGPP has always viewed CORK experiments as a high priority, and asks that ODP makes a commitment to maintain the equipment, unless it become evident that the CORK site is not adequate to achieve the desired objectives.

Regarding the Antarctic program, Hay explained that the reason for the second motion is linked to some problem with the Bransfield Strait site, which has a tectonic objective in addition to a paleoclimatic objective. Concerns were expressed that a group of proponents from the original Bransfield Strait Proposal 453 may have been excluded from the addendum to 452

(Barker) in which the Bransfield Strait site was included. Humphris asked if the concern expressed by SGPP in these two motions suggests that the panel would like to see the ADPG meet again. Hay said this is not what the motions say. Humphris asked again if this is one way for SGPP 's concerns to be addressed. Humphris said this will be revisited. Hay also mentioned the Hudson Apron proposal (476). The panel reviewed this as a contingency plan for NJ if time becomes available if the hammer drill system does not go ahead. In a letter that Hay has received here at this meeting, he had been told by Hudson Apron proponents that some of the HAT sites are coincident with NJ alternates (Leg 174A). He reviewed the scientific objectives of this proposal. SGPP supported this program as a contingency plan.

TECP

Robertson reviewed TECP activities over the last three years and finished by showing a tectonic plan that TECP would like to see drilled in the future (see Appendixes 14-16). Roberston expressed his thanks to ODP, and thanks to the outstanding TECP members for their years of service to the program. Robertson noted that there are many new proposals in the system with tectonic objectives. In the long run, TECP felt that there will be a need for two ships for tectonic objectives, one is a *JOIDES Resolution* type, the other is a riser ship. TECP has also supported DCS and similar types of engineering projects, and *in situ* measurements of fluids and gases, and supported collection and archiving of structural data. One item of concern for TECP is the overall thematic panel balance in the new structure. TECP wanted also to be sure that the "external " groups (global geoscience programs) are not able to unduly influence ODP drilling, and that the SSEPs are evenly balanced so that they do justice to the interests of the community as a whole.

Roberston then reviewed the three panel recommendations to PCOM:

- JANUS - TECP recommends that the integration of structural (and related sedimentary) data is fully completed within JANUS phase II, or equivalent.
- Deep Hole -TECP recommends to exclude Somali Basin as a candidate for a deep hole as it has no scientific merit. Alternates of scientific interest to TECP are the Nankai upslope site and Woodlark Basin.
- DCS - While supporting the concept of a DCS engineering leg, TECP believes that an alternate to 735B may well fit the science drilling plan better, i.e., Nankai slope; Woodlark Basin.

Regarding the JANUS recommendation, Robertson said he is very concerned that the momentum of TECP in this area should not be overlooked in the new system. Regarding the deep hole recommendation, TECP felt that there are alternates to Somali and suggests convening a small group to look into this carefully, taking into consideration the safety factor.

Robertson said that TECP has three suggestions for PPGs: (1) downhole measurements and observatories, (2) conjugate margins, and (3) seismogenic zones. In summary, TECP wanted to see a seamless transition to the new structure, and suggested these PPGs produce a realistic plan to 2003.

LITHP

Ludden presented a recommendation that was not included in the LITHP minutes. This regards the drilling of ION holes, which is considered to be a high priority by LITHP. He said the panel feels that mini-legs to drill ION holes should be coordinated by PCOM when the ship schedule takes it near high-priority ION sites.

The LITHP recommendations tp PCOM were:

- Digital imaging of core - LITHP was not satisfied with quality of the hard rock digital-image-based system of the JANUS data base (presented at their meeting by the TAMU representative) that represents the "backbone" of the hard-rock community's requirements. The need for this system in the JANUS program and should not be forgotten.
- DCS system- LITHP strongly supports the development and testing of DCS for future hard-rock legs and for use in areas of difficuolt lithologies (cherty sequences, hydrothermal systems, etc.). The most reasonable site for such a test is probably at site 735. However, the panel stressed that such testing should be on a bare rock, low angle site, with reasonable access to a port.
- Comments on the transition to the new review process - Concern was expressed regarding how the new proposal review will be handled. In particular, how soon will proponents be advised that their proposal is going for mail review, and how much time will a proponent be given to rewrite the proposal before review? LITHP stressed that JOI or JOIDES should inform proponents as soon as possible of the changes in the review procedure, providing proponents and reviewers clear guidelines on the new review procedures.

Ludden said that the 5 Yr. Plan was discussed, and LITHP was pleased that their plan was used model for the new structure.

At end of the meeting LITHP came up with two types of PPGs: short-lived and long-lived ones. One short-lived one should be on world class ore deposits- meeting with mining experts as participants. A short-lived group on fluxes (part of GERM) is needed to determine what should be measured. Mix said that the short-lived PPG sounds like a workshop. A brief discussion ensued regarding the differences between WGs, PPGs and DPGs. Humphris noted that PCOM will revisit this when EXCOM concerns are addressed. Natland said that a DPG was always meant to produce a drilling plan from several proposals, and short-lived group should have different name from a DPG to avoid confusion.

OHP

Loutit presented six recommendation from the panel:

- CLIP software development - OHP voted to further endorse and recommend continued support for the development of CLIP (Core-Log Integration Platform) software. The two products currently in development, Splicer (core-core data integration) and Sagan (core-log data integration) data integration software are viewed as essential shipboard and shorebased research tools for Ocean History drilling objectives. The panel supports the incorporation of Splicer and Sagan data products into the JANUS database and recommends that the programs be enhanced to access data directly from the database, and that ODP assume a proactive role in insuring that these CLIP software products are compatible with current and future modifications to the shipboard computing and network facilities.
- Recommendations to PCOM - The OHP endorses the 2 October 1996 recommendations to PCOM on (1) the new ODP advisory structure, (2) JANUS, (3) new publications, and (4) printing and distribution of ODP IR and SR volumes for archival purposes.
- Approval of shipboard collaborations - OHP does not endorse the IHP recommendation that any and all collaborations between shipboard scientists be approved, monitored, and adjudicated by the Co-Chief Scientists of the leg. Consequently, the OHP recommends that an independent body that can respond quickly to leg-based appeals have ultimate responsibility for adjudicating collaborative arrangements between shipboard scientists.

- Subsidized publication costs- ODP SR volumes constitute a primary resource for much earth historical research. Resources of particular importance include (1) microfossil studies that document taxonomic concepts of stratigraphic significance, and (2) site-specific stratigraphic studies. OHP recommends that PCOM consider subsidizing costs of publishing such studies in the open peer-reviewed literature (i.e., by payment of page charges for taxonomic and stratigraphic studies).
- JANUS - OHP supports the migration of existing data to the JANUS database system. The migration of biostratigraphic data should be a high priority task.
- Leg 175 - OHP is aware that coring depth restrictions imposed due to safety considerations in the North Angola Basin may limit the scope of sites in this area to Quaternary/upper Pliocene. This will nevertheless provide important new information and the southern transects retain a sufficiently broad coverage to provide a robust reconstruction of the evolution of the Benguela current system. This leg remains a top priority for OHP. It has been considerably strengthened by the addition of high resolution sites in Walvis Bay and has the full support of the panel.

Loutit said that OHP has prepared an LRP implementation document and this should be addressed and updated every year. This will mean that every year accomplishments will be listed that can go up through the system to the ODP Council. He noted that he has spent the last three years on ODP Council and has observed the great disconnect between ODPC and those conducting the science of the program. Mix 's presentation last year began to make a difference with respect to the way that ODPC views the program . He felt that the SCICOM Chair must continue to do this, showing accomplishments and plans and their socio-economic consequences, and must force the panels to do this exercise also. All the information from the panels cannot be presented to ODPC, but only the most salient points. This is necessary as they are bombarded constantly by other groups looking for money. OHP has had a very successful year with 165, 166, and 168 in FY '96. Loutit stressed the need to pick out the significant issues and boil down the important items from the panel perspective. He said Mix did this and with his presentation was actually able to interest the Council and have them actively participating in the program giving feedback.

SSP

Srivastava gave an overview of last year's issues dealt with by the panel. He discussed the need to have three-day meetings and requested that JOI fund an extra day for proponents to spend looking at data on their own at the SSDB. The next meeting will be in Japan, and Srivastava noted the value of having meetings outside the US. He said SSP had concerns about the new structure. Srivastava acknowledged Ellins's assistance and patience in listening and responding to the panel's concerns.

Regarding membership, SSP had requested from ODP France that Jean Claude Sibuet be allowed to continue to serve on the panel. France agreed, but this is to be formally routed through the JOIDES Office. Srivastava also mentioned SSP's desire for Roger Scrutton (UK) to continue. Srivastava expressed concerns about the large number of proposals that SSP has to consider. He would like SSP to have liaisons with PPSP, TAMU, JOIDES and the SSEPs in the new structure. Srivastava thanked TAMU for their liaison to SSP as well as Ellins, who acted as the JOIDES liaison to SSP. He raised his concerns regarding whether SSEPs will be able to take into account SSP recommendations when they meet in May 1997 to consider the proposals, following the April SSP meeting.

SSP made the following recommendation to PCOM:

- Use of GI guns on board *JOIDES Resolution*- SSP recommends that PCOM should direct JOI to request TAMU to explore the possibility of carrying out an evaluation on the superiority of GI guns over water guns for acquiring seismic data at speeds greater than 5 knots on board *JOIDES Resolution* during one of its Legs in the coming year. These guns can be acquired on loan from interested participant(s) on a particular leg where the guns are to be used, or from institutions like Lamont or IFREMER who have been using these guns on a regular basis. If such guns can be obtained, appropriate time and funds will need to be budgeted during that particular leg where this evaluation will be carried out.

Moran commented that a performance evaluation was done on board the ship on two different cruises using borrowed LDEO guns. All worked well. Mountain clarified that water guns were tested, not GI guns. Still, he noted that it demonstrated this method of testing works. SSP wanted to reemphasize the desire for TAMU to put differential GPS on the ship. Srivastava then discussed what the data bank has been doing. There is a tremendous amount of data due to a larger number of proposals.

PCOM Motion 96-3-7
PCOM asks that JOI direct TAMU to evaluate the performance of a GI airgun for underway profiling on the *JOIDES Resolution*. Leg 172 is an opportunity to compare, during any of several scheduled seismic deployments, the quality of a GI gun vs. the water gun source that is currently in use. Whether on this or some other leg, the test should go ahead only if a GI gun plus needed hardware can be procured on loan.

Proposed: Mountain, Seconded: Natland *Unanimous*

SMP

Humphris thanked Gieskes for his efforts in the SciMP subcommittee meeting and with the new mandate. Gieskes said he likes the idea of more liaison between the panels and he expects the documents that have been prepared will help towards this. For the past two meetings, SMP has advocated a review of all shipboard equipment. Now that the groups are assembled, this will be a good effort to be overseen by the new SciMP. Visual core description was raised a few meetings ago by Brown as liaison from TECP. SMP was also asked to look into the costs of a potential microbiology laboratory. In the meantime, he was informed by Falvey that JOI is sponsoring a Workshop. Gieskes said he wants to see better communication between JOI and the new SciMP to avoid duplication in effort. SMP, in response to a message from TAMU to prepare a budget for the year, has prepared a budget as requested, subdividing items costing more than 50K, and items costing less than 50K. JOI has reported that they are already setting aside funds for a new X-ray diffractometer. SMP welcomes this. Regarding Sulfur analysis, a Leco S analyzer can also be used by a scientist if a technician is not available. Paleontologists have been looking forward to a processor for sample digestion, which will be safer and faster. Brown asked if funding for digital core imaging has been allocated. Fox replied there are funds in the FY 97 budget. Humphris reviewed the presentation and said that SMP wanted feed back from PCOM on some sort of capital replacement plan from TAMU.

PCOM Motion 96-3-8

PCOM requests JOI to request from ODP-TAMU, a list of all major shipboard scientific equipment emphasizing the following:

a. Life expectancy
b. Availability of spares
c. Software requirements
d. Maintenance requirements

Using the above information as a guide, ODP-TAMU is also requested to produce a capital improvement plan for shipboard equipment. PCOM recognizes this will be a significant effort, but hopes that this information can be made available for the first meeting of the new SciMP.

Proposed: Larson, Seconded: Mevel *Unanimous*

IHP

Fryer said she will keep her report brief because some of the issues have already been brought under the PANCH report and others will be brought up by Sager when he will talk about the advisory structure later on in the meeting. The IHP recommendations are:

- MRC report and plans for the Stratigraphic Database Center- IHP recommended to Huber that he send the diatoms but hold the forams until some agreement is reached for providing the necessary vials etc. to process the samples. The panel suggested that the Moscow Curator (Basov) be invited to attend the next curatorial meeting.
- Publications Steering Committee- IHP recommends that the JOI Publications Steering Committee ensure that once some final decision is reached with regard to the future publications of the ODP, a set period of trial implementation is provided for so that the effects of the changes can be evaluated in a deliberate manner. Further, the IHP hopes that the Program will provide for a long-term group to provide oversight of the ODP publications operations.
- Publications- IHP is concerned about the potential negative effects of the Inspector General's investigation of ODP publications and endorses fully the integrity of the publications staff of the ODP/TAMU.
  In addition, IHP supports the suggestion of the ODP operator that a printer be identified who would agree to print on demand a small number of hard copies (10-50, the final number to be decided by PCOM/SCICOM) of ODP SR and IR volumes be printed, to fulfill the archival obligations of the Program, and that copies be distributed to selected localities (libraries, ODP offices, etc.).
- New Advisory Structure- IHP recommends that the long-term functions of the ODP be overseen by long-term standing committees of some sort and that care be taken to avoid convening multiple ad hoc advisory bodies simultaneously to advise different levels of the ODP structure on the same functions.
  The IHP recommends that any JOI-coordinated ad hoc committees have liaisons from the PCOM/SCICOM and the new SciMP and that any reports from the JOI-coordinated committees go jointly to PCOM/SCICOM, SciMP, and JOI.
  The IHP recommends that the scope of the mandate to the SciMP be broadened to encompass most of the mandates of the IHP (as well as the SMP and DMP), but that the activities of these mandates be performed via some mechanism that distributes responsibility within the SciMP with outside help on an as-needed basis.

- Ethic Issues and Non performers- IHP recommends that in the future, any and all collaborative arrangements made among groups of scientist on board the ship must be approved, monitored, and adjudicated by the Co-Chief scientists of the Leg.
- JANUS- IHP recommends that JANUS Phase II be implemented as soon as possible and that new moneys be identified to support this effort. The IHP recommends going to JANUS Phase II before completion of Phase I (once the SC priorities 1-4 are complete) and made suggestions to the Operator as to what tasks could be taken over by ODP/TAMU instead of having them completed by TRACOR (see minutes).
- Legacy data-The IHP recommends that the migration of the legacy data remain a high priority.

Fryer clarified the issue regarding the shipboard collaboration recommendation that IHP initiated and said the intention was to have the Co-Chiefs be told formally of any kind of collaborative data or sampling sharing or intent to collaborate on publications, that are made on board the ship. PANCH discussed this issue, and recommended that the agreement should be lodged with the staff scientist, and the Co-Chiefs should monitor it once it is formally set up.

With regard to JANUS, IHP realized that some of the JANUS Steering Committees prioritization of 1 through 7 seemed to have changed and that there were items that were in JANUS 2 at the top of their priority list that are really needed now onboard the ship to collect data. IHP recommended that development move on to beginning JANUS 2, and give the responsibility for finishing up JANUS 1 to TAMU.

IHP alse recommended that migration of the legacy data remain a high priority.

Regarding the IHP comment on the Inspector General's investigation, Fryer explained that IHP wants to stress it fully endorses the Publication Sgroup and that there is obviously nothing that would indicate malfeasance of any sort. IHP recommends to PCOM to possibly make some comments regarding this. IHP felt that this Investigation does not look positive, especially considering that the program is now undergoing critical review now.

With regard to the new Advisory Structure, IHP suggested that the SciMP take over the mandates of the 3 service panels. Regarding the part of this recommendation that the long-term functions of the ODP be overseen by long-term standing committees of some sort and that care be taken to avoid convening multiple ad hoc advisory bodies simultaneously to advise different levels of the ODP structure on the same functions, Fryer said this should be ignored as it was already discussed during this meeting. Fryer said she will provide any additional comments when the discussions move to the advisory structure and shipboard collaboration.

Shipley asked if IG report was the one that promoted electronic publication. Malfait said that the IG has the right to look at any program at any time. Fryer said the perception is that they look at fraud.

On the questions of ethics and collaboration, Pearce said there seems to be some conflict as to whether the Co-Chief Scientists should be the overseers of this or not. Fryer said that someone not on board the ship does not know what is going on, and a third party outside cannot know what agreements are established. Natland said there is a shipboard sampling policy that asks the shipboard party to review the entire sampling program and agree upon it. Humphris explained that the problem is that those agreements are not always lived up to, and there are participants whose science suffers..

TEDCOM

Skinner said that his contribution is somewhat limited due to having to return prematurely to the UK to attend the funeral of Jack Pheasant, his colleague in offshore activities within the British Geological Survey. He also said that TEDCOM has an excellent liaison to PCOM in Jim Natland, who can provide the information to PCOM on topics that TEDCOM requests PCOM actions at the appropriate time. Skinner said that too often in the past TEDCOM only became involved in new developments "after the event" or "when they went wrong". He also said that for the future things seem to be taking a different course which hopefully will continue. TEDCOM has the expertise available for initial advice/contacts for various technological topics associated with drilling, and not only the drilling itself, and he wishes to see this expertise being used, through PCOM and its successor SCICOM as part of the forward technology planning to aid ODP science. ODP needs to do as much as they can to preserve the *JOIDES Resolution*, as this ship is the only one that they will have for many years. TEDCOM was asked to put priorities on engineering aspects they felt to be essential. TEDCOM are discussing an ODP-TAMU proposal that TEDCOM meet as a full body only once per year (prior to the Fall SCICOM) and hold sub-committee meetings as required for other matters. Since this was originally proposed, Skinner said they would now wish to have more than only one meeting per year.

TEDCOM recommendations are:

- OD21 Workshop and TEDCOM - TEDCOM will support the OD21Project as fully as possible. The *"JOIDES Resolution"* is likely to remain the only option for global ocean drilling while the OD21 vessel undergoes a test period of drilling in Japanese waters for a few years post-2003. This will have implications on any refurbishment/refit options to that vessel which may be influenced by ODP.
- TEDCOM interactions- TEDCOM request PCOM to consider agreeing to a single TEDCOM meeting per year, together with sub-committee meetings for progressing selected projects.
- Active heave compensation- TEDCOM will advise PCOM, by the December '96 meeting regarding Active Heave Compensation (AHC) which could be fitted to the *"JOIDES Resolution"* to improve coring.
- Hammer drill- TEDCOM recommend that the hammer drill project be closely monitored and be slowed down if good information and favorable results for a *JOIDES Resolution* operation are not forthcoming from SDS, even if this precludes a product for an engineering test in 1997.
- Drydocking - TEDCOM will assist ODP-TAMU in building up a priority list for drydocking requirements. Implementation will be dependent on finally agreed funding.
- Engineering Legs - Leg 175B- will test the Hammer-in Casing if available; the projected DCS test leg will not be required.

Active heave compensation and the hammer drill-in system were discussed. Active heave is more feasible now than when first presented in 1989. Following discussions at the Yokohama TEDCOM meeting regarding active heave compensation, a TEDCOM Sub-committee and ODP-TAMU met in December to determine a TEDCOM recommendation for this PCOM meeting. The sub-committee's conclusions are that an active heave compensation package is a feasible option that will improve all ODP coring and logging operations. It will also aid DCS operations, but may not, simply by its installation, allow DCS to operate without a secondary heave compensation system. There was much less unanimity on the hammer drill system, as TEDCOM though that TAMU was working with a contractor who may have been pulling the wool over their eyes. TEDCOM asked TAMU to go back and get good data and

information. TEDCOM is now satisfied, as TAMU has responded to TEDCOM concerns. TEDCOM now feels that the chances for success are very good for the engineering leg.

Skinner discussed membership problems in TEDCOM. Charles Sparks has been retired by his parent organization IFP, and France will be providing a replacement. The loss of Charles Sparks to TEDCOM is a serious blow as he is one of the foremost authorities on Slimline Riser Technology which is going to be a feature of technological innovation in the years to come. The UK operates with "alternates" and it will have to nominate a 'replacement' for Jack Pheasant in due course. They need also at least one more US member and he asked PCOM to advise the chair of TEDCOM on the US membership.

Sager asked how TEDCOM feel about the active heave compensator impact on DCS development. PCOM had been told that any delay could kill DCS. TEDCOM reminded PCOM that if they can get the active heave compensator to work, then 95% of problem is addressed. Natland will elaborate further on this in his report. Francis asked about the TEDCOM recommendations to TAMU on the dry-dock refit. Humphris said this should come through the JOIDES Office to JOI to TAMU. Skinner said he is not sure he can collect this advice and give it to Humphris. He will ask TEDCOM members to send advice to PCOM also. Regarding membership on TEDCOM, Falvey said the decision for U.S. membership will come from USSAC.

PCOM Motion 96-3-9
PCOM applauds recent developments to improve all coring operations through technological development at ODP/TAMU. PCOM approves TEDCOM's recommendation to put DCS Phase III development on hold and apply currently identified DCS funding for FY '97 and FY '98 to conversion of the primary heave compensator to an active heave-compensation system. Procurement of the new system should follow review of the simulations requested by TEDCOM.

Proposed: Natland, Seconded: Kudrass *14 For, 2 Abstain*

PCOM Motion 96-3-10
PCOM endorses TEDCOM's recommendation on the test sequence for the hammer drill and drilling casing, but defers the at-sea test until Leg 179 (April-June 1998). James Natland is appointed a sub-committee of one to identify locations for testing, and report to TEDCOM and SciCOM in the Spring of 1997.

Proposed: Natland, Seconded: Larson *Unanimous*

PPSP

Ball said the panel does not advocate or promote proposals, but is only concerned about their safety. The panel works very closely with SSP and with SSDB. Larson thanked the safety panel and noted their diligence and said that nothing serious has happened over the years. Mountain concurred, but noted that there is a down side to the conservative caution of PPSP and the TAMU Safety Panel. Mountain noted how this has negatively impacted his science and would like to see PPSP intervention earlier in the system, and suggests that an earlier PPSP review is needed. Ball responded that there will be early interaction between SSP and proponents regarding potential hydrocarbon hazards. Co-Chiefs do not get this information on safety requirements until the leg is scheduled. Humphris said it needs be conveyed to proponents. The new Site Summary forms will alert proponents to the need to get information on hydrocarbons

into the system early. Mountain noted that this is conveyed in the watchdog letter. The panel suggested that the Green Book on safety and general guidelines be updated so that it can be sent to proponents and put on the web site. Ball agreed that this is a good idea and this will be done. Francis noted that proponents do not like to do extra work, whereas they will do it if they have been nominated Co-Chiefs.

F. Leg Reports

1. Leg 168

Davis reported on results from drilling during Leg 168, which addressed the issue of fluid flow on the flanks of the Juan de Fuca Ridge. He presented a transect through aging crust along the eastern flank of the Juan de Fuca Ridge. The closest point where fluids can get into crust is to the west, and all sites are located progressively at distant locations from it, to a maximum of 3 km. Drilling was used to determine fluid flow velocities, fluid fluxes and fluid temperatures. The temperature variability on top of the crust along sediment/basement interfaces, measured at several locations, is only on the order of 2°C, probably due to vigorous mixing. At the formation scale, the system is more variable than at the borehole scale, generating a paradox. Osmotic continuous fluid samplers installed at the end of each hole will measure T and P at the bottom of the hole as the system goes back towards equilibrium in the next few years. This leg has provided better constraints on temperature and fluid flow . Sulfate (SO_4) content decreases away from the ridge, but not to zero, as would be expected. It is possible that a sulfate reservoir in the crust is slowly diffusing into pore waters, or there is an additional source in sediments, like anhydrite. Time-dependent chemical budgets will be generated from data to resolve this issue. Mg can be used as a good tracer of the temperature of reaction in upper crust because it decreases with increasing temperature of reaction.

Natland asked how osmotic sampling is done. Davis replied that 800-900 m of coiled tubing is filled with fresh distilled water at the beginning, and then salt water fills in with time through osmosis. Later on, the tube is removed and cut into portions to represent times of different fluid chemistry. This gives a time-series on fluid composition. Carter asked that if Working Groups were to be planned to develop research on hydrothermal fluxes, how would Davis suggest this be done after this experience? Davis replied that the target of this leg was only the upper crust. However, there was evidence of activity at depth, and they could now identify target areas for deeper drilling for the future. Pearce asked what is causing the Mg/T correlation. Davis said he thinks it is an equilibrium reaction, but he does not know.

2. Leg 169

Zierenberg said this Leg was technically difficult and comprised several diversified objectives. He felt this is the most important leg ever drilled. About 100 m of massive sulfide were penetrated at Bent Hill which is underlain by an addition 100 meters of feeder zone mineralization. The upper part of the feeder zone is intensively veined, and the number and width of veins decreases downhole indicating changing hydrological regimes at depth. The base of the mineralized area is a turbidite complex, and the contact is probably a fault, as imaged by logging. He said these sands are a conduit for fluid flow, and act as a separator between basalt at the base and sulfide deposits on top. Additional holes were drilled around this one, allowing a cross section to be reconstructed. Zierenberg said that Escanaba Trough was drilled to

investigate its sediment filling and hydrothermal history. This area is much more enriched in sedimentary hydrothermal components compared to a mid-ocean ridge. This is interpreted as related to a major difference in the duration of intense event of sulfide formation.

Pearce asked for volume estimates of sulfides. Zierenberg replied that it is on the order of 15 M tons. He said that often plastic core liners melted and rubber seals in the drill string even evaporated. Humphris asked if they tried to drill without liners. Zierenberg said they had aluminum liners, but that they were not used. Mountain asked if they have number on average recovery rates. Answer is 25-30% recovery at base of mound, but it is very difficult recovering core in the uppermost rubbly and unconsolidated part. Zierenberg said that hammer in casing would have not made a difference, but maybe DCS would have. Carter asked about the response from environmentalists. Zierenberg responded that they did not do any more damage than an earthquake. Robertson asked about large-scale hydrological recharge. Zierenberg replied that there was lots of local recharge, but they did not study the large-scale aspects.

G. Ongoing Computer and Publication Projects

1. JANUS

Moran reported on the JANUS Steering Committee (SC) meeting at the San Diego Port call and presented the status of JANUS development and the schedule for the deployments (see Appendix 17). Different user groups were defined: UG 1 through UG 4b/5. Regarding the sedimentary/structural aspects (in development under UG 4b/5), Applecore has been taken from the shelf (the cost is ca $300) and modified and will be deployed during Leg 171B.

Moran said that the SC is pleased with Tracor performance. She reported that several problems exist at the project management level, including: 1) bad relationship between TAMU and Tracor, 2) tendency to wait for more "community input", 3) there is bad press given to contractors on several fronts, 4) TAMRF do not share budgetary project information with the SC so it is difficult to assess priorities. In addition to the project management, TAMU has not yet shown a commitment for getting software developers on the ship, which isan essential component for the long-term success of JANUS. TAMU proposed managing Tracor personnel post-171B in personnel-training type contracts.

Regarding the JANUS digital image core description (Appendix 18), Moran reported that a work statement to define the user requirements was drafted in March 96, then an additional meeting with Applecore developer in Halifax defined core description changes to Applecore. There, digital image needs were also reviewed. The SC met in October 96 and generated a better definition of the proposed approach. The SC recommendations to PCOM are listed in Appendix 18.

Sager said he heard about the possibility of cutting off the Tracor contract. Moran replied that it would be a bad idea to cut them off now, as they have taken a long time to understand what the need is, but have shown their good intentions by taking the time to sail. Larson said that the cost of the JANUS project has had impact on many budgetary items, including publications, and he wanted to know more specifically what is wrong and how it will be fixed. Moran said that the biggest problem she sees is because the initial contract had unspecified deliverables, and now TAMU is trying to make it into a fixed deliverable contract, asking them to produce monthly reports. She felt that a change of attitude is needed from the TAMU side. Humphris said there is a strong need to send a message to JOI about the need to fix this. PCOM

will endorse the long term support of JANUS , and say that they would like Tracor personnel to sail regularly in order to complete the JANUS project.

Regarding budgetary issues, PCOM agreed that a mechanism has to be put in place so that any future development on the ship includes JANUS. Humphris said PCOM will ask that the capital improvement plan from TAMU should include software and data development. Robertson wanted to reinforce the TECP recommendation and noted the value of the Clift report and Brown report on digital data. He noted that this is the first time that he, as TECP Chair, has received information on the Applecore program. Brown wanted to reemphasize the efforts on the digital capture system and what LDEO is doing. He noted that there are many overlaps and wanted to spend the money wisely. Loutit said that Splicer and Sagan and the interface to the database are at the forefront. Moran said that Splicer has been implemented and will be checked in Charleston during the port call, but Sagan has not been completed. Fox suggested that it would be wise to step back and look at JANUS in its totality in order to determine how things can be done better in the future. It is noted that there were no deliverables in the contract between TAMU and Tracor. Fox also noted that TAMU was asked to work with Tracor, but the ultimate authority lay with the JANUS Steering Committee. Tracor was aware of this and the situation has created several problems. Fox noted that the concept of the Steering Committee is good, but it must not separate authority from the entity which is paying for the service to be provided. Fox noted that the Steering Committees has the authority to make decisions about what direction projects can go in. Falvey corrected Fox and stated that a steering committee only provides advice. Falvey said that this is between TAMU and TRACOR. Fox pointed out that Moran, Chair of the JANUS Steering Committee, has requested confidential budget information to which TAMU feels she is not entitled. Brown noted that the structural measurements need to be treated differently from other data, and that it would be nice to have a person who takes such measurements on the ship be involved with the Steering Committee. Tim Byrne is suggested. Humphris said she can pass this name onto JOI. Humphris noted that JANUS interfacing should be included in the proposed TAMU Capital Replacement plan. Also, she noted the PANCH recommendations pertaining to JANUS. Fryer and Robertson want to be sure that it is noted that there is some ambiguity between what is intended in Phase 1 and Phase 2. Moran replied that Phase 1 is for existing ongoing data collection, which is taking place now. Measurements not currently collected are included in Phase 2. Some discussion that data migration represents a Phase 3 ensued. Loutit said that this is something to be taken in to account now as it is important in the long run. In subsequent discussion, the issue of reporting was considered. The question raised was that if these are JOI Steering Committees, how will information be conveyed to the Advisory Structure.

PCOM Motion 96-3-11
PCOM is concerned that the success of the fundamentally necessary and expensive JANUS data base upgrade is being hampered by management-related issues at TAMU. PCOM recommends that JOI direct TAMU to investigate and correct any management related problems that are posing a serious risk to the successful completion of this project. TAMU should report to SCICOM at their April meeting on the steps they have taken to rectify these problems.

Proposed: Brown, Seconded: Larson *15 For, 1 Absent*

PCOM Motion 96-3-12

PCOM reaffirms its support of the JANUS Oracle database project and endorses the PANCH recommendation that funds be found to allow the completion of the initial database development (i.e., software interfaces for existing shipboard equipment, a.k.a., JANUS Phase I) and for a follow-on project to develop an electronic core description system (a.k.a., JANUS Phase II).

Proposed: Sager, Seconded: Brown *Unanimous*

PCOM Motion 96-3-13
PCOM recommends that JOI direct ODP-TAMU to facilitate ongoing evolution of the JANUS database by the following: (a) regularly sending JANUS software personnel from TAMU on drilling legs to evaluate and improve JANUS software and (2) include development of a JANUS interface into capital equipment replacement programs.

Proposed: Sager, Seconded: Moore *15 For, 1 Abstention*

PCOM Motion 96-3-14
PCOM supports the migration of existing data to JANUS. The migration of biostratigraphic data should be a priority.

Proposed: Moore, Seconded: Brown *13 For, 3 Absent*

2. Publications

Falvey showed the diagram that he had shown previously at the August PCOM meeting in Townsville, showing that publication of books of the Initial Results will be extended out to Leg 175 (Appendix 19). The traditional books of the Scientific Results will be published up to, and including, Leg 168. The diagram also shows the current outline for implementation of the publication policy which had been approved in Townsville, and which is now in place.

Fryer asked if the intent is to keep a paper copy on low acid paper. Falvey responded that an archival copy will be kept. Carter asked where advice will come from regarding the information contained on the CDs and electronic publications. Falvey responded that this will be from the pertinent experts and users. Fryer noted that one of the dreams that IHP has held is that there be an interface with JANUS. Falvey said that this is written into the policy document that was approved by EXCOM. It is intended that there will be hotlinks on the web between publications and the JANUS database. Fryer said she would like to see this in the mandate as this will require oversight by the new SciMP and she would also like to see such an expert on the JOI Publications Steering Committee. Falvey agreed to take this suggestion on board. Brown noted that CDs will go out of existence and asked what type of money will be involved in the switch to upgrade technology. Shipley stated that we know that the technology will change and can be addressed by foresight and ensuring planning to transfer from one media format to the next. Falvey said that Dave Scholl will be the Chair of the JOI Publications Steering Committee and Kappel will be the JOI liaison to the Committee. Humphris asked about a questionnaire that was mentioned by Falvey during his report. He said that this is something that TAMU is going to do. Fox added that Ann Klaus suggested to Kappel that a questionnaire be sent to the community, and he has seen a first draft.

Mevel objected that the national committees were not asked to recommend names of people to serve on this Steering Committee. Kudrass pointed out that at the Townsvillle PCOM meeting, Falvey requested the non-US PCOM members request that their respective national

committees submit names of scientists to serve on the JOI Publications Steering Committee. Humphris explained that the thematic panels were also asked to submit candidates and these have been forwarded to JOI. In response to concerns relating to the direction of publications staying in step with other geosciences publications, Falvey said that there will be certain check points along the way to ensure that the publications policy and changes are being implemented properly. Sager noted that IHP was not asked to propose representatives to the committee. Humphris explained that it is because SciMP will have to provide the person.

Mountain wanted to know why this is a JOI committee instead of a committee within the Advisory Structure. Falvey said it short-circuits the advisory structure to permit TAMU (Ann Klaus) to be directly advised. Falvey said the project plan for the new publication policy is already in place, but this is such an important issue that a JOI Steering Committee has been established. Natland asked for an explanation of how reporting will occur and clarification of the links to SciMP or SCICOM. Falvey will report to SCICOM since the Publications Steering Committee will be a JOI Committee. Natland expressed the opinion that the reporting should be to SciMP. Humphris said that the experience of the JANUS project suggests that the advisory structure is not well enough informed by this line of reporting. She added that in light of this experience, reporting at other levels must be considered. Falvey suggested that a hard line could be established to SciMP. Humphris suggested that SciMP members should be liaisons to both JANUS and the Publications Steering Committees. Fryer asked if the Steering Committee will continue in perpetuity. Falvey responded that the Steering Committee must have a sunset clause.

PCOM Motion 96-3-15
PCOM recognizes the need for rapid communication between SciMP and the various steering committees set up by, and reporting directly to, JOI, which have mandates overlapping that of SciMP. PCOM authorizes SciMP liaisons to these committees where appropriate.

Proposed: Sager, Seconded: Brown *Unanimous*

Larson stated that he was approached by participants at FUMAGES regarding the same concerns that SGPP has expressed about dropping the hard copy. This has led Larson to conclude that there is a broad concern about this matter, and this continuing problem has to be addressed by SciMP and the Publications Steering Committee. He asked at what point should publication of a hard copy cease, and suggested that the minimum requirement is a workable electronic publication, as well as acquiescence from the community to this change. Humphris reminded PCOM of the checks along the way, and requested Falvey to ensure that continuous review of the publications policy takes place as it is implemented.

Brown asked whether ODP should charge for their Results Volumes. Humphris felt that the Steering Committee could be asked to consider as a possibility.

There was also discussion of ODP funds going to support page charges in published volumes of journals. Malfait suggests that this is a pit into which ODP should not fall. USSAC-funded scientists can use their support funds to pay these charges. Carter said that the ODP Volumes in the past have provided high quality paleontological microplates, and cautions PCOM to be aware of whittling away at the edges of the program in terms of the data that ODP has provided to the entire community. Humphris said that these plates, as well and other types of data, can be downloaded from the web. McKenzie said at present it is very difficult for people outside the US to do this, as the system often crashes when one attempts to do so. Humphris did

not think that page charges are the way to go, and felt that PCOM cannot act on these recommendations now. Humphris suggested that these concerns should be passed on to the Steering Committee. Pearce said that the UK pays page charges in journals. Humphris said this should be passed on to the national committees to handle these issues. National committees can take decisions on whether they wish to fund page charges..

H. JOI Workshops Reports

1. Curatorial Report

Moran reported that the Curatorial Workshop was very successful and represented the first hard look at the original curatorial policy, which came from NSF and DSDP. The thrust of the original policy was, " this is what you cannot have", and the workshop sought to replace this tone with a flexible, positive policy. The policy was based on determining the minimum archive needed to support science in the future, and the setting up of a "sampling strategy". The new policy is broken into four components. The first is the leg-specific sampling, for which a strategy will be developed by a Sample Allocation Committee for each leg. This will be published in the Leg Prospectus, and scientists will develop their Sample Requests based on that strategy. Problems will be resolved by a Curatorial Advisory Board.

The new proposed curatorial policy distinguishes between a Moratorium phase, with leg-specific sampling and a Post-Moratorium phase (after 15 months) (Appendix 20). Moran commented on the changes to the policy and said that a major one is linked to the realization that the 50 cc per meter sample size is a guideline, although it has been used as a rule. In addition, the workshop participants want to see a formalized sampling strategy, and have also recommended that approval of the revised curatorial policy be swift, as people in the community will want to abide by it as soon as it is known. The workshop report also suggests that the drilling proposal information submitted by proponents should include initial proposed sampling strategies. The recommendations to PCOM from the Curatorial Workshop are listed in Appendix 21. Moran distributed an outline of the new ODP sample distribution policy (Appendix 22).

Humphris asked how the inclusion of proposed sampling strategies can be done at the proposal stage. Moran responded that by doing this, proponents will have a better idea of how many cores will be required to achieve their objectives, and it will influence the number of cores collected. Humphris expressed concern for how this would work for a hard rock proposal. McKenzie pursued this line of questioning and asked how the policy differentiates between hard rock and sediment legs, as recovery rates can be quite different. Moran said that the uniqueness of the hard rock holes is addressed in the workshop report. Sager had concerns about making out a sampling plan in advance without knowing what might be recovered.

Sager was concerned that people on board the ship with a more flexible policy will be encouraged to oversample the cores. He feared that inexperienced Co-Chiefs may be bowled over by scientists who will want to take away more core than they will actually ever use. Sager further noted that SciMP will have to monitor this policy and that this committee is rapidly becoming overloaded with work. Natland noted that there are some existing policies in place to avoid oversampling and asked what this new policy does to that older policy. Moran replied that the old one is gone. Moran noted that the participants of the Curatorial Workshop represented a lot of shipboard experience. Natland said that there was an ODP cruise with open sampling (Leg 37) once and that the participants tore the core apart. Natland said that the existing policy has

worked well. Moran pointed out that there were four hard rock people on the committee and they disagreed with the concerns that Natland expressed. Humphris noted that there is a difference between soft and hard rock cores, and stricter guidelines might be needed for hard rock legs. Johnson said that the proposed policy is a restrictive shipboard policy and a flexible post-cruise sampling policy. He noted that the shipboard frenzy is very real. Mountain noted the cost implications of shorebased sampling parties (travel, etc). Sager said there must be a two-tiered sampling policy. Shipley applauded this effort and noted that ultimately there is the problem of over sampling at sea, adding that the role of the external board may be significant. Shipley said that it is important to have someone to backstop the Co-Chiefs.

Falvey said that there is pressure in the community to see changes happen quickly. This must go first to EXCOM and then ultimately ODP must have NSF's permission to change the policy. PCOM could in principle endorse it so that it can be inplaced by the end of March. If a thorough review is done, then there will be a significant delay. Fryer wanted to see the non-performer issue addressed in the policy. Humphris wanted PCOM to read the draft policy and see whether they can endorse it in principle and then recommend modifications, which can be dealt with by JOI and subsequently included in the presentation to EXCOM.

Regarding shipboard collaborations, Moran noted that there are cases where samples collected on the ship have then been passed on to another person. She noted that the participants of the Curatorial Workshop felt that this is the obligation of the person who collects the samples. They were split on whether such scientists should ever sail again on a ship as long as the dispute remained unresolved. Sager pointed out that the non-performer issue has always been difficult to address. Although letters have gone out to non-performers and their national committee offices, ODP cannot actually dictate to the national committees whether people can or cannot sail again. Moran noted that there are a number of rules to be followed that will help address this. Humphris noted that TAMU has been policing this, but the exceptional cases need to come back to the Advisory Structure, and SciMP is the place for this. TAMU is charged with the implementation of the policy. Sager noted that dissatisfied scientists will always take their grievances directly to the Advisory Structure. Moran noted the recommendation of the establishment of the CAB, which will be a permanent group that will deal with these sorts of problems. PCOM discussed whether they should endorse the policy without the inclusion of example sampling strategies. PCOM agreed that this will be left to curation at TAMU to implement. PCOM set up a small sub-committee to look at the policy and make recommendations the following day. The sub-committee consisted of Mix, Pearce, and Kudrass.

PCOM Motion 96-3-16 PCOM endorses the recommendations of the JOI Sampling and Curation workshop as revised by PCOM.

Proposed: Larson, Seconded: Moore *14 For, 1 Abstain, 1 Absent*

2. Co-Chief Scientists' Workshop

Falvey reported on the Co-Chief Scientists' Workshop, hosted at JOI (see Appendix 23), at which Co-Chiefs from Legs 160 to 169 were represented.

- The issue of shipboard staffing was among the many issues addressed. Co-Chiefs requested more flexibility from non-US partners in choosing shipboard participants. Non-US partners nominate only two people, requiring the US to pick up the responsibility of achieving scientific balance.

- Public Affairs were discussed and the improved communications between ship and shore were noted. Regarding press releases, it was felt that the science should come first, then the program as the means of delivering the science, and only then should agencies and organizations be promoted in press releases.
- PCOM was asked to be more aware of the pitfalls of trying to achieve too much with respect to combining proposals, especially in creating multidisciplinary drilling programs. It was felt that the original proposals were always too optimistic and Co-Chiefs then had to modify the science that had been voted on and approved by PCOM.
- Flexibility in when salary in JOI/USSSP grants can be used was discussed and JOI pointed out that JOI/USSSP has always been flexible, although this has not generally been realized.
- Regarding shipboard scientist job titles, TAMU will redefine these according to the scientific needs of each leg. The idea is to match science to the leg instead of having fixed scientific job categories.
- Another issue considered was the shipboard laboratory. It was felt that ODP-TAMU should organize Working Groups for each lab and produce a clear statement of why each laboratory exists.
- VSP was considered very important, and LDEO was asked to bring before SCICOM the benefits of this. It was felt also that shipboard photography needs to go digital as soon as feasible.
- The JOIDES Office has been asked to alert national ODP offices about emerging site survey needs connected to highly regarded ODP proposals. In addition, the JOIDES Office should advertise the following year's science plan in EOS to attract scientific participation.

Mountain said that it is a great idea to have JOIDES Office alert national ODP offices about emerging site survey needs connected to highly regarded ODP proposals, although this is already conveyed by the SSP watchdog very effectively in the watchdog letter to proponents. The main point here, according to Falvey, is that a bigger flag is raised if this comes through the JOIDES Office. On the issue of shipboard staffing, Fox pointed out that Zierenberg's Leg (Leg 169) had 8 sulfide petrologists (7 more than he needed). As a consequence, he couldn't get the one or two that he wanted himself, and it created havoc on board. This problem arose because the member countries came forward with only one or two names each. Humphris will write to the National Offices on this point. Robertson raised the human management problems that crop up leg after leg. He noted that as a Co-Chief himself, he did not have much guidance on the sociological and psychological aspects of an ODP cruise. He felt the problems could be avoided with proper preparation. PCOM agrees that this it is an issue.

I. Implementation of New JOIDES Advisory Structure

1. EXCOM Outstanding Issues

Humphris reviewed the EXCOM outstanding issues which include OPCOM membership, SciMP mandate and membership, and the need for Working Groups. Regarding the PANCH Recommendation on OPCOM, Humphris pointed out it should not say voting as the members of OPCOM will not vote, but operate by consensus. Humphris asked for any changes that PCOM wanted to see. Mountain asked for clarification on the difference between liaisons and non-voting members. Liaisons come from other panels and operators within the advisory structure and provide advice to the Committee of six who makes the decisions. Sager said that SciMP, and

other service panel chairs should attend both meetings. Larson said that the concerns from EXCOM are to do with proportional representation.

PCOM Motion 96-3-17
PCOM reaffirms its intent that OPCOM be a SCICOM subcommittee of six, chaired by the SCICOM chair. The other five members, chosen by SCICOM, will be two other SCICOM members and three non-SCICOM members from the general ODP community.

Proposed: Larson, Seconded: Mix *Unanimous*

The next issue discussed concerned the differences among PPGs, DPGs and WGs. Humphris explained the differences between the three, but pointed out that the mandates for the PPGs and WGs overlap. Mevel totally supported the PANCH recommendation to discard the Working Group category. In response to a query from Sager, Humphris said WGs can be called PPGs. The current mandate for the PPGs can be modified to include science and other functions.

PCOM Motion 96-3-18
PCOM recommends that JOIDES Working Groups (WGs) be deleted from the new JOIDES Science Advisory structure and that their mandate be merged with that of Program Planning Groups (PPG). The revised mandate and purpose for PPG are as follows:
General Purpose
Program Planning Groups (PPGs) are small focused planning committees formed by SCICOM when there is a need to develop drilling programs or technological strategies to achieve the goals of the Long Range Plan.
Mandate
PPG will advise upon drilling/technology strategies and proposals for major scientific objectives that are not adequately covered by existing drilling strategies or proposals. Drilling proposals arising from PPG meetings must be submitted to the JOIDES Office by individual proponents or groups of proponents. PPG will also foster communication between the ODP and other major geoscience initiatives.
Reporting
PPG will report to the appropriate panel in the JOIDES advisory structure as directed by SciCOM.

Proposed: Sager, Seconded: Pearce *15 For, 1 Abstain*

2. Scientific Measurements Panel

Sager explained the deliberations of the PCOM subcommittee on the Scientific Measurements Panel and detailed their interaction with the service panels which will be disbanded. These panels worked very effectively with the PCOM subcommittee. The panels felt that none of their mandates could just be eliminated. Since SciMP cannot do all of their previous tasks, management issues will have to be handled by the operators and WLS. Sager reviewed the mandate that the PCOM subcommittee on the Scientific Measurements Panel had written up and the flow of information to and from SciMP. Larson asked if SciMP will report in parallel to both OPCOM and SCICOM. The answer is no, and will be addressed under Reporting Paths. Sager said that the subcommittee saw a need for two types of advice: at one level a small ad hoc advisory committee composed of one or two experts and at another level, WGs with a finite lifetime tasks with specific charges. Two meetings per year are proposed. Payment for

participation/attendance of these individuals on advisory committees and WGs is an issue that is dealt with by different countries in different ways. Carter commented that the term Working Group is one understood by the community and might be appropriate in this case. Humphris and Mevel suggest that these proposed advisory committees and WGs should simply be called ad hoc advisory committees, which would eliminate confusion (and PCOM had just decided to eliminate the term WGs). Another point of discussion was why there is a need for a liaison from NGDC. NGDC has a contract with NSF to be the long-term repository of ODP data. It is also one of the largest databases, so it is useful to have a representative at SciMP meetings. In the past, this individual was a member of the committee and attended all meetings as a voting member. Shipley said that he prefers the NGDC representative to be an offical member. Carter said that having the person from the NGDC serve as a liaison to SciMP elevates the NGDC to an important position to which it is not entitled as it is not part of the JOIDES structure. Fryer mentioned the newly established German Stratigraphic Center of which Bill Hay will be in charge, and hence a representative of that could be an important SciMP member.

Sager presented the Reporting Path that allows operational advice to flow to OPCOM and then to JOI (Appendix 24). However, advice with scientific implications will be passed to SCICOM. Some comments were made regarding the reporting path diagram. Humphris pointed out that the diagram should be entitled "Information Flow" instead of " Reporting Flow". Mix suggested that the information lines on the left be removed.

Sager discussed the changes connected to the elimination of the three service panels (IHP, DMP, and SMP) and noted some tasks will have to go elsewhere. There will be little or no refereeing of policy disputes by this panel. There will be less expertise sitting on the Panel. There will be little oversight of third party tools, and no review of the logging prospectus. LDEO-BRG will have to oversee third party tool development. Finally, Sager listed the requests for WGs that were provided by the now disbanded service panels. SMP has asked for laboratory advisory committees. DMP has asked for a group on seismic profiles and one on log quality. IHP has a sub-committee on long-term paleontology and stratigraphy. This is a very important database that needs to continue to be dealt with, particularly during data migration. In addition, Sager noted that it might be extremely difficult to find a Chair for the Panel because of the enormity of the task. Some members from DMP and IHP have expressed interest in continuing, but none of the Chairs of the old service Panels wishes to take on the Chair of SciMP. PCOM noted the efforts of the Subcommittee and the service panel chairs resolving this issue and thanked them for their hard work.

Moore reviewed the DMP Recommendations from the panel's final meeting. The panel had recommended that proponents now be required to provide logging information on the Site Summary forms. Ellins noted that the Site Summary forms are being revised by Quoidbach at the SSDB and said she has written to Rick Jarrard to request that he communicates with Quoidbach on the matter.

PCOM Motion 96-3-19

PCOM endorses the following statement of purpose, mandates, membership, reporting paths, meeting guidelines, and liaison assignments for the Scientific Measurement Panel (SciMP).

General Purpose

The Scientific Measurements Panel (SciMP) will contribute information and advice to the JOIDES community through the Operations Committee (OPCOM) with regard to the handling of ODP

data and information, on methods and techniques of ODP measurements, and downhole measurements and experiments.

Mandate

SciMP will provide advice on ODP information related to scientific measurements made onboard *JOIDES RESOLUTION* and alternate platforms, within and around boreholes, and on samples collected by ODP and associated programs. Its specific mandates are to develop policies concerning said measurements and to furnish advice about scientific measurements , which will assist the Science Committee (SCICOM) and OPCOM in the formulation of annual and long term plans.

Specific responsibilities for the panel are publications, databases, curation, computers, shipboard equipment usage and needs, measurement calibrations and standards, and borehole measurements, equipment, usage, and needs.

Reporting Path

SciMP recommendations will be sent to OPCOM. The SCICOM chair will decide whether these are operational or scientific issues. If purely operational, the recommendations will go directly to JOI for action. If having scientific implications, the recommendations will be passed to SCICOM for consideration.

Membership

SciMP will consist of sixteen members proportionally representing the ODP partners (10 U. S. and 6 non-U.S.). The term of membership will be three years. Members should have expertise representing the three core areas of the panel mandate, namely information handling, downhole measurements, and shipboard measurements. Ideally, many of the panel members will have experience onboard the drill ship, *JOIDES Resolution*. With SCICOM approval, the panel may bring in additional information about its mandate issues by setting up ad hoc advisory committees whose lifetimes are mandated by SCICOM.

Meetings

SciMP will meet twice a year, mainly at the location of one of the Science Operators to encourage interactions between the Panel Chair and Operators. Other acceptable meeting locations include port calls of the *JOIDES RESOLUTION* and other locations appropriate to the Panel mandate. These meetings will be held prior to OPCOM meetings so the recommendations will be quickly acted upon.

Liaisons

SciMP should have non-voting liaisons from SCICOM, JOI, the Operators (ODP-TAMU and LDEO-BRG). A liaison to TEDCOM is recommended for collaboration on development issues. Liaisons to other JOIDES advisory bodies may be sought with the approval of SCICOM.

Proposed: Carter, Seconded: Johnson *Unanimous*

3. Mail Reviews- Report from Subcommittee

Natland reported from the subcommittee on mail reviews and showed the guidelines they have come up with (Appendix 27). The outcome is that the structure we have now, nurturing proposals, is working very well, and only those proposals that are almost ready for scheduling would be sent out for review. Proponents would have the choice to put their proposal out for review immediately by asking in the cover letter. Before they can be sent out for review, proposals must meet a list of technical requirements.

Carter asked if there is already a length limit in proposals. Ellins said that such guidelines were put in place 2-years ago on the recommendation from PANCH, and this is

known to all proponents. Mevel suggested crossing out the wording regarding *JOIDES Resolution* capability, as this restriction will not apply to phase III. Humphris said that PCOM should first put emphasis on science, then on technical aspects. PCOM discussed whether a 2B or a 2C in site survey readiness should be considered a criteria. Humphris said that technical aspects should be handled within the ODP structure, whereas scientific advice should be sought from external reviewers. Ellins asked if SSEPs or external review will decide whether a proposal is site-survey ready and said that some site survey readiness must be evaluated by SSEPs. Mountain agreed and said it is risky to have this decision made by reviewers, who might not understand entirely site survey readiness requirements. Humphris noted this a point of concern and will look more into it.

Mix commented that there will be lots of work for outside reviewers. Mountain said we should try not to clog the system with immature proposals. Shipley said that if the PI can decide if they want proposal to go out immediately out for outsides review, all of them would choose this option. He thinks this will allow bad proposals to go out, damaging ODP's image. Carter said that it is unrealistic to send out 12-13 proposals, as the objective of the review is to decide what goes into the prospectus, therefore he thinks that 20-22 is an appropriate number. Malfait said he is in favor of reviewing anything that comes in as soon as it is considered ready for review, and that it is arbitrary to decide what is 2B or 2C. Malfait also commented that some countries will make site survey data funding available only if a proposal is in the system. Shipley commented that whatever is decided, it will be a difficult transition and suggested that it is important to keep in mind that the program is multinational and different languages are a reality. Mevel said that many proponents will not want to have their proposal sent out before they have interacted with SSEPs. Mountain said that there is the need to assure proponents that they will benefit with interaction from the SSEPs. Pearce suggested that proponents write an abstract, which could be reviewed, as a first stage, then if comments are positive it could then be rewritten as a more complete proposal. PCOM's general perspective is that not all proposals should go out for review, as that could damage ODP's image. Carter asked if we need ta mail review process. Humphris said that PCOM has suggested it and EXCOM approved it. McKenzie said that as the whole system has changed, maybe it is time to change the proposal system. One idea would be for letters of intent or preliminary proposals to be submitted, which are then nurtured and given feedback by the Panels. After this, proponents can come back with a full proposal, which will go though the review process. PCOM thought this a good approach, and suggested this approach be developed, together with characterization of the requirements for two levels of proposals.

Humphris said that confidentiality arguments require that science reviews are not handled by the JOIDES Office. Humphris and the subcommittee will work with Malfait and Falvey to develop a plan and will circulate it to PCOM members in January for comments.

4. Meeting and Proposal Schedule

Humphris showed the schedule regarding the new proposal annual cycle and indicated that the proposal deadlines will be moved to May 15 and September 15 to have time to get proposals logged and sent to the SSEPs. PCOM had no suggestions for changes to this schedule.

5. Procedures for Nominations to SCICOM and SSEPs

Humphris asked all the international members to briefly review nomination procedures for the country/consortium which they represent. Suyehiro (Japan) said that a meeting to

nominate one person for SCICOM and one for each SSEPs took place on December 2. The selection criterion was for a person with broad scientific understanding. Kudrass (Germany) said that the whole community discusses and nominates the panel members, and EXCOM and SCICOM representatives are nominated from the Geological Survey. He said they are now trying to change, and have established a subcommittee that will meet in January. Pearce (UK) said that they will have one member from each appropriate thematic panel to go on to SSEPs, just for the transition year. The person on SCICOM is selected by NERC- the funding agency. Carter (Canada-Australia-Korea) said that the selection process is very similar to that of the UK. The national science committee will meet in March, so possibly current panel members will continue for the first year. Larson (US) said that nominations for SCICOM are considered by a nominating committee who will give a list to JOIBog to decide. He said he expects that a majority of current membership will continue, and said that those who want to continue, and whose term has not expired, should submit a letter to express their intention to continue. They do not yet have a mechanism to choose members for SciMP and SSEPs. This will likely be done by USSAC as a committee as whole, and Larson would like to see PCOM Chair there to advise on scientific balance. McKenzie (ESCO) said they try to nominate people in a way to attempt to balance northern and southern countries. The ESCO chair is the PCOM member, and will also be the SCICOM member. Thematic panel and service panel memberships were devised also to achieve balance between northern and southern countries, in proportion to the money they pay. The Italians pay more, and they have more representation on panels.

Humphris expressed her concern about thematic balance on panels, and said that one way to achieve this would be if national committees gave a list of names to choose from. Another option is that she corresponds with the national representatives and try to find together the best solution. PCOM agreed that Humphris will try to work with national committees in order to achieve the needed thematic balance. Natland asked if there is one chair or two in the interim panel. Humphris said there is one -John Ludden - but they have not yet discussed how the meeting will be organized.

6. Creation of PPGs

Humphris said that many have been suggested and clearly not all of these can be appointed. SCICOM should appoint the PPGs, so at this meeting only those PPGs that are key within the next six months should be appointed.

Mevel suggested a biosphere PPG and Humphris agreed that this is important. McKenzie suggested calling it the Deep Biosphere Pilot Project, to match the wording in the LRP. Shipley agreed with McKenzie and said it was the only PPG that he felt is necessary to set up at the present time.

PCOM Consensus 96-3-20 PCOM will set up a PPG entitled the Deep Biosphere Pilot Project PPG.

Suyehiro suggested that a PPG should be set up for borehole instrumentation. Humphris said it was an important group, but asked if this is critical within the next six months. Suyehiro said he thinks it is necessary, as there are a number of initiatives in various countries that are not well organized at present. It would be helpful to have one group coordinating this effort as proposals are being written. Mevel agreed and added that this group could also look at the CORK maintenance problem and long-term planning. Larson said PCOM should be careful and

not have "PPG proliferation" as there will be only a limited number Fox pointed out that there should be more than six to preclude any ideas that each should get 1 leg/year. Humphris said that 7-10 PPGs is probably the limit. Carter said there should be cheaper ways of dealing with maintenance of downhole instruments so that the drillship does not have to be used. All this needs planning in a strategic way, and it is time to start. Larson asked whether the mandate would include all instruments installed in boreholes. The general feeling was that this would be the case. Mix questioned whether this was recreating the DMP? Mevel responded the idea was long-term observations, not downhole measurements. Humphris asked whether it should be called "seafloor" or "borehole" observatory. Brown preferred "seafloor" because not all instruments necessarily go down the borehole. Sager said it needed to be "borehole" or it would include any instrument on the seafloor. Humphris pointed out that part of the idea was that boreholes would be part of a seafloor observatory. Pearce said that an observatory program can be linked to other international programs like InterRidge and should not be limited to seismic instrumentation. Humphris said that her preference was to make it as broad as possible because the borehole nees to be linked to seafloor instruments. PCOM agreed to set up a PPG on long-term observatories. Kudrass was concerned that the ION community would be excluded because there are many other groups. Humphris responded that they would be an important part of the PPG.

PCOM Motion 96-3-21 PCOM will set up a PPG entitled "Long-Term Observatories" that is concerned with long-term instrumentation both in and around the boreholes.

Proposed: Larson, Seconded: Mevel *15 For, 1 Abstain*

Humphris requested that PCOM members provide names of possible Chairs and PPG members to her, and she will then circulate the list, together with draft mandates to PCOM by e-mail.

J. FY '98 Schedule Revisited

1. The FY '98 Schedule

Francis presented the two options, A and B, with the proposed Legs (Appendix). Option A includes the W. Antarctic Peninsula. However, in order to do this in the weather window, the hammer drill-in casing test would have to be postponed until FY'98, and could be included in a transit with the NERO operation. Option B excludes W. Antarctic Peninsula, but includes Mariana-Izu. This would make a very long transit to NERO (40 days transit). In both cases, the ship and schedule would be well placed in early December for another high latitude leg. Francis said that both options can accommodate a Conoco project, which could still be inserted sometime in the summer.

Moore asked when is the dry-dock. Francis replied it will be in mid '99. Brown was concerned about abandoning Barbados CORKs when PCOM had made a resolution to do it if hammer drill-in casing was not ready. In terms of budget, in Option A there is the cost of an ice-breaker; in Option B there are the costs for reentry cones.

Natlanc commented that the original proposition for Leg 174B was to get to a location with a well-characterized image of the bottom to find out whether the hammer drill-in casing,

with its reentry cone, could be put on to a sloping surface. That was why the MARK area was selected. In the Indian Ocean, the platform at Hole 735B is flat. There may be some sites near NERO or, if a test of spudding in to basalts was in order, there are some seamounts near Hole 735B. We currently do not know of a well-imaged sloping surface in the Indian Ocean. Francis commented that the NERO site(s) are sedimented, but drilling will require drilling into basement, so one suggestion would be to test the hammer drilling down that hole. This would be a different test from the original one.

Mountain asked what are the barebones operational costs of transit without scientists for 40 days, and where is the crew exchanged. Fox estimated about $360K. They would use not a full crew, but maybe JANUS people, people to fix labs etc. Mountain was concerned with efficiency of manpower with Option B. Larson said this is the wrong question to ask, as both options have long transit times so the question is what is the difference. Fox presented costs above standard leg costs for each option, assuming he could find a cheaper ice boat for $700K. Option A comes out at $1.542K, and Option B at $981K above standard costs.

Mevel said she understood why Kerguelen was not in the schedule because of the weather, but felt uncomfortable that Kerguelen and Prydz Bay were listed as alternates for a FY '99 leg when Kerguelen was much more highly ranked. Humphris pointed out that PCOM could schedule a leg into 1999. Pearce noted that if Kerguelen was included in Option A, then all the main groups - the LIPs group, the W. Pacific group, and the Antarctic group- would have a leg in the schedule which would be good for the community. Sager noted that Kerguelen doesn't cost $1million extra, so if it is placed in the weather window for the FY '99 schedule, the additional cost of the ice boat in FY'98 won't be repeated in FY '99.

Shipley pointed out that, without pre-judging how to make savings in the FY '97 schedule to meet the whether window requirements, 2 days needed to be found for Option B and 10 days for Option A. Discussion followed on the necessary characteristics of a site to test the hammer drill-in casing. Francis said the hammer could be tested in the vicinity of Site 735 or at the NERO site, and the casing possibly at Hole 735B. Some proposed imaging cruises to the SW Indian Ridge might reveal some sites. Natland pointed out that bottom images and a bare-rock outcrop are needed, not just bathymetry or sidescan. Fox felt there had to be some suitable sites near the Atlantic transform. McKenzie suggested testing on a flat surface would at least test the tool if not in the right environment. Humphris asked what the impact on the program would be if the hammer drill-in test does not happen until '98. Mevel said the program is not hurt if tests is delayed, and suggested the test be done later. Natland said the targets would have to be researched. He was also concerned that a delay would impact offset-section proposal development. Humphris requested views on whether to keep hammer drill-in casing in the FY '97 schedule. Pearce expressed his concern over the timing and felt he would prefer to see it done properly and slightly later than it being rushed. Shipley felt that, based on previous experience, he would be in favor of delaying it.

Mountain mentioned there are good reasons for postponing the engineering development by six months and this will not take 10 days away from science. In addition, the probability of success will increase if the right place is found. Kudrass said there is not an immediate need to have this test now in view of legs likely to be scheduled for FY '98.

Humphris asked conflicted people to leave the room as the following discussion would lead to a vote. Humphris asked for a straw vote on delaying the hammer drill-in casing until FY'98: 10 in favor, 1 against, 5 abstentions (2 out of the room).

Humphris asked if there were any objections to removing Prydz Bay as an alternate to Kerguelen. Mix was suggesting it be "penciled in", but that was not Mevel's intent. Sager suggested leaving this issue until the Option was decided. Humphris said that the postponement of hammer drill-in casing implied Option A, since Option B did not include it. Mountain asked why there is no Option C to transit west instead of east. Francis said one cannot sail west in the Pacific because it is against the weather.

Mix suggested voting on the FY'98 schedule as far as Leg 182 to avoid the Kerguelen issue. Natland recommended adding a test of the hammer drill-in casing to Option B so that both are equivalent in that sense. Humphris called for a straw vote on Option A and B as far as, and including, Leg 182: Option A - 10 in favor; Option B - 1 in favor; Abstentions - 5 (2 out of the room).

Humphris then asked for a straw vote to add Kerguelen to the schedule: 12 in favor, 4 abstentions (2 out of the room).

Humphris then said the next issue was to deal with the 10 days that are needed to move the FY'98 schedule forward. Humphris reminded PCOM that there was a motion that, if time was available ,it would be split 50-50 between New Jersey and Barbados CORKs. The Option A schedule implies that 10 days have to be found. The options are to take it from Leg 174B or find it from other Legs. Brown pointed out that there are experiments running at Barbados that it would be nice to get the data from, so perhaps the time needed could be less. Humphris asked if there was a time estimate needed to retrieve the data. Francis responded that, with transit, it would be about 5-6 days. Sager asked if the schedule can be adjusted, and Francis responded the time had to come out of something. Mevel and Sager expressed concern about follow-up of instrumentation in holes and their impact on drilling ship time.

Mountain said that with respect to sea level issues, he has been fighting for a long time and finally shallow water drilling has been recognized as an area that needs effort. PCOM has been waiting for this opportunity for a long time. Humphris asked what legs would PCOM be willing to cut. Francis said that changes in the schedule should not be before April, as people have already purchased tickets. Mountain said Kerguelen might be restricted to shallower sites, resulting in shorter drilling time. Kudrass said Benguela is already penalized by long transit times. Francis said that the Prospectuses have appeared already up to Leg 173. Sager suggested that time could be taken out of those with a lot of drilling time, such as Iberia, 735B, and Legs 177 and 178. Humphris asked PCOM if they would vote on taking time from legs to accommodate Barbados CORKs, going against what was already decided, with all those limitations already discussed. This implies that six days have to be taken away from 97-98 schedule. Fox said that in FY' 97 the leg that stands out is the New Jersey margin, where there are incredible constraints on operations, it is high profile and need sextra time. Humphris asked if PCOM wanted to go against the original recommendation, and is willing to find time for CORKs? Pearce suggested that the previous recommendation be removed and then decide on the issue without CORKs and New Jersey being tied together.

PCOM Motion 96-3-22
PCOM rescinds PCOM Motion 96-1-9, regarding the reallocation of time that may be available on Leg 174B as a result of not being able to do engineering tests on a 50-50 basis to leg 174A and LOI 69, in the light of new FY'98 schedule information and operational constraints.

Proposed: Pearce, Seconded: Brown *7 For, 2 Against, 3 Abstain , 4 Absent*

Humphris asked for a vote on whether PCOM wishes to take time off legs in '97 and' 98 to accommodate Barbados CORKing: 5 in favor, 3 against, 6 abstentions (4 absent). The vote did not pass. Humphris then asked for a vote on whether PCOM wishes to take time off legs to add time to New Jersey: 2 in favor, 7 against, 7 abstentions (4 absent). The vote did not pass. Ellins then pointed out that voting should be redone as there are people conflicted for '98, but not for '97, so they should vote on this again. Bob Carter is the only one to whom this applies. Taking this into account, there are now 2 people conflicted (Mountain, Natland) plus Larson who is absent. Humphris asked for a vote again if PCOM wishes to take time off legs in 97 and 98 to accommodate Barbados CORKing: 6 in favor, 4 against, 5 abstentions. The vote did not pass. Humphris then called for a vote as to whether PCOM wanted to take time off legs to add time to New Jersey: 2 in favor, 8 against , 5 abstentions. The vote did not pass. Hence the time from Leg 174B will be used to move the schedule forward to accommodate high latitude drilling.

PCOM Motion 96-3-23
PCOM approves the following program for FY'98 and beyond:

Leg 176 Return to 735 B
Leg 177 Southern Ocean Paleo Oceanography(464)
Leg 178 W. Antarctic Peninsula
Leg 179 Transit and NERO and Hammer Drilling
Leg 180 Woodlark Basin (447)
Leg 181 SW Pacific Gateway (441)
Leg 182 Great Australian Bight (367)
Leg 183 Kerguelen (457)

To assure appropriate weather conditions in the Southern Oceans, Leg 174B is to be shortened 10 days by delaying hammer drilling tests.

Proposed: Shipley, Seconded: Sager *12 For, 0 Against, 4 Abstain*

Humphris said PCOM needs to give the ADPG group some advice on drilling priorities, so a small group of Mix, Kudrass, Mountain, and Hay met to formulate some advice.

PCOM Consensus 96-3-24
PCOM, noting that logistical constraints will limit drilling and logging time off the West Antarctic Peninsula (scheduled as Leg 178) to about 37 days, recommends focusing on high priority objectives in this leg by:

1. Eliminating sites in Bransfield Strait from the drilling plan.
2. Increasing operations in Palmer Deep to include a short seismic survey, and quadruple APC coring at Site APSHE-13A (and/or its alternate) with penetration greater than 50 m if possible within the limits of seismic imaging and safety considerations.
3. Using ODP/TAMU estimates of time required for drilling, logging, survey, and transit.

PCOM also notes that budgetary constraints preclude LWD operations on this leg.

PCOM Consensus 96-3-25

PCOM thanks the Antarctic DPG for its tremendous effort, on short notice, in developing a coherent and comprehensive drilling program for the Antarctic. Acknowledging this accomplishment, PCOM disbands the Antarctic DPG.

PCOM needs stronger justification for a CORK at Woodlark. The JOIDES Office will request this from the proponents.

2. Co-Chief Scientist Nominations

This part was not recorded in minutes to maintain confidentiality of the discussion.

K. FY '98 ODP Budget

1. FY '98 ODP Program Budget

Falvey reviewed the budget for '98 and said he will not know where to put the cutoff, until the fixed base costs are fine-tuned (Appendix 25 and 26).

2. PCOM Discussion and Prioritization of Budget Items

Falvey said he needs PCOM advice if there are items that need to be moved significantly in this list of priority. Fox said that numbers related to JANUS can come down to $300-350 K, or be reduced by a 1/3 to 2/3 because of the savings associated with Applecore. Humphris said that DCS development is a large number for '98 and would like to know if it is likely to change, now that the project is moving in a different direction? Fox said those funds are for the active heave compensation project. Goldberg pointed out a line item related to active heave compensation-logging evaluation, and asked why this is considered as a separate expense, when there is a heave compensator project which is allocated money. Goldberg suggested either to have it done at a different time or added to the rest of costs related to the active heave compensator project. PCOM recommended linking the two costs. Moran said that equipment for imaging cores (JANUS) and the system that Goldberg presented are similar and could be viewed together. Carter asked how the ranking was designed as leg-related costs for logging are low in the list when they should be a priority. Moran said that some costs estimates are related to JANUS Phase I completion, which should be considered priority when doing the budget. Pearce said that as '99 will be cheaper as there will be no ice boat, XRD replacement could be done then. PCOM agreed to defer XRD costs until FY '99. PCOM agreed to remove the expenses related to a microbiology lab on the ship from the list, until the results from the workshop are known. Regarding the costs related to GHMT in Woodlark, Goldberg said that priorities for that tool are low compared to other Woodlark tools. Goldberg talked about the Atlas of Borehole images and explained that it is taking advantage of FMS data and core data, looking at core images identifying facies. It would be a CD atlas that could be seen on screen. Humphris asked if it could be postponed to a time when there is no ice boat, unless it would make a difference. Goldberg said it could start in one year, so PCOM decided to postpone this to a later date. Humphris asked what is re-curation. Fox said it is getting old cores in shape to be sampled at all the repositories

L. 5-yr Program Plan

1. Status of Science Implementation Plan

Humphris gave an overview of the evolution of the Science Implementation Plan since Townsville. She noted that since this was sent out in October, there has not been much feedback from PCOM. Humphris said that all comments have to be returned by January 2nd. Then she will revise and pass the document around once more before it goes to JOI. She also noted the PANCH recommendation on the five year plan and their concern that the topic " active convergent margins" is missing from the plan. Pearce disagreed and Shipley noted that the way the document is set up that active convergent margins is spread around. Humphris reminded PCOM that this document needs to interface with the LRP. PCOM agreed with PANCH that the diagrams need to be simplified and inserted into the text to avoid the appearance that the document is too proscriptive .

Humphris noted that this document is intended for ODPC, and it is not aimed at the scientific community. Falvey said that this is meant also as a document that can be shown to the national committees to get funding. Carter said that this document would be used by ODPC to audit ODP, and he expressed concern that this could be detrimental if objectives are not attained. Mix reiterated that ODPC wanted ODP to show how they would achieve the LRP and they wanted budget scenarios, and he said this is an opportunity to communicate to them a vision of what we will do as an integrated program. However, he pointed to the danger that ODPC may go through and select parts that they do not want to support if it remains too explicit. Humphris said maybe it needs to have an overarching statement at the beginning and then say that a certain number of legs is needed to achieve this. Falvey said that the LRP represents the global integrated strategy, but it is not good enough to justify how they will spend the money. A new level of detail is required, and it needs to be one that neither overspecifies nor underspecifies. Pearce noted that that the format of this is exactly as JOI requested. If requirements have changed then JOI must specify what they want changed. He pointed out that this was requested by ODPC for budgetary reasons. Pearce was concerned that this could be used to replace the LRP, which is not how it was intended.

Humphris noted that this document will be revised before it goes to NSF and the National Science Board. Fox said that ODPC wanted to see evidence that ODP is addressing high priority science problems of global importance. Humphris asked PCOM to scrutinize the document which must be sent to JOI in time for JOI to respond in terms of the budgetary implications and then to submit it to the EXCOM Agenda Book by January 10. Mix expressed concern about the budgetary stuff and felt that JOI will be making decisions regarding low and high budget scenarios, and he felt that PCOM should be making this decision. Falvey responded that he will be presenting options of service and technology that would or would not happen under different budget scenarios. The deadline for final input to Humphris is December 26; a revised version will then be sent to PCOM by e-mail to get the final comments by 1 January, and then a final version will go to JOI in time for them to add budget information to be included in the EXCOM Agenda Book.

M. Status of the Japanese OD-21 Program

1. International Workshop on Riser Technology

Takagawa reported on the Workshop on Riser Drilling held in Yokohama at the end of October that was organized by JAMSTEC/ORI/TEDCOM. About 95 scientists and engineers attended. It was held in response to an EXCOM motion suggesting such a meeting, with the objective to evaluate the technology needed to achieve the scientific goals of the LRP. The

Workshop was based on a series of model holes from different tectonic settings. A set of recommendations came out, with Phase A being a riser for 2500 m water depth, and Phase B being a riser for 4000 m water depth (see Appendix 28).

Mountain said that seven model locations were evaluated by scientists and engineers, but he pointed out that there is a whole shallow water community that needs to be addressed and this was lacking at this Workshop. Natland said the Workshop was aimed at deep water riser drilling as shallow water riser drilling already exists. Larson emphasized that the model holes were not chosen by committees, but by individuals. Larson also commented that TEDCOM found this exercise very useful, although Humphris pointed out that this same exercise had been done in the early 1990's. Mountain said that he applauds the Japanese effort, but it must be made clear to the community that the OD-21 vessel is not the vessel for very shallow water objectives.

2. CONCORD

Suyehiro reported on a meeting held in Tokyo of a Steering Committee that is setting up the CONCORD workshop. This will be held in Tokyo on 22-25 July 1997. The objective is to identify the science that should be targeted to take advantage of the enhanced capabilities provided by riser drilling. It is planned that there will be engineers attend the meeting to interact with the scientists. This meeting is critical to getting the funding to build the OD-21 vessel, and it is very important that it is an international meeting. In addition, JAMSTEC and ORI have asked JOIDES to be co-hosts of the meeting. It is an open meeting, and they expect about 100 people to attend.

Humphris said that this meeting is very important for the future of ocean drilling, and PCOM has to make sure that this is going forward and that the best representation from the drilling community is there. Suyehiro said that Japan is trying to secure some funding to support scientists to go, but he can't promise anything yet. PCOM agreed to have JOIDES as one of the hosts of the meeting.

N. Rock Drilling

Johnson presented over-the-side rock drills as they pertain to ODP's interest in alternative platforms. He presented his experience with Williamson and Associates, who built the 3 m drill for the University of Washington (which was lost), the 20 m drill for the Japanese Metals Mining Agency, and who are in the process of designing and building the PROD (Portable Remotely Operated Drill) which will drill to 100 m in a hard-rock environment.

The Japanese over-the-side drill is capable to water depths of 6000m. It has a rotating carousel with 25 slots in which drill pipe casing or instruments can be accommodated. This drill can be po
goed around to collect twenty, 2 m cores, or can be used to get a long sample. The Williamson 20 m drill can be deployed by the R/V Thompson or other UNOLS fleet vessels. This drill has extensible legs and is capable of coring manganese crusts. All Williamson drills have control over rotation speed, bit weight, and flushing water pressure to minimize the risk of getting stuck. They also have thrusters, four television cameras for real time observations, and can specify landing sites.

PROD is a portable, sea floor drilling and coring device which will be available for lease in the first quarter of 1998 from Benthic Geotech Pty. Ltd., an Australian consortium. PROD is

expected to be finished in late 1997, and operations will start in 1998. PROD will be able to drill to 100 meters in 2000 meters water depth. The drill is weight-limited so, for shallower cores, can drill in deeper water.

Johnson discussed the matter of access to these drills. Negotiations are underway with MMAJ to see if they will consider outside users. One problem is that the MMAJ drill is built in such a way that it must be used with a special fiberoptic cable which is on an expensive Japanese ship. Johnson is trying to negotiate with MMAJ to permit use of their drill with the ROPOS cable and winch, which is also expensive, but then the MMAJ drill can be adapted and deployed on the R/V Thompson.

In contrast, Benthic Geotech is actively seeking users of PROD. There will be a cable and winch that is part of the package. The cost will be about $10,000 per day and a stand-by rate of half that amount. The consortium has not finalized this yet. They are actually looking for outside users for about 25% of the time. The Australian Consortium does not want money from ODP but want a structure that organizes potential users into a consortium partner. Johnson asked whether PCOM might wish to recommend to SCICOM that a small group look into these alternative platforms and determine the type of relationships there should be between them and ODP.

Humphris suggested that it would be useful to consider sending a JOIDES Liaison to one of the PROD meetings. Sager concurred, saying that this was a good idea, and that he supports ODP involvement with this group as it may provide an outlet for science that cannot be carried out by ODP now. Mountain asked about the efficacy of PROD in penetrating sediments in shallow water. Johnson replied that it appears that some sediments respond well to diamond drilling, while in other cases they do not. Johnson cited an example of an experiment off Hawaii drilling into sand. There was little recovery of the sand but that would have been different if they had used the right bits. PCOM decided by consensus that they would send a liaison to one of the meetings of the consortium. Humphris will write a letter to this group expressing PCOM's desire to send liaison.

PCOM Consensus 96-3-26 PCOM will send a liaison to one of the meetings of the Australian Consortium to look into developments in over-the-side rock drills, and to determine the type of relationships there should be between them and ODP.

O. PCOM Correspondence

1. Response to K. Miller

Miller requested that some on-shore drilling being done in conjunction with Leg 174A be designated as Leg 174X, as had been done in a similar situation for Leg 150. All results from both shore and offshore drilling will be published in a special volume. Leg 174X cores will be stored at Rutgers at no cost to ODP.

PCOM Consensus 96-3-27

PCOM, in response to a letter from K. Miller, agrees that on-shore drilling done in conjunction with Leg 174A be designated as Leg 174X. Leg 174X cores will be stored at Rutgers at no cost to ODP.

2. Response to H. Dick

Dick had requested some extra time be added to Leg 176 for some work in association with a VSP experiment. PCOM agreed that they cannot add extra time due to scheduling limitations. Humphris will write a letter to Dick in response.

3. Response to R. Von Herzen

Von Herzen alerted PCOM to a problem relating to the incorporation of ancillary programs into scheduled Legs. He cited a recent unsuccessful attempt at getting some measurements scheduled on core for Leg 174A, and requested PCOM consider how communication related to ancillary projects can begin early in the process.

Sager said that by the time a program gets to the point where it is scheduled, it is already fully booked. Natland said that he is opposed to people crashing the program late in the day. Natland said that in the new structure, opportunities to link ancillary programs with proposals can be identified by the SSEPs and PPGs. Humphris suggested that a mechanism might be by a letter of intent to the JOIDES Office for certain projects or experiments, which can be routed to the SSEPs or PPGs. Humphris agreed to include some mechanism in the rewriting of the proposal process.

P. New Business

1. Future Meeting of SCICOM and OPCOM

A conflict regarding the dates of the first SCICOM meeting has emerged. The original meeting was planned for 14- 17 April, in College Station, but it is in conflict with the Lisbon port call and several people cannot attend. It is not possible to move the meeting to a week later due to space problems at TAMU. Therefore both dates and locations must be changed. PCOM agreed that SCICOM will take place on 22-24 April in Hawaii.

2. Other Business

a) European Technology Meeting

Kudrass reported on a meeting of European ocean drilling scientists with industry, which took place in the autumn of 1996. Drilling targets related to the objectives of the ODP LRP were discussed. Tim Francis, representing ODP-TAMU, gave a presentation on ODP technology. The industry is interested in drilling in water depths of 2005 m in very calm environments (Gulf of Mexico) and water depths of approximately 1000 meters in the North Sea with a drill ship. Other drilling will be done by semi-submersibles. On the topic of joint ventures (the slim line riser, for example), there was no interest expressed by industry in doing any development with ODP, even if they are funded to do so. Kudrass said that it was made very clear at the meeting that the companies from industry have their own agendas and work very quickly. They are also concerned about losing the competitive edge if they work with a number of groups and the information becomes public. This is especially a concern with respect to ODP, which is group of organizations who are bound in MOUs to make their results public.

b) The International Continental Drilling Program (ICDP)

The International Continental Drilling Program (ICDP) is a consortium which was established to address a spectrum of scientific problems that will improve our understanding of the Earth's lithosphere. Other countries are expected to join with Germany, the USA, and China in the near future. Field drilling programs will be in Hawaii, Chicxulub Crater, and high resolution record in lakes, etc. Dr. Christian Paterman, Chair of the Assembly of Governors (AOG) of the ICDP, has written to the EXCOM Chair to request liaisons from JOIDES's EXCOM and SCICOM to the ICDP's AOG and Executive Committee (EC). The ICDP is interested in having a liaison from SCICOM to the ICDP equivalent body in their structure, the Executive Committee (EC). Kudrass noted that this request provides an opportunity to cooperate with another global science program. He added that the ICDP is a spin-off from the KTB project. The consensus from PCOM is to send a liaison. Mevel noted the advantage of having a close relationship with a group which is potentially seeking the same funds in each country. Roger Larson volunteered to serve in the capacity of a liaison. Francis noted that Roland Lawrence, the U.S. engineer for Continental Scientific Drilling, is based at ODP TAMU.

PCOM Consensus 96-3-28
PCOM will send a liaison to the meetings of the International Continental Drilling Program (ICDP).

c) Iceboat in Antartica

On previous high latitude Legs there have been small science programs mounted on the iceboat, so PCOM should be aware of this opportunity. The type of science needs to be "non-interfering"; for example, ornitology. Humphris noted that one of the nominees for Co-Chief has already communicated with TAMU on this issue.

d) OPCOM membership

Falvey asked how membership of OPCOM should be dealt with. It needs to be a mix of U.S and non U.S. members, and requires two SCICOM members (besides the Chair), and three others from outside the community. Humphris said she would be willing to take names and that those people should be interested and experienced in dealing with logistics and budgets. Shipley recommended that Humphris put together a slate of names, with help from the non-U.S. members, and they communicate by e-mail. Perace pointed out that Alaister Skinner would be there as the TEDCOM liaison.

Q. Other Motions and Action Items

Suyehiro returned to TEDCOM minutes and commented on problem of having the *JOIDES Resolution* listed as the sole vessel for drilling for OD 21 through 2008. Natland will communicate with Skinner on this issue and have TEDCOM minutes changed before their next meeting.

PCOM Motion 96-3-29
PCOM would like to express gratitude to both the Thematic Panels (LITHP, SGPP, OHP and TECP) and Service Panels (IHP, DMP, and SMP) for their hard work and valuable contributions to the drilling program under the present structure. We anticipate continuing interactions with many of the members of these panels within the new organization structure. PCOM expresses

similar gratitude to those members of panels that will be continuing in the new structure (SSP, PPSP, TEDCOM).

Proposed: Johnson, Seconded: Larson *Unanimous*

PCOM Motion 96-3-30
PCOM thanks Tom Shipley for his years of service on PCOM, noting that this is the end of his second term. His long experience in DSDP/ODP yielded insightful comments on critical issues. We hope to see him continue in ODP/OD21 in the future.

Proposed: Moore, Seconded: Brown *Unanimous*

PCOM Consensus 96-3-31
PCOM thanks Tim Francis for his long and continuing service to ODP, first as the UK' s representative to PCOM, and more recently as ODP/TAMU's liaison. We know that OPCOM will start off on the right foot as Tim continues in that role to take the science dreams of JOIDES and "make them real".

PCOM Consensus 96-3-32
The PCOM Chair notes that a number of long-serving PCOM members will not be carried forward as members of the new SciCOM.
PCOM Chair greatly appreciates the support these and other PCOM members have offered at this difficult time of transition to the new system.
The quiet logic of Kiyoshi, gallic flair of Catherine, wisdom of Alan, pungent comments of Tom, dogged determination of Will will be greatly missed by the SciCOM progeny. We thank them for their unremitting hard work on behalf of ODP, and wish them every success in their future PCOM-free lives.

PCOM Consensus 96-3-33
PCOM thanks Greg Mountain and Columbia University for efficiently hosting its Annual Meeting, and for developing unique field experiences ranging from the microbes of Biosphere II to the distant galaxies viewed from Kitt Peak. PCOM notes Greg's exceptional ability to orchestrate this meeting in a remote location, and to make management of complex meeting logistics look simple.

APPENDIX LIST

Appendix 1 - NSF Budget
Appendix 2 - ODP Budget
Appendix 3 - Timing of Phase III decisions
Appendix 4- JOI Liaison Report
Appendix 5- Downhole Losses since Leg 101
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Appendix 25- Draft FY98 X-base allocations
Appendix 26 - Draft FY98 X-base allocations
Appendix 27- Proposal Review Procedures-Subcommittee
Appendix 28- Workshop on Riser Drilling: Executive Summary and recommendations for] Phase A being a riser for 2500 m water depth, and Phase B being a riser for 4000 m water depth (4 pages)

JOIDES

Joint Oceanographic Institutions for Deep Earth Sampling

The Mandates and Terms of Reference for the *NEW* JOIDES Science Advisory Structure

Prepared by the JOIDES Office, University of Wales, Cardiff, United Kingdom
September 12, 1996

Revised by the JOIDES Office, Woods Hole Oceanographic Institution, Woods Hole, MA
January 9, 1997, March 1, 1997 and March 20, 1997

Ratified by EXCOM: February 12, 1997

University of California, Scripps Institution of Oceanography • Australia - Canada - Chinese Taipei - Korea Consortium • Columbia University, Lamont-Doherty Earth Observatory • European Science Foundation: Belgium, Denmark, Finland, Iceland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, Turkey • France: Institut Francais de Recherché pour l'Exploitation de la Mer • Germany: Bundesanstalt für Goewissenschaffen und Rohstoffe • University of Hawaii, School of Ocean and Earth Science and Technology • Japan: Ocean Research Institute, University of Tokyo • University of Miami, Rosenstiel School of Marine and Atmospheric Science • Oregon State University, College of Oceanography • University of Rhode Island, Graduate School of Oceanography • Texas A&M University, College of Geosciences and Maritime Studies • University of Texas at Austin, Institute for Geophysics • United Kingdom: Natural Environment Research Council • University of Washington, College of Ocean and Fishery Sciences • Woods Hole Oceanographic Institution

TERMS OF REFERENCE

JOIDES Executive Committee for the Ocean Drilling Program

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

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

3. The membership of this committee is now composed of one representative of each of the six non-US countries or consortia with an active Memoranda of Understanding (MOU) with the National Science Foundation (NSF) [Australia-Canada-Korea Consortium, European Science Foundation, France, Germany, Japan, and the United Kingdom] and one representative of each of ten US institutions [University of Miami, University of Washington, Oregon State University, University of Hawaii, University of Rhode Island, University of Texas at Austin, University of California at San Diego, Texas A&M University, Woods Hole Oceanographic Institution and Columbia University]. The appointment of additional members will be determined by the JOI Board of Governors on the recommendation of the JOIDES Executive Committee. In the case of representatives of non-US country participants, the existence of a valid MOU with NSF is a prerequisite to membership.

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

4. Each institution or organization designated for participation on this Committee by the Board of Governors shall provide one voting member.

5. The Executive Committee shall reach all its decisions by the affirmative vote of at least two-thirds of all members, including members from at least three non-US members. A quorum shall constitute two-thirds of the Executive Committee. If a member of the Executive Committee is absent from a duly called meeting of the Executive Committee, he or she may designate an alternate with full authority to act for him or her in his or her absence.

6. The Executive Committee may establish subcommittees for cognizance of certain components of the Ocean Drilling Program. Areas of cognizance and the Terms of Reference for each subcommittee shall be defined by the Executive Committee. In particular a Science Committee and a Budget Committee shall be established.

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

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

9. These Terms of Reference, upon ratification by members of the existing JOIDES Executive Committee and adoption by JOI, Inc. will supersede all previous JOIDES agreements.

The Chair of EXCOM rotates with the JOIDES Office among the JOIDES institutions, excluding the Science Operator and Wireline Logging Service Operator institutions. The term of office is usually two years.

JOIDES Budget Committee for the Ocean Drilling Program

1. General Purpose. The Budget Committee provides JOIDES overview and first review of the ODP Program Plan and budgets therein.

   The ODP Program Plan is compiled by JOI, Inc., the ODP prime contractor. This includes the annual Science Plan which is developed by SCICOM and prepared by the JOIDES Office on the basis of the drilling schedule determined by OPCOM and approved by SCICOM. Budgets in the Program Plan include those of the Science Operator and Wireline Logging Contractor. The Program Plan also includes a list of scientific and technological development needs, including estimated costs, which have been reviewed by the JOIDES Advisory Structure and which are required for successful completion of the Plan.

   The ODP Program Plan (including budgets) is then submitted in draft form to the National Science Foundation (NSF). BCOM meets as occasion demands, according to a Program Plan and budget timetable, in order to provide continuing guidance in developing the final version of the budget in the Program Plan. The committee consults with JOI, Inc. and the subcontractors if budget questions or problems arise. BCOM reports to EXCOM at its spring meeting (the joint EXCOM/ODP Council meeting). At that time, the full EXCOM approves the final ODP Program Plan and a detailed budget for the upcoming fiscal year.

2. Mandate. The Budget Committee is to review the ODP Program Plan and budgets therein and evaluate how well the Program Plan and budget address the priorities which have been defined by EXCOM and SCICOM. This review is to be reported to EXCOM and SCICOM.

   BCOM also acts on behalf of EXCOM on budget matters that EXCOM delegates to it. BCOM can request that liaisons from the ODP subcontractors, JOI, or NSF attend its meetings.

3. Meetings. BCOM meets as required for developing the ODP Program Plan. Up to three meetings per fiscal year may be necessary to provide input on the ODP Program Plan and budget. Meetings may be required in the entire phase of developing the budget and Program Plan.

4. Membership. The Budget Committee consists of three EXCOM members and two SCICOM members, one of whom is the present SCICOM Chair. The second member is ideally the immediate past SCICOM Chair. A balance of three US and two non-US BCOM members is maintained. A quorum shall consist of two of the EXCOM members and one of the SCICOM members. BCOM members are appointed by EXCOM. EXCOM or SCICOM members representing JOIDES institutions with major ODP subcontracts will not be appointed.

JOIDES Science Advisory Structure for the Ocean Drilling Program

The purpose of the ODP Science Advisory Structure of JOIDES is to enable the formulation of the most productive scientific plan for the Program. JOIDES is open to suggestions and proposals from the entire scientific community, and its plans shall be open to continued review and revision.

1. Science Advisory Structure

The Science Advisory Structure of JOIDES will consist of a Science Committee, an Operations Committee, a Technology and Engineering Development Committee, two Science Steering and Evaluation Panels and three Service Panels. Ad hoc Program Planning

Groups and Detailed Planning Groups may be approved by the Science Committee as requested by the Science Steering and Evaluation Panels, the Scientific Measurements Panel, or by the Science Committee itself.

2. Committees, Panels, Program and Detailed Planning Groups

Each committee, panel, Program or Detailed Planning Group (PPG or DPG) will operate under a mandate, along with guidelines as to membership and frequency of meetings. Mandates, guidelines, and amendments to them, for the standing panels, shall be proposed by the Science Committee for approval by the Executive Committee. Mandates, guidelines and duration of operation for the short-lived Program and Detailed Planning Groups will be specified by SCICOM as required.

3. Science Committee

3.1 General Purpose. The Science Committee (SCICOM) reports to the Executive Committee and provides advice to JOI, and through JOI, the Science Operator and Wireline Logging Services Operator on plans designed to optimize the scientific productivity and operational efficiency of the drilling program.

More specifically, the SCICOM is responsible for:

- custody of the ODP Long Range Plan;
- ranking of mature drilling proposals that address the scientific themes and initiatives in the ODP Long Range Plan;
- carrying out long-term science planning, over the 5-year period of ODP Phase III and beyond;
- fostering communications among and between the general community, the JOIDES science advisory panels, the Program Management and Operators.

3.2 Mandate. SCICOM is responsible for the creation and mandates of the various advisory panels and planning groups and their membership, which must be approved by EXCOM. In addition, SCICOM may assign special tasks to such advisory panels and planning groups. The SCICOM Chair convenes the panel meetings and approves the meeting dates, locations, and agendas of all the science advisory committees, panels, and groups. SCICOM sponsors and convenes COSOD-type conferences at intervals determined by long-term science plans for ODP. SCICOM, through the JOIDES Office, assigns proposals to Science Steering and Evaluation Panels, Program Planning Groups and, if relevant, to Service Panels, for review. SCICOM ranks the scientific objectives of the proposals into final priority after they are reviewed by the panels. SCICOM approves by a majority (e-mail) vote the annual drilling schedule as determined by OPCOM. The Science Committee proposes Chief Scientists to the Science Operator, who makes the final selection.

SCICOM periodically reviews the JOIDES advisory structure in the light of developments in science and technology, and recommends to EXCOM amendment of its panel structure and mandates. Much of the work of SCICOM is carried out by the commissioning of reports from OPCOM and the other science advisory panels, including Detailed Planning Groups, ad hoc subcommittees of its own membership, and by its Chair at the JOIDES Office.

3.3 Structure. SCICOM is empowered to establish an infrastructure appropriate to the definition and accomplishment of tasks described in its annual program plan as approved by the Executive Committee and the National Science Foundation.

Communication with the panels and active PPGs and DPGs is maintained by having their Chairs meet with the Committee annually, and by assigning committee members as non-voting liaison members to its panels and planning groups. Where counsel and

communication are deemed important, other individuals may be asked ad hoc to meet with the Committee or a panel.

3.4 Meetings. SCICOM meets at least twice a year, normally in March and early September. *Robert's Rules of Order* will govern its meetings, and those of all of its subcommittees.

3.5 Membership. SCICOM will consist of sixteen members proportionally representing the ODP partners (10 US and 6 full non-US). Each full non-US member shall designate one member of the Science Committee and an alternate to serve in the absence of the designated member. US members of the Science Committee will be appointed by the JOI Board of Governors. The term of membership will be three years and at least one third of SCICOM members shall rotate off the Committee annually, so that the SCICOM membership is replaced every three years. Re-appointment shall be made only in exceptional circumstances. All appointees to SCICOM shall satisfy the fundamental criteria of having the ability and commitment to provide mature and expert scientific direction to the program. Balance of fields of specialization on the Science Committee shall be maintained as far as possible by requests to member committees.

3.6 Liaison. The Director of ODP at JOI, and the Directors, or nominees thereof, of the Science Operator and the Wireline Logging Services Operator, and a nominee of NSF, are permanent, non-voting liaison observers, as is the TEDCOM Chair. The SCICOM Chair is the liaison to EXCOM.

3.7 Vote and Quorum. Within the framework of the Memoranda of Understanding with each non-US member, it is intended that the US members shall constitute at all times at least a majority of members. Substantive issues decided by formal vote require the vote of a majority of all members. A quorum shall consist of at least two-thirds of the non-US members and at least two-thirds of the US members.

3.8 Chair. The SCICOM Chair (and the JOIDES Office) rotates between US and non-US JOIDES institutions, excluding the Science Operator and Wireline Logging Service Operator institutions. The term of office is usually two years.

4. Operations Committee

4.1 General Purpose. The Operations Committee (OPCOM) is a sub-committee of the Science Committee. The Operations Committee reports to the Science Committee on the implementation of science and technological development plans required to achieve the goals of the ODP Long Range Plan.

4.2 Mandate. OPCOM is responsible for recommending the schedule of the drilling vessel over a period that may exceed one year, based on SCICOM's ranking of proposals. It will receive, and act upon, reports from the service panels and TEDCOM, and under guidance from the Chair, advise JOI accordingly. OPCOM will advise SCICOM on short-term logistical, technological, and budgetary implications of scientific programs highly ranked by SCICOM, and on longer-term technological requirements for implementing the ODP Long Range Plan.

4.3 Meetings. OPCOM shall meet at least twice per year. Dates, locations, and agendas will be approved by the SCICOM Chair. The spring meeting will precede SCICOM to allow formulation of reports; the summer/fall meeting will follow SCICOM to allow a drilling schedule to be constructed from SCICOM's proposal ranking. This will be sent to SCICOM for approval. If a proposed drilling schedule is not approved, OPCOM will reconvene and formulate a new schedule.

4.4 Membership. The Operations Committee will consist of the SCICOM Chair plus two other SCICOM members plus 3 other members from the marine geoscience community and should have regard to the US non-US balance. Membership will be determined by SCICOM. The term of membership will be for 1 year, renewable by SCICOM for up to 3 years. Additional expertise required to address specific issues may be brought in with the approval of SCICOM. Invited specialists will provide advice and will not serve as members of OPCOM.

4.5 Liaison. The Director of ODP at JOI, or a nominee thereof, and the Directors, or nominees thereof, of the Science Operator and the Wireline Logging Services Operator and the Wireline Services Operator, and a nominee of NSF, are permanent, non-voting liaison observers, as are the Chairs of TEDCOM, SSP, PPSP and SciMP.

4.6 Vote and Quorum. A quorum shall be at least two SCICOM members and two other members. The Operations Committee will reach all decisions by consensus.

4.7 Chair. The SCICOM Chair will be the OPCOM Chair.

5. Science Steering and Evaluation Panels

5.1 General Purpose. The Science Steering and Evaluation Panels (SSEPs) are established by the Science Committee to interact with proponents and Program Planning Groups in nurturing selected drilling proposals to maturity, evaluating those proposals, and then recommending mature proposals for external comment. The Science Steering and Evaluation Panels advise SCICOM on thematic development within the Ocean Drilling Program. Based on the 1996 ODP Long Range Plan there shall be initially two SSEPs.

Dynamics of Earth's Environment SSEP: Area of Interest

The interests of Dynamics of Earth's Environment SSEP are explained in detail in the ODP Long Range Plan. In particular, important themes of investigation are:

- Understanding Earth's changing climate: this explores the causes, effects, and interrelations between climate change and oceanic circulation patterns which is essential to understanding our climate system and predicting its response to such factors as global warming from greenhouse gases.
- Causes and effects of sea-level change: this investigates the complex interactions between climate, orbital dynamics, and the vigor of thermal convection within the Earth's asthenosphere and their effects on the timing, rates and magnitude of sea-level changes.
- Sediments, fluids and bacteria as agents of change: this examines the complex interactions between organic and inorganic material from the continents, deposition from the marine biosphere, and circulation of fluids through the deposited material.

Dynamics of Earth's Interior SSEP: Area of Interest

The interests of Dynamics of Earth's Interior SSEP are explained in detail in the ODP Long Range Plan. In particular, important themes of investigation are:

- Exploring the transfer of heat and materials to and from Earth's interior: this attempts to quantify and model the physical and chemical processes involved in the solid Earth geochemical system through exploration of mantle dynamics, the formation and structure of oceanic crust, hydrothermal processes and sulfide mineralization, crustal aging, and recycling of material at subduction zones.
- Investigating deformation of the lithosphere and earthquake processes: this investigates deformation along extensional, translational and convergent boundaries, and examines earthquake mechanisms.

5.2 Mandate. Each Science Steering and Evaluation Panel is responsible to the Science Committee, and will respond directly to requests from it, as well as reporting to it on a regular basis. Each Science Steering and Evaluation Panel will be responsible for:

- nurturing to maturity and evaluating the scientific merits of selected drilling proposals by interaction with Program Planning Groups and proponents
- providing Program Planning Groups, proponents, and SCICOM with written evaluations and comments on the proposals through the JOIDES Office;
- selecting proposals for external comment, suggesting reviewers, and providing SCICOM with external comments and a written evaluation of those comments before SCICOM ranks the proposal;
- alerting the Site Survey Panel to proposals that will require initial site survey evaluation;
- advising and interacting with SCICOM on thematic development with ODP;
- advising SCICOM on initiatives and themes that need further development (formation of Program Planning Groups);
- facilitating communications between SCICOM, Program Planning Groups, and proponents;
- providing SCICOM with the names of possible Co-Chief Scientists.

The Science Steering and Evaluation Panels will also act to disseminate and correlate information in the appropriate areas by:

- monitoring the progress made by ODP cruise participants and other scientists on the results from shore-based research on samples; encouraging shore-based laboratory work on samples recovered through ODP drilling;
- encouraging its members to contribute to symposia at which the results of drilling will be discussed;
- publishing progress reports in the open literature to inform and encourage participation in the project;
- providing input to SCICOM for the summary of scientific achievements of ODP for inclusion in the ODP Program Plan.

These mandates are guidelines and do not restrict panels. The Science Committee may ask Panels to take up topics not in their original mandates.

5.3 Meetings. Science Steering and Evaluation Panels meet at least twice a year, but may meet more frequently as requested by SCICOM. They will always endeavor to meet at the same time and location, and have overlapping sessions as overlap in thematic coverage is expected to continue to evolve. The SCICOM Chair approves their meeting dates, locations, and agendas.

5.4 Membership. Science Steering and Evaluation Panels are composed of 10 or fewer appointees from US institutions and one appointee from each full non-US member. SCICOM will advise member committees of its preferred SSEP membership, based on maintaining scientific balance of expertise. Panel members will serve a maximum of three years, with one-third of the panelists being replaced each year. Members of the Science Steering and Evaluation Panels will not be members of any Program Planning Group. Invitation to any guests must be issued by the SCICOM Chair.

5.5 Liaison. The Director of ODP at JOI, or nominee thereof, and the Directors, or nominees thereof, of the Science Operator and the Wireline Logging Services Operator and the

Wireline Services Operator, the Site Survey Panel, and a member of the JOIDES Office, are permanent, non-voting liaison observers.

5.6 Vote and Quorum. A quorum shall be two-thirds of the panel membership and decisions shall be reached by majority voting.

5.7 Chair. The Chairs are appointed by SCICOM.

6. Program Planning Groups

6.1 General Purpose. Program Planning Groups (PPG) are small focused planning groups formed by SCICOM when there is a need to develop drilling programs or technological strategies to achieve the goals of the Long Range Plan.

6.2 Mandate. PPGs will advise upon drilling/technology strategies and proposals for major scientific objectives that are not adequately covered by existing drilling strategies or proposals. Drilling proposals arising from PPG meetings must be submitted to the JOIDES Office by individual proponents or groups of proponents. PPGs will also foster communication between the ODP and other major geoscience initiatives. PPGs will report to the appropriate panel in the JOIDES Advisory Structure as directed by SCICOM.

6.3 Meetings. These will be on an as-required basis, determined by SCICOM and approved by the SCICOM Chair, who will also approve dates, locations, and agendas.

6.4 Membership. Members of PPGs will be focused groups of specialists and proponents, chosen by SCICOM through consultation with the SSEPs and community programs. Each full member of ODP will have the right of representation. A maximum number of 16 members is suggested based on current MOUs. The number of PPGs will be determined by SCICOM's need to fulfill the Long Range Plan objectives, subject to budgetary constraints. The normal term length will be three years, but is renewable by SCICOM.

6.5 Liaison. SCICOM establishes liaison with PPGs by the appointment of non-voting liaisons. A liaison from the appropriate SSEP may also be established.

6.6 Chair. The PPG Chairs are appointed by SCICOM.

7. Detailed Planning Groups

7.1 General Purpose. Detailed Planning Groups (DPGs) are short-lived planning groups that may be created by SCICOM for more intensive study of certain aspects of planning that may arise.

7.2 Mandate. DPGs will be created by SCICOM with individual mandates that may be either scientifically or technologically based. DPGs will provide written reports to SCICOM. Example tasks for DPGs include: translating highly-ranked ODP science proposals into concrete drilling plans; advising on regional and site surveys needed for future drilling; preparing drilling prospectuses which synthesize all thematic and site survey input, etc.

7.3 Meetings. Active DPGs meet at the request of SCICOM as frequently as required by ship scheduling and routing. Meeting dates, locations and agendas will be aprroved by the SCICOM Chair. DPGs will be disbanded once their task is completed.

7.4 Membership. Members of DPGs will be chosen by SCICOM for their expertise and experience with respect to the assigned DPG mandate. Members may be recommended by the SSEPs. Each full member of ODP will have the right of representation. The size of the DPG should be commensurate with the charge of the group; a maximum number of 16 members is suggested, based on current MOUs.

7.5 Liaison. SCICOM appoints a liaison to each standing DPG.

7.6 Chair. The DPG Chair will be appointed by SCICOM.

8. Technology and Engineering Development Committee

8.1 Purpose. The Technology and Engineering Development Committee (TEDCOM) is responsible for advising SCICOM on technological developments related to long-term science planning, over the 5-year period of ODP Phase III and beyond. TEDCOM is also responsible for recommending to SCICOM through OPCOM drilling tools and techniques to meet the objectives of the scientific plan, and for monitoring the progress of their development through liaison with the ODP-TAMU Engineering Development Department.

8.2 Meetings. TEDCOM meets twice per year or as requested by SCICOM.

8.3 Membership. Members of TEDCOM will be specialists who can provide expert advice in the fields of drilling engineering and technology. TEDCOM is composed of a number of US appointees, and one appointee from each full non-US member, with advice from SCICOM. The normal term length will be three years.

8.4 Liaison. SCICOM appoints a liaison to TEDCOM. An ODP-TAMU engineer acts as Science Operator liaison with TEDCOM. TEDCOM maintains a liaison with the Scientific Measurements Panel.

9. Service Panels

Service Panels provide advice and services to the JOIDES Science Advisory Structure, and, through JOI, to the various entities responsible for processing, curation and distribution of samples, data and information (including publications) to the scientific community. The Service Panels can respond to specific requests from the Science Operator, the Wireline Logging Contractor, or JOIDES Panels, but in all cases, must report on these requests through OPCOM to JOI. Recommendations from the Service Panels that involve major fiscal decisions or major programmatic changes will be channeled through OPCOM to SCICOM.

The Service Panels, beyond their help to the JOIDES Advisory Structure, are not directly involved with selection of drilling targets or definition of cruise objectives.

10. Site Survey Panel

10.1 General Purpose. The general purpose of the Site Survey Panel (SSP) is to provide information and advice to the Science Committee on the adequacy of, and need for, site surveys in relation to proposed drilling targets.

10.2 Mandate. The Site Survey Panel is mandated to:

- review site survey data packages prepared by the ODP Site Survey Data Bank and to make recommendations as to their adequacy to the Science Committee in light of the needs defined in mature proposals of the Science Steering and Evaluation Panels, Program Planning Groups and Detailed Planning Groups;
- identify data gaps in proposed future drilling areas and to recommend appropriate action to ensure that either (1) sufficient site survey information is available for pinpointing specific drilling targets and for interpretation of drilling results; or (2) that sites not be drilled until specified information has been reviewed;
- provide guidelines for proponents and panels as to required site survey data and to examine the opportunities and requirements for the use of new technologies for surveying potential drill sites;
- promote international cooperation and coordination of site surveys for the benefit of the Ocean Drilling Program, particularly between participating ODP partners' survey activities;
- promote the logging of all data used for planning drilling targets with the ODP Data Bank.

10.3 Meetings. SSP will meet twice per year or as requested by SCICOM, with one meeting usually at the location of the Site Survey Data Bank. Other acceptable meeting locations include port calls of the *JOIDES Resolution* and other locations appropriate to the Panel mandate.

10.4 Membership. Members of SSP will be scientists who can provide expert advice on the site survey requirements of proposed drill sites. SSP is composed of a number of US appointees, and one appointee from each full non-US member, appointed by ODP member committees with advice from SCICOM. The normal term length will be three years.

10.5 Liaison. The Panel maintains liaison with the ODP Site Survey Data Bank Manager and the JOIDES Office, who both send representatives to SSP meetings. OPCOM also maintains a liaison with SSP. SSP maintains liaisons to the SSEPs.

10.6 Chair. The Chair will be appointed by SCICOM.

11. Pollution Prevention and Safety Panel

11.1 General Purpose. The general purpose of the Pollution Prevention and Safety Panel (PPSP) is to provide independent advice to the Operations Committee and to the Ocean Drilling Program with regard to safety and pollution hazards that may exist because of general and specific geologic circumstances of proposed drill sites.

11.2 Mandate. All drilling operations involve the chance of accident or pollution. The principal geologic safety and pollution hazard in ocean drilling is the possible release of substantial quantities of hydrocarbons from subsurface reservoir strata. In most deep sea regions, the risk of hydrocarbon release can be reduced or eliminated by careful planning and proper site surveys. Additionally, safety problems may arise in drilling hot hydrothermal systems for lithosphere targets.

Those who plan each ODP cruise and select its drilling sites are initially responsible to propose only sites that are considered reasonably safe. The JOIDES Pollution Prevention and Safety Panel independently reviews each site to determine if drilling operations can be conducted safely.

The preliminary site survey information and the operational plan are reviewed for each site. Advice is communicated in the form of: (1) site approval, (2) lack of approval, or (3) approval on condition of minor site relocation or amendment of the operational plan.

Approval is based on the judgment of the Panel that a proposed site can be safely drilled in light of the available information and planning.

11.3 Meetings. The panel will usually meet twice a year, generally with one meeting at the location of the Science Operator. Other acceptable meeting locations include port calls of the *JOIDES Resolution* and other locations appropriate to the Panel mandate, as approved by the SCICOM Chair.

11.4 Membership. Members of PPSP are specialists who can provide expert advice on the safe drilling of proposed drill sites. PPSP is composed of a number of US appointees, and one appointee from each full non-US member, appointed by ODP member committees with advice from SCICOM. Panel membership, not to exceed 16, should be maintained as small as is allowed by the range of expertise necessary to meet mandate requirements.

11.5 Liaison. The Pollution Prevention and Safety Panel maintains liaison with the Site Survey Panel, and a designated SSP member attends its meetings. A representative from the Science Operator also attends the meetings. The OPCOM Chair or a designate from OPCOM attends as a liaison.

11.6 Chair. The Chair is appointed by SCICOM.

12. Scientific Measurements Panel

12.1 General Purpose. The Scientific Measurements Panel (SciMP) will contribute information and advice to the JOIDES community through the Operations Committee (OPCOM) with regard to the handling of ODP data and information, on methods and techniques of ODP measurements, and downhole measurements and experiments.

12.2 Mandate. SciMP will provide advice on ODP information related to scientific measurements made onboard *JOIDES Resolution* and alternate platforms, within and around boreholes, and on samples collected by ODP and associated programs. Its specific mandates are to develop policies concerning said measurements and to furnish advice about scientific measurements, which will assist SCICOM and OPCOM in the formulation of annual and long term plans.

Specific responsibilities for the panel are publications, databases, curation, computers, shipboard equipment usage and needs, measurement calibrations and standards, and borehole measurements, equipment, usage, and needs.

SciMP recommendations will be sent to OPCOM. The SCICOM Chair will decide whether these are operational or scientific issues. If purely operational, the recommendations will go directly from OPCOM to JOI for action. If having scientific or budgetary implications, the recommendations will be passed to SCICOM for consideration.

12.3 Meetings. The panel will meet twice a year, usually at the location of one of the Science Operators to encourage interactions between the Panel members and Operators. Other acceptable meeting locations include port calls of the *JOIDES Resolution* and other locations appropriate to the Panel mandate. These meetings will be held prior to OPCOM meetings so that recommendations will be quickly acted upon.

12.4 Membership. SciMP will consist of sixteen members proportionally representing the ODP partners (10 U. S. and 6 full non-U.S), and appointed by the ODP member committees with advice from SCICOM. The term of membership will be three years. Members should have expertise representing the three core areas of the panel mandate covering information handling, downhole measurements, and shipboard measurements. Ideally, many of the panel members will have experience on board the drill ship, *JOIDES Resolution*. With SCICOM approval, the panel may bring in additional information about its mandate issues by setting up ad hoc advisory committees whose lifetimes are mandated by SCICOM.

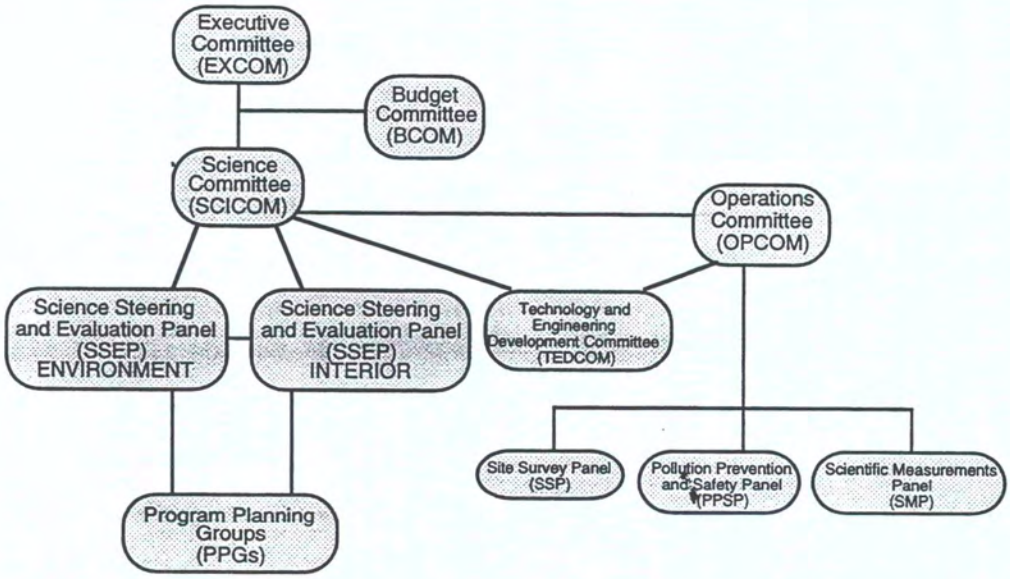
12.5 Liaison. SciMP will have non-voting liaisons from SCICOM/OPCOM, JOI, the Science Operator and the Wireline Logging Contractor. A liaison to TEDCOM is recommended for collaboration on development issues. Liaisons to other JOIDES advisory bodies may be sought with the approval of SCICOM.

12.6 Chair. The Chair will be appointed by SCICOM.

Ratified by EXCOM: 12 February, 1997

Adopted by JOI Board of Governors: 13 February, 1997

Figure 1. Wiring diagram of the JOIDES science advisory reporting structure.



EXCOM MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Beiersdorf, Helmut	Germany	1/93		
Briden, James C.	UK			
Brown, Otis	RSMAS			
Dalrymple, Brent	Oregon State	11/94		
Detrick, Robert S. (Chair)	WHOI			
Duce, Robert A.	TAMU			
Eldholm, Olav	ESF	7/95	Comas, Maria Carmen	
Feary, David A.	A-C-K-CT			
Lancelot, Yves	France	12/92		
Leinen, Margaret	URI			
Mutter, John	LDEO	1991		
Nowell, Arthur	U. Washington			
Orcutt, John	SIO			
Stoff, Paul L.	UTIG	11/94		
Taira, Asahiko	Japan			
Taylor, Brian	U. Hawaii	1/96		

Membership and Rotation Schedule March 31, 1997

Executive Committee (EXCOM)

	Liaison to	Appointed	Rotation Date (if applicable) or non-US
Beiersdorf, Helmut (G)		1/93	G
Briden, James C. (UK)			UK
Dalrymple, Brent (Oregon State)		11/94	
Detrick, Robert S. (WHOI)			
Duce, Robert A. (TAMU)			
Eldholm, Olav (ESF)		7/95	ESF
Feary, David A. (A-C-K-CT)			A-C-K-
Lancelot, Yves (F)		12/92	F
Leinen, Margaret (URI)		88	
Mutter, John (LDEO)		91	
Nowell, Arthur (Washington)			
Orcutt, John (SIO)			
Stoffa, Paul L. (UTIG)		11/94	
Taira, Asahiko (J)			J
Taylor, Brian (SOEST)		1/96	
Brown, Otis (RSMAS)			

Actions:

SCICOM MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Bond, Gerard C.	LDEO	3/97	Mountain, Greg(U.Hawaii)	3/97
Brown, Kevin M.	SIO	2/95	Tauxe, Lisa(SIO)	
Humphris, S.E. (Chair)	WHOI	1996		
Klein, Emily M.	Duke	3/97	Bender, John(UNC)	3/97
Kudrass, Hermann	Germany	8/93		
Larson, Roger L.	URI		D'Hondt, Steve(URI)	
Ludden, John	France	3/97		
McKenzie, Judith A.	ESF	3/97	Kristoffersen, Y.	3/97
Miller, Kenneth G.	Rutgers	3/97	Mountain, Greg(U.Hawaii)	3/97
Moore, Gregory F.	U. Hawaii		Fryer, Patty(U.Hawaii)	
Moore, J. Casey	UCSC	3/97	Zachos, Jim(UCSC)	3/97
Overpeck, Jonathan T.	NGDC/NOAA	3/97	Peterson, Larry(RSMAS)	3/97
Pearce, Julian A.	UK	1996	Robertson, Alister	
Raymo, Maureen E.	MIT	3/97	Boyle, Ed(MIT)	3/07
Scott, Steven D.	A-C-K-CT	3/97	Chen, Ju-Chin	3/97
Tamaki, Kensaku	Japan	3/97	Suyehiro, Kyoshi.	3/97

Membership and Rotation Schedule March 31, 1997

Science Committee

	Liaison to	Appointed	Rotation Date (if applicable) or non-US
Humphris, Susan E. (WHOI)		1996	
Klein, Emily M. (Duke)		3/97	
Kudrass, Hermann (G)		8/93	G
Larson, Roger L. (URI)			
Ludden, John (F)		3/97	F
McKenzie, Judith A. (ESF)		3/97	ESF
Miller, Kenneth G. (Rutgers)		3/97	
Moore, Gregory F. (SOEST)		3/97	
Moore, J. Casey (UCSC)		3/97	
Tamaki, Kensaku (Japan)		3/97	Japan
Pearce, Julian A. (UK)		1996	UK
Bond, Gerard C. (LDEO)		3/97	
Brown, Kevin ()		2/95	
Raymo, Maureen E. (MIT)		3/97	
Scott, Steven D. (A-C-K-CT)		3/97	A-C-K-
Overpeck, Jonathan T. (NGDC/NOAA)		3/97	

Actions:

SSEP Environment MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Austin, James A.	UTIG	3/97		
Blanc, Gerard	France	3/97		
D'Hondt, Steven L.	URI	8/95		
deMenocal, Peter R.	LDEO	3/97		
Erba, Elisabetta	ESF	7/95	Buchardt-Larsen, B.	
Exon, Neville F.	A-C-K-CT	3/97		
Gee, Jeffrey S.	SIO	8/95		
Kemp, Alan	UK	1994		
Martin, Jonathan B.	U. Florida	3/97		
Moore, Theodore C.	U. Michigan	1/94		
Popp, Brian N.	U. Hawaii	1/95		
Ravelo, Ana C.	Hebrew U.	1/95		
Tada, Ryuji	Japan	3/97		
Thomas, Ellen	Yale	3/97		
Underwood, Michael B.	U. Missouri	3/97		
Zahn, Rainer	Germany	1996	Brumsack, H.J.	

Membership and Rotation Schedule March 31, 1997

Science Steering & Evaluation Panel for Dynamics of Earth's Environment

	Liaison to	Appointed	Rotation Date (if applicable) or non-US
Austin, James A. (UTIG)		3/97	
Blanc, Gerard (F)		3/97	F
D'Hondt, Steven L. (URI)		8/95	
Erba, Elisabetta (ESF)		7/95	ESF
Ravelo, Ana C. (Hebrew U)		1/95	
Gee, Jeffrey S. (SIO)		1995	
Kemp, Alan (UK)		1994	UK
Moore, Theodore C. (U. Michigan)		1/94	
Popp, Brian N. (SOEST)		1/95	
Tada, Ryuji (Japan)		3/97	Japan
Thomas, Ellen (Yale U.)		3/97	
Underwood, Michael B. (Missouri)		3/97	
Zahn, Rainer (G)		1996	G
Martin, Jonathan B. (U. Florida)		3/97	
deMenocal, Peter B. (LDEO)		3/97	
Exon, Neville F. (A-C-K-CT)		3/97	A-C-K-

Actions:

SSEP Interior MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Arima, Makoto	Japan	3/97		
Bangs, Nathan L.	UTIG	3/97		
Bleil, Ulrich	Germany	3/96	Devey, Colin	3/96
Ceuleneer, Georges	France	3/97		
Fitton, Godfrey	UK	1994		
Karner, Garry	LDEO	12/95		
Kelley, Deborah S.	U. Washington	3/97		
Louden, Keith E.	A-C.K-CT	3/97		
Mahoney, John J.	U. Hawaii	1995		
Manning, Craig	UCLA	3/97		
Morris, Julie	Washington U.	3/97		
Ruppel, Carolyn	Georgia Tech	3/97		
Skogseid, Jakob	ESF	7/95	Weis, D. (Belgium)	7/95
Tarduno, John A.	U. Rochester	3/97		
Wiens, Douglas A.	Washington U	3/97		

Membership and Rotation Schedule March 31, 1997

Science Steering & Evaluation Panel for Dynamics of Earth's Interior

	Liaison to	Appointed	Rotation Date (if applicable) or non-US
Bleil, Ulrich (G)		3/96	G
Fitton, Godfrey (UK)		1994	UK
Karner, Garry (LDEO)		12/95	
Louden, Keith E. (A-C-K-CT)		3/97	A-C-K-
Mahoney, J.J. (SOEST)		1995	
Morris, Julie (Washington U.)		3/97	
Ruppel, Carolyn (Georgia Tech)		3/97	
Skogseid, Jakob (ESF)		7/95	ESF
Arima, Makoto (Japan)		3/97	Japan
Tarduno, John A. (U Rochester)		3/97	
Manning, Craig (UCLA)		3/97	
Bangs, Nathan L. (UTIG)		3/97	
Ceuleneer, Georges (France)		3/97	France
Kelley, Deborah S. (U Washington)		3/97	
Wiens, Douglas A. (Washington U)		3/97	

Actions:

SciMP MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Anderson, David	NGDC/NOAA	3/97		
Cheng, Arthur	Western Atlas	1995		
Flemings, Peter B.	Penn State	3/97		
Fryer, Patricia	U. Hawaii	8/93		
Gieskes, Joris M.	SIO	1/94		
Huber, Brian T.	Smithsonian	12/92		
Isern, Alexandra R.	A-C-K-CT	3/97	Chen, Min-Pen	
Janecek, Thomas R.	Florida State	3/97		
Lallemant, Siegfried	France	5/95		
MacLeod, Christopher J.	UK	1995		
Morin, Roger H.	USGS	1989		
Murray, Rick	BU	3/97		
Sager, William W.	Texas A&M	1989		
Soh, Wonn	Japan	3/97		
Wohlenberg, Juergen	Germany	1994	Heiden, Franz	1994
Woodside, John	ESF	1995	Strand, Kari	1995

Membership and Rotation Schedule April 7, 1997

Scientific Measurements Panel

	Liaison to	Appointed	Rotation Date (if applicable) or non-US
Fryer, Patricia (SOEST)		8/93	
Gieskes, Joris M. (SIO)		1/94	
Huber, Brian T. (Smithsonian)		12/92	
Janecek, Thomas R. (Florida State U)		3/97	
Lallemant, Siegfried (F)		5/95	F
MacLeod, Christopher J. (UK)		1995	UK
Morin, Roger H. (USGS)		1989	
Murray, Rick (Boston U.)		3/97	
Anderson, David (NGDC/NOAA)		3/97	
Sager, William W. (TAMU)		1989	
Wohlenberg, J. (G)		1994	G
Woodside, John (ESF)		1995	ESF
Isern, Alexandra R. (A-C-K-CT)		3/97	A-C-K-
Cheng, Arthur (Western Atlas)		8/95	
Flemings, Peter B. (Penn State U)		3/97	
Soh, Wonn (Japan)		3/97	Japan

Actions:

SSP MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Casey, Jack F.	U Houston	9/94		
Deibold, John B.	LDEO	4/95		
Enachescu, Michael E.	Husky Oil	3/95		
Flood, Roger D.	SUNY	4/95		
Hinz, Karl	Germany	1/92	Meyer, H.	
Christeson, Gail L.	UTIG	3/97		
Lykke-Andersen, Holger	ESF	5/95	Argnani, Andrea	
Paull, Charles K.	UNC	4/95		
Peterson, Larry C.	RSMAS	1/94		
Sibuet, Jean-Claude	France	2/93		
Srivastava, Shiri	A-C-K-CT	12/92	Park, Soo Cheol	
Tokuyama, H.	Japan	1/94	Kuramoto, S.	

TEDCOM MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Elkins, Hugh	Varco/Shaffer	3/97		
Gearhart, Marvin	Rock Bit Intl	3/97		
Luy, Ralf	Germany	5/93	Eickelberg, D.	
Maidla, Eric E.	A-C-K-CT	10/94	Robertson, P.	
Marsh, Gary L.	Retired	3/92		
Rasmussen, Bjorn	ESF	7/95	Vallini, A.	
Reardon, Daniel	Sperry Sun	3/97		
Schuh, Frank J.	Consultant	5/84		
Shanks, F. Earl	Mobil	1/90		
Shatto, Howard L.	Consultant	1/90		
TBD	France			
Skinner, Alister	UK	12/90		
Summerour, Alex	Chevron	8/92		
Svendsen, Walter W.	Consultant	2/87		
Takagawa, Shinichi	Japan	1/94		

PPSP MEMBERS

Name	Affiliation	Date of Appointment	Alternate	Date of Appointment
Ball, Mahlon M.	USGS	11/84		
Claypool, George E.	Mobil	10/83		
Delahaye, Thierry	France	1/94		
Green, Arthur R.	EXXON	10/83	Farre, John	
JuvKam-Wold, Hans	Consultant	4/95		
Katz, Barry	Texaco	10/89		
Liu, Char-Shine	A-C-K-CT	3/97	Park, K.S.	
Lowell, James D.	Consultant	4/95		
MacKenzie, David B.	Consultant	10/83		
Nicolich, Rinaldo	ESF	7/95	Settem, Joar	
Okuda, Yoshihisa	Japan	1/94		
Purdy, Ed	UK	2/92	Blanchard, J.	
Strack, Dieter	Germany	3/97	Horn, D.	
Watkins, Joel S.	TAMU	4/94		

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(Revised Draft: 5 April 1997)

THE ODP PROPOSAL PROCESS

Starting with the 15 September 1997 deadline, a new two-step system of proposal submission to ODP will be established. This will consist of:

1) a "Preliminary Proposal" that will be evaluated and nurtured (if appropriate) through Panels within the JOIDES Advisory Structure;
2) a "Full Proposal" that is developed taking into account the advice from the appropriate Panels. Guidelines for each of these, and their evaluation paths, are described below.

Proposals already within the system will not be required to go through the "Preliminary Proposal" stage, but any revisions will be expected to meet the guidelines for "Full Proposals, and will be processed as described below.

I. Preliminary Proposals

New ideas for scientific ocean drilling will first be submitted as Preliminary Proposals to the JOIDES Office by the 15 March or 15 September deadline. Sources of "Preliminary Proposals" may be:

i) individual scientists or groups of scientists;

ii) national/international scientific groups (independent of ODP);

iii) JOIDES Program Planning Groups (PPGs).

In each case, the individuals who are submitting the Preliminary Proposal must be named, and a contact proponent must be clearly identified.

Preliminary proposals will be **no more than 10 pages long and must adhere to the content and format requirements listed in Appendix I.**

Preliminary proposals will be reviewed by the appropriate SSEP(s) with respect to the the fundamental scientific advances that the proposed drilling might make; its relevance to the Long Range Plan; and the appropriateness of the geographic location and proposed sections drilled to address the scientific objectives of the proposal.

Written reviews will be returned to the contact proponents with one of the following recommendations:

1) The proposal does not address high-priority goals of the LRP, or is of low scientific interest. The panel(s) rejects the proposal and recommends that a Full Proposal should not be developed.
2) Some specific additional information is needed to evaluate the proposal adequately (e.g. insufficient data to evaluate whether drilling addresses the stated objectives). The panel(s) requests these data from the contact proponent for their next meeting(s). If the data are unavailable and critical, the panel(s) will recommend that a revised Preliminary proposal be submitted once the data are available.
3) The proposal addresses objectives for which other proposals exist. The panel(s) refers the preliminary proposal to a PPG, or recommends that the proponents collaborate.
4) The proposal is of high priority, but could be improved and made more relevant. In this case, the appropriate SSEP may nurture a proposal (possibly through a watchdog system) and request a revised Preliminary Proposal.
5) The proposal is of high interest and well justified. The panel(s) recommends the development of a Full Proposal.

II. Full Proposals

The submission of a full proposal will be recommended by the Scientific Steering and Evaluation Panel(s) or by SCICOM on the basis of the Preliminary Proposals. Full proposals will be submitted to the JOIDES Office by the 15 March or 15 September deadline. Sources for these proposals will be mainly the proponent(s) of the Preliminary proposal(s), but may include members of a PPG or DPG (for those proposals referred to such Groups), or others that are added to address issues raised by the panels.

Full proposals will be **no more than 25 pages long and must adhere to the content and format requirements listed in Appendix I.**

Full proposals will be reviewed by the appropriate SSEP(s) to determine whether they meet the criteria necessary to be sent out for external comment. These criteria are:

- The proposal addresses a scientific problem that is identified as a high priority in the ODP Long Range Plan (or moves the program beyond the LRP);
- There is clear justification that drilling is the best way to achieve the scientific objectives being addressed;
- There is a well-defined drilling strategy, the success of which can be assessed on the basis of the geophysical/ geological data as presented in the proposal.

If these criterai are met, the panel(s) will recommend to the JOIDES Office that external comments be acquired. The SSEP(s) will provide a list of qualified evaluators for each proposal that they recommend be sent out for external comment. These will include individuals who are active within the international drilling community, as well as others from outside that community who can comment on the science with a broader perspective of its contribution to the appropriate field.

If it is determined that the criteria are not met, the panel will advise the proponents (through the JOIDES Office) as to which criteria are not met, and recommend the revisions necessary for further consideration.

III. The External Comment Process

JOI Inc. will be responsible for managing the acquisition of external comments. The JOIDES Office will provide JOI with the list of proposals selected by the SSEPs, together with the recommendations of potential evaluators from both the Panels and the proponents. JOI will select and contact individuals to provide external comments, will be the recipients of those comments (3-4 per proposal dealt with electronically), and will then remove any identification from the comments before passing them back to the JOIDES Office for distribution to the proponents and the appropriate SSEPs.

Given that this is a very different process from a normal proposal review, specific guidelines on issues to be addressed in the external comment process will be provided. Individuals will be asked to comment on the following:

- the importance of the scientific problem addressed by the proposed drilling effort;
- the fundamental advances in understanding earth's history and/or earth's processes that will be made by the proposed drilling;
- the appropriateness of the location selected for drilling to address the stated scientific problem;

- the likelihood that the sections drilled will contribute significantly to the solution of the stated scientific problem.

IV. Evaluation by SSEPs - and Recommendations to SCICOM

The anonymous external comments will be sent to proponents by the JOIDES Office to allow them an opportunity to respond in a **short (2-page) letter**. The anonymous external comments, together with the proponents' response, will then be reviewed by the SSEP(s) at their next meeting. Information on site survey readiness will also be provided by the SSP liaison(s) to the SSEP(s). For each reviewed proposal, a package will be assembled for SCICOM that contains:

- the SSEP(s) review(s) of the proposal;
- the external comments received from anonymous evaluators;
- the proponents' reponse to the external comments
- an assessment by the SSEP(s) as to the priority of the drilling program in the context of the overall achievement of the ODP Long Range Plan (or how the proposal addresses an exceptional scientific opportunity).

SCICOM will take all this information into consideration when ranking the proposals for incorporation into the drilling schedule. Those that do not get selected will be advised as to whether (i) SCICOM wishes to keep the proposal active for consideration at a later time (e.g. perhaps when more data are available; pending results from an already scheduled leg or scheduled site survey cruise), (ii) SCICOM wishes to see a revision or clarification made before taking a final decision, or (iii) will not consider it further.

V. Ancillary Programs Letters

On occasion, individuals or groups of investigators have projects with scientific objectives that do not address key scientific goals of proposed drilling legs, but that require collection of shipboard data and measurements from drill holes or cores. There is no provision for these types of projects within ODP's Sampling and Curation Policy. Examples include specific measurements of physical properties not routinely collected on a cruise, or the collection of an additional downhole measurement during logging unrelated to cruise objectives. Because such projects can require an investment of time (either drilling, logging or technician time), and/or the dedication of a shipboard bunk, it

is critical that such projects are integrated with the appropriate drilling projects as early as possible in the proposal submission and evaluation process.

Requests for accommodation of ancillary programs in the Ocean Drilling Program should be submitted to the JOIDES Office in the form of an Ancillary Program Letter. This should include:

- a description of the project and its overall scientific goals;
- the types of shipboard measurements/ data collection necessary;
- the geographic areas of interest;
- the commitment, both in terms of shiptime and shipboard personnel necessary.

Ancillary Program Letters will be forwarded to the SSEPs who will be review them and suggest any appropriate collaborations. The JOIDES Office will be responsible for initiating contact between proponents of appropriate drilling proposals (preferably at the Preliminary Proposal stage), and investigators with ancillary programs.

Appendix I. Proposal Content and Format Guidelines

Both Preliminary and Full Proposals must adhere to the following formatting requirements. Failure to do so (or exceeding the page limits) will result in the proposals being returned to the proponents:

- Abstract - 400 words
- Font size - 12 point, 1 1/2 spacing
- Margins - one inch all around
- Binding- none; proposals must be stapled.
- Figures - black and white. Colour figures are discouraged. If color figures are essential, please contact the JOIDES Office for advice. Figures should be page-sized. Do not include large foldouts.
- Electronic version is required on disk formatted for Macintosh (WORD or WORDPERFECT).

PRELIMINARY PROPOSALS

Preliminary Proposals **may be no more than 10 pages** (including Abstract, Figures, and References, but not including Site Summary Sheets) and should contain the following:

1. Clearly-stated scientific goals, and how they relate to high priority scientific objectives within the Long Range Plan (or how they move beyond the LRP, or open up new fields of study). A description of relationship to other global geoscience programs (if any) should be included.
2. Justification of the need for drilling to accomplish the objectives.
3. Brief description of proposed sites, penetration depths, expected lithologies, etc..
4. Brief description of available site survey data.
5. A well-defined drilling and logging/downhole measurements strategy and explanation as to how it addresses the scientific goals of the project.
6. For each proposed drill site, a Revised Site Summary Form with only page one completed. Site location names must conform to the ODP drilling site designation policy.

FULL PROPOSALS

Full Proposals **may be no more than 25 pages** (including Abstract, Figures, and References, but not including Site Summary Sheets) and should contain the following:

1. Clearly-stated scientific goals, and how they relate to high priority scientific objectives within the Long Range Plan (or how they move beyond the LRP, or open up new fields of study); A description of relationship to other global geoscience programs (if any) should also be included.
2. Justification of the need for drilling to accomplish the objectives.
3. Detailed drilling and logging/downhole measurement strategies and how these relate to the scientific objectives of the project.
4. Detailed estimates of drilling and logging times are required.
5. A description of available site survey data and a discussion of the relation of drilling targets to pertinent site-survey data; a description of site survey information that is still required and the plans for its acquisition.
6. A description of logistical requirements including plans to deal with any anticipated logistical problems (e.g. the use of an alternate platform, ice, etc.).
7. Complete Site Summary Forms for each proposed drill site. Site location names must conform to the ODP drilling site designation policy.
6. Discussion of the expected scientific outcome, of drilling and what studies will remain to be done at completion;
7. a list of at least five (5) individuals qualified to provide comment on the scientific aspects of the proposed drilling program.

ODP Site Description Forms:

Page 1 - General Site Information

New ☐ Revised ☐

Please fill out information in all gray boxes

Section A: Proposal Information

Title of Proposal

Proposal Number: Date Form Submitted:

Site Specific Objectives (Must include general objectives in proposal)

List Previous Drilling in Area:

Section B: General Site Information

Site Name: (e.g. SWPAC-01A)		If site is a reoccupation of an old DSDP/ODP Site, Please include former Site #	Area or Location:	
Latitude:	Deg:	Min:	Jurisdiction:	
Longitude:	Deg:	Min:	Distance to Land:	
Priority of Site:	Primary:	Alt:	Water Depth:	

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m)		
General Lithologies:		

Coring Plan (circle): 1-2-3-APC VPC* XCB MDCB* PCS RCB Re-entry HRGB

** Systems Currently Under Development*

Logging Plan:

Standard Tools		Special Tools	LWD
Triple-Combo: Neutron-Porosity ☐, Litho-Density ☐, Natural Gamma Ray ☐, Resistivity-Induction ☐	FMS-Sonic: Acoustic ☐, FMS ☐	Borehole Televiewer ☐, Geochemical ☐, Resistivity-Laterolog ☐, High Temperature ☐, Magnetic/Susceptibility ☐	Density-Neutron ☐, Resitivity-Gamma Ray ☐

Estimated days: Drilling/Coring: Logging: Total On-Site:

Hazards/ Weather: *List possible hazards due to ice, hydrocarbons, dumpsites, cables, etc.* *What is your Weather Window?*

Instructions:

Please fill out these forms for each site that you are proposing to drill, including as much detail as possible. The following table describes the purpose of each page, what information is needed, and when each page should be submitted.

Page	Information needed	Used By	When to submit	Contact for more information
1	General Info. about proposals, site location and basic operational needs	JOIDES Office, Data Bank, Logging Group, ODP/TAMU, SSP, PPSP	When submitting preliminary proposal and when updating site information.	JOIDES Office email: joides@whoi.edu www: http://www.whoi.edu/joides/
2	Information regarding site survey data available and to-be-collected	JOIDES Office, Data Bank, SSP, PPSP	When submitting full proposal and when updating site survey information	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
3	Detailed Logging Plan	JOIDES Office, Logging Group, ODP/TAMU	When submitting full proposal and when updating logging plan	ODP-LDEO Wireline Logging Services email: borehole@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/BRG/brg_home.html
4	Lithologic Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/
5	Pollution and Safety Hazard Summary	JOIDES Office, Data Bank, ODP/TAMU, PPSP	When proposal is placed on Drilling schedule, prior to PPSP review.	Site Survey Data Bank email: odp@ldeo.columbia.edu www: http://www.ldeo.columbia.edu/databank/

Form last revised: 24 March 1997

ODP Site Description Forms:

Please fill out information in all gray boxes

Page 2 - Site Survey Detail
New ☐ **Revised** ☐

Proposal #:	Site #:	Date Form Submitted:

	Data Type	SSP Requir-ements	Exists In DB	Details of available data and data that are still to be collected
1	High resolution seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
2	Deep Penetration seismic reflection			Primary Line(s): Location of Site on line (SP or Time only) Crossing Lines(s):
3	Seismic Velocity†			
4	Seismic Grid			
5a	Refraction (surface)			
5b	Refraction (near bottom)			
6	3.5 kHz			Location of Site on line (Time)
7	Swath bathymetry			
8a	Side-looking sonar (surface)			
8b	Side-looking sonar (bottom)			
9	Photography or Video			
10	Heat Flow			
11a	Magnetics			
11b	Gravity			
12	Sediment cores			
13	Rock sampling			
14a	Water current data			
14b	Ice Conditions			
15	OBS microseismicity			
16	Navigation			
17	Other			

SSP Classification of Site:	SSP Watchdog:	Date of Last Review:
SSP Comments:		

X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; † Accurate velocity information is required for holes deeper than 400m.

Form last revised: 24 March 1997

ODP Site Description Forms:

Page 3 - Detailed Logging Plan
New ☐ Revised ☐

Proposal #:	Site #:	Date Form Submitted:
Water Depth (m):	Sed. Penetration (m):	Basement Penetration (m):

Do you need to use the conical side-entry sub (CSES) at this site? Yes ☐ No ☐

Are high temperatures expected at this site? Yes ☐ No ☐

Are there any other special requirements for logging at this site? Yes ☐ No ☐

If "Yes" Please describe requirements:_____

What do you estimate the total logging time for this site to be:_____

Measurement Type	Scientific Objective	Relevance (1=high, 3=Low)
Neutron-Porosity		
Litho-Density		
Natural Gamma Ray		
Resistivity-Induction		
Acoustic		
FMS		
BHTV		
Resistivity-Laterolog		
Magnetic/Susceptibility		
Density-Neutron (LWD)		
Resitivity-Gamma Ray (LWD)		
Other: Special tools (CORK, PACKER, VSP, PCS, FWS, WSP		

For help in determining logging times, please contact the ODP-LDEO Wireline Logging Services group at:	Note: Sites with greater than 400 m of penetration or significant basement penetration require deployment of standard toolstrings.
borehole@ldeo.columbia.edu http://www.ldeo.columbia.edu/BRG/brg_home.html Phone/Fax: (914) 365-8674 / (914) 365-3182	

Form last revised: 24 March 1997

ODP Site Description Forms:

Please fill out information in all gray boxes

Page 4 - Pollution & Safety Hazard Summary

New ☐ Revised ☐

Proposal #:	Site #:	Date Form Submitted:

1	Summary of Operations at site: (Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on page 3.)	
2	Based on Previous DSDP/ODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock:	
3	From Available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.	
4	Are there any indications of gas hydrates at this location?	
5	Are there reasons to expect hydrocarbon accumulations at this site? Please give details.	
6	What "special" precautions will be taken during drilling?	
7	What abandonment procedures do you plan to follow:	
8	Please list other natural or manmade hazards which may effect ship's operations: (e.g. ice, currents, cables)	
9	Summary: What do you consider the major risks in drilling at this site?	

ODP Site Description Forms:

Page 5 - Lithologic Summary
New ☐ **Revised** ☐

Proposal #:	Site #:	Date Form Submitted:

Sub-bottom depth (m)	*Key reflectors, Unconformities, faults, etc*	*Age*	*Assumed velocity (km/sec)*	*Lithology*	*Paleo-environment*	*Ave. rate of sediment accumulation (m/My)*	*Comments*

Form last revised: 24 March 1997

INTERIM SCIENCE STEERING AND EVALUATION PANELS MEETING

20-22 January 1997

Carriage House
Woods Hole Oceanographic Institution
Woods Hole, MA 02543

Monday, 20 - Tuesday, 21 January

Members and guests present:
ex-OHP: A. Ravelo, A-M. Karpoff, S. D'Hondt
ex-SSGP: B. Hay, M. Whiticar, G. Eberli, M. Underwood, P. Baker, W. Soh
ex-LITHP: J. Ludden, J. Gee, M. Whiticar, K. Gillis, R. Rihm
ex-TECP: K. Brown, J. Skogseid, A. Yin, G. Karner, D. Mueller

J. Miller (TAMU), P. Dauphin (NSF), E. Kappel (JOI), John Farrell (JOI), M. Mutti (JOIDES), S. Humphris (JOIDES)

Meeting Agenda:

1. Welcome	John Ludden (Interim SSEP Chair)
2. Meeting Logistics	Maria Mutti (JOIDES Office Liaison)
3. Role of the Interim SSEPs	S. Humphris (PCOM Chair)
4. The Mail Review Process	S. Humphris (PCOM Chair)

5. Selection of Proposals for Mail Review
   (a) Review of proposals submitted to the 1 January 1997 Deadline
   (b) Review and recommendations for Proposals that were highly ranked in the 1996 Thematic Panel Global Rankings
   (c) Mail Review Recommendations for other active proposals in the system

6. Review of the list of Proposals for Mail Review
7. Selection of five reviewers for each proposal
8. Closing remarks on the review process

Adjourn

Summary of the meeting:

The purpose of this meeting was to start the external review process and as such the review process was different from past thematic panel reviews, and, presumably, from that which will be used by the new SSEP's.

The objective was to select about 20 proposals for external comment from those in the system. Three groups of proposals were evaluated:

(1) New proposals and revisions submitted for the 1 January 1997 deadline;
(2) Proposals that were ranked in the top 10 of each thematic panel's global ranking at the spring 1996 meeting, including those proposals not scheduled in the 1998 drilling prospectus;
(3) All other active proposals in the system

The criteria for readiness for external comment were based on a preliminary document provided by the JOIDES Office. These were:

(1) The proposal addresses a scientific problem that is identified as a high priority in the ODP LRP (or moves beyond the LRP)
(2) There is clear justification that drilling is the best way to achieve the scientific objectives being addressed
(3) There is a well defined drilling strategy, the success of which can be assessed on the basis of geophysical/geological data as presented in the proposal

Each proposal was ranked from A (high) to C (low) for each of these criteria. Those scoring a (C) for any of the review criteria were not recommended for external comment.

For the proposals received for the January 1 deadline which were not sent for external comment, the committee completed a full review using the evaluation forms defined by the thematic panels. No reviews were completed for the new proposals that were sent for review; however, in certain cases, recommendations have been noted in these minutes for the new SSEPs panel chairs.

Closing remarks:

It should be noted that the panel worked as a single multidisciplinary group throughout the process, and the interaction between scientists of different backgrounds was extremely beneficial to the review process. For example: comments from members of the ex-TECP panel on regional tectonic overprints in evaluation of global sea-level change; from the ex-OHP panel on the role of LIP's in biological change.

In general the committee recommends that the future SSEP's should meet as a single body, which may divide from time to time depending on the review requirements in specific areas.

Given that some proposals, that were not revised for the January 1997 deadline, were selected for external comment, the committee recommends that the proponents should be contacted, and given the chance to revise their proposals before they are sent for review.

LIST OF PROPOSALS RECOMMENDED FOR EXTERNAL COMMENT:

Proposals received for the January 1997 deadline

25 new and revised proposals and letters of intent were submitted for the January 1997 deadline, of which 13 were recommended for external comment.

451-Rev4	Ocean Drilling in the Tonga Forearc	Tappin, D.R.
455-Rev3	Laurentide Ice Sheet Outlets (LISO)	Piper, D.J.W.
463-Add3	Shatsky Rise Plume Impact Hypothesis	Sager, W.W.
472-Add2	Mass Balance : Mariana-Izu	Plank, T.
484-Rev	East Asian Monsoon History	Wang, P.
485-Rev2	Southern Gateway - Australia and Antarctica	Exon, N.F.
489-Rev	Ross Sea Shelf : Glacial History & S.L.	Davey, F.J.
490-Rev	Prydz Bay Glacial History	O'Brian, P.E.
499-Rev	ION Equatorial Pacific Site	Oreutt, J.
511	Sea-Level Models : Canterbury Basin	Fulthorpe, C.S.
503-Add	East Antarctic Ice Shield and Weddell Basin	Jokat, W.
496-Rev	VRM's and Oceanic Plateaus W. Australia	Planke, S.
426-Rev	Australia-Antarctic Discordance	Christie, D.

Recommendations for external comment from panel's thematic and global rankings:

431	ION West Pacific Seismic Network	Suyehiro, K
465	SE Pacific Paleoceanography	Mix, A.C.
445	Nankai Trough	Moore, G.F.
450	Taiwan Collision	Lundberg, N.
480-Rev	Caribbean Cretaceous Basalt Province	Driscoll, N
442	Northern Marian Rift	Stern, R.

Recommendations for other proposals in the system

355	Peruvian Gas Hydrates	Von Huene, R.
467	Sea Level Changes in the Western Mediterranean	Droz, L.
486	Paleogene Equatorial Pacific transect	Lyle, M.

New Proposals and Revisions reviewed but NOT selected for external comment

448-Rev3	Origin/Post-Emplacement Hist. of Ontong Java	Kroenke, L.W.
477-Add	Okhotsk & Bering Seas Plio-Pleistocene History	Takahashi, K.
479-Add	Anatomy of an Active Hydrothermal System	Binns, R.A.
482-Rev	Wikes Land Glacial History & Sea-Level	Escutia, C.
492-Rev	Taiwan Arc-Continental Collision II	Lallemand, S.E.
497-Rev	Ryukyu Forearc Tectonics and Paleoceanography	Ujiie, H.
500-Rev	Fast Spread Crust at the H2O Seafloor Observatory	Stephen, R.A.
510	Coral Sea : Sea Level & Paleoceanography	Isern, A.R.
512	Eastern Atlantis Ridge-Transform Intersection High	Blackman, D.
513	The Scott Plateau - Indian Ocean Water Mass History	Opdyke, B.N.
514	Timing and Amplitude Sea Level variations in Maldive	Droxler, A.W.
515-	Pleistocene Climatic Cycles in the Black Sea	Flood, R.D.

Proposals from Global rankings and Prospectus NOT sent for external comment

79	Somali Basin
LOI 69	Barbados Cork Refurbishment
481	Red Sea Deeps
420	Evolution of Oceanic crust
476	Hudson Apron
453	Bransfield Strait

Reviews of new proposals and revisions:

Note to new SSEP's: All proposals with A and B rankings were recommended for external comment, only those for which we had a specific comment which we feel should be considered as part of the review of the proposal are listed here. New proposals, LOI's and revisions which were not recommended for external comment were provided with a review and comments under the «old-style».

448-REV3 Ontong Java

Encourage discussion with Castillo et al. group (501). Needs site survey before it can go for outside review. The panel was uncertain what specific hypotheses were being tested with regard to rift-dipping reflectors (emplacement style) and collision-related tectonism and how the proposed drillsites would contribute to the solution of these problems.
See recommendation of LITHP on Western Pacific magma evolution experiment, and also section on LIP's in Woods Hole report.
Not ready for external comment -
SEE DETAILED REVIEW.
448-Ontong-Java
A1; B1.2; B2.1, C2, D1; E8 (site survey); F2

451-REV4 Tonga forearc

1B 2A 3A
The panel would like to re-emphasize the importance of a drill site to the south of the Louisville Ridge (i.e. the "initial" conditions prior to back-arc basin initiation).

463-ADD3 Shatsky Rise

1A 2A 3A
Send it out for comment as this proposal is mature. The panel does however encourage integration of all of the West Pacific Ocean crust and LIP sites in one global multi-leg experiment, based on a series of testable hypotheses.

477-ADD Okhotsk and Bearing Sea High res paleo

Climatic history, highly methanogenic-gassy sediments
Proponents need to evaluate organic materials in sediments-no mention of organic geochemistry problems-
Bering Sea-what is the connection to the Arctic. Deeper penetration possibility. Sediments in the Sea of Okhotsk are gas rich, and an appropriate strategy for sampling them needs to be worked out, in particular concering a coring and core-handling strategy to preserve the fine time-scale record
Need to be rewritten for outside review.
SEE DETAILED REVIEW.
477-Okhotsk and Bering Sea
A1, B1.2, C1, D6, F2

479-ADD Anatomy of an active hydrothermal system, Manus Basin
Site survey materials are available, will be delivered at next proposal submission deadline. Not appropriate for outside review-not ready until new survey data comes in.
May be other places where these problems can be addressed-but this is the only proposal like this in the system. Revision expected by September.
Review to proponents asking for submission of revision with new site survey data for outside review.
SEE DETAILED REVIEW
479-Manus Basin
A1, B1.2, B2.1, C2, D1, E8, F2

SSEP NOTE-For all Antarctic DPG sponsored proposals:
Drilling in the Antarctic Peninsula region has recently been scheduled. Other proposals for Antarctic drilling are far enough along to be sent for external comment. On balance, we suggest that the current status of the proposals reflects very well on the Antarctic Detailed Planning Group activities of the last few years, and that following the relative success of that activity there is no longer any need for an Antarctic DPG.

During its last meeting, SGPP strongly suggested that consideration of any future drilling should be based on thorough evaluation of the results from the Antarctic Peninsula (Leg 178). This initial test case will be essential for evaluating core recovery, biostratigraphic resolution, and exact timing of ice-sheet arrival at the continental edge.

482-REV Wilkes Land Glacial History
Timing of glacial onset, change in glacial interglacial regime, high res records
No major change in strategy, site location since last review.
As the Interim SSEP recommends that no new Antarctic DPG is needed, the proponents are strongly encouraged to resubmit and revise the proposal in order to consider separately the 2 options: 1 leg scenario and 1 superleg combined with 490-Ross Sea drilling strategy.
See Antarctic DPG comments above.
SEE DETAILED REVIEW
482-Wilkes Land
A1, B1.1, B2.1, C2, D1, E8, F2

484-REV East Asian monsoon history
1A 2A 3B
Send out for comment.
The interim SSEP is very enthusiastic about the multidisciplinary scientific opportunities that would come out of drilling in the South China Sea and felt that this proposal would now benefit from external comment. There are several aspects of the proposal that still need work/nurturing that should be considered when handling this proposal in the future, and that may influence site selection significantly:

1. The proposal needs a more detailed explanation of the hydrographic setting, and better developed rationale and strategy for monitoring deep and surface paleoceanographic changes.

2. Questions raised by the Tectonics Panel comments in their Spring 1996 meeting still need to be addressed in detail. (See the Tectonics Panel review). The proponents should be encouraged to form collaborations with researchers with expertise in tectonics in order to adequately develop those aspects of the proposal.

485-REV2 Southern Gateway
1A 2A 3B
Proponents need to elaborate on the tectonics aspects of this proposal. They mention making comparisons between the TFZ site and those drilled during ODP Leg 159. The proponents should explain how their drilling strategy differs from that of Leg 159, how the lessons will be applied to the TFZ, and how they expect to achieve their objectives by drilling a single hole. They should provide a clearly stated hypothesis regarding the TFZ and a clear outline of how they intend to test the hypothesis.

489-REV Ross Sea
1A 2A 3A
Send for comment, but see Antarctic DPG comments above.

490-REV Prydz Bay
1A 2A 3A
Send out for comment, but see Antarctic DPG comments above.

492-REV Taiwan Arc Collision
Note this is NOT the 450 Taiwan arc collision that was TECPs #1 ranked proposal.
Series of sites, but most don't really address the questions that they ask.
There are, however, clear problems with how the scientific objectives were formulated in this proposal. Basically, how would the data collected at most of the proposed sites forward our fundamental understanding of the collision process? Many of the sites do not have a convincing relationship to the principal objective of this proposal. Some specific comments:
1 The justification for how/why the transect of sites (ACT 5, 6, 3) across wedge relates to the collision process is very weak. For example;
a) why does the regional diachronous unconformity that is referred to is at the base of the trench fill relate to the timing of collision? This unconformity has presumably been present since the beginning of subduction along this margin.
b) Why really is it important to date the oldest portion of the wedge?
c) Seismic stratigraphy is probably the best way to demonstrate activity at the toe of the wedge. Based on the seismic evidence, the frontal thrust looks active, why do we need to spend the money to drill ACT 6? This also beings into question the significance of the shear zone at site 4.
SEE DETAILED REVIEW
492-Taiwan Arc Collision II
A1, B1.3, B2.1, C3, D1, E8, F3

496-REV Western Australia Volcanic Margin
1A 2A 3B
Send out for comment. Send to plume and nonplume reviewers.

497-REV Ryukyu forearc tectonics and paleoceanography

The panel recommends the proponents to look more carefully on the last reviewes provided by TECP and OHP. The proposal lacks a presentation of the regional geological setting; there is no hypothesis testing strategy suggested; and neither the global relevance, nor the ODP Long Range Plan objectives are directly addressed.
SEE DETAILED REVIEW
497-Ryukyu forearc
A2, B1.3, B2.1, C3, D1, E4, E8, F3

499-REV ION equatorial Pacific
1A 2A 3A
Send out for comment. Send out Global Siting Plan with request for comment.

500-REV Fast spread crust at the H2O seafloor observatory

We support the proposed scientific plan for installing a long-term seafloor observatory in the fast spread eastern Pacific ocean using the AT&T's Hawaii 2 cable. The availability of the cable provides an unusual opportunity for recording global seismic data in a real time fashion which has broad implications for mantle dynamics. We anticipate the completion of the site survey in the near future and look forward to providing more specific suggestions on the site selection once the preliminary geologic and geophysical data are obtained in the general targeted area. We are pleased to note that the proponents include tectonic implications of the proposed drill sites.
SEE DETAILED REVIEW
500-Fast spread crust at the H2O observatory
A1, B1.3, B2.1, C2, D2, E2, E6, F2

503 ADD Glacial history in Weddell Basin
1A 2A 3B
The panel retains the OHP enthusiasm for the Mesozoic objectives and Polarstern drilling. Given that enthusiasm, the panel was concerned about the apparent loss of Mesozoic objectives (resulting from the 503-ADD plan to drill less deeply at WSO6A and to limit WSO7A to an alternate site). Realistically, the present drilling plan will probably not provide well-constrained estimates of the timing of Gondwana break up.

510 Coral Sea, sea level and paleoceanography
Complete Great Barrier Reef study (Leg 133-drilled near here)
Sea level, paleoclimate, fluid flow. All sites address objectives.
Paleoocean-Australia closed in to north, changes effectively cut off circulation between Aus and NG.
SEE DETAILED REVIEW
510- Coral Sea
A1, B1.2, B2.1, C1, D1, E8, F2

511 Sea level models, Canterbury Basin
1A 2A 3B
Send for external comment:
The interim SSEP generally felt that this proposal was well-written and focused on a high-priority ODP objective directly testing models of global eustacy and indirectly testing the relationship of global sea level to the global marine -18O record. However, four concerns were raised by the panel. First, given the burial depth (mbsf) of these sequences (910 to 1640 m), carbonate

diagenesis will greatly impede direct correlation of local onlap and offlap to the marine -18O record. Second, members of the panel expressed concern about whether any global signal could be truly disentangled from the regional response of sea level to Neogene tectonic activity. The impact of New Zealand tectonics should be assessed and addressed in any revised proposal. Third, a tremendous amount of drilling would be required to drill the proposal sites (11,550 m of total drilling). Fourth, the relationship of previous ODP results to the proposed drilling is not fully developed, It should be more fully developed in any revised proposal. This proposal is unlikely to proceed much further unless the sites are prioritized and a coherent drilling strategy is defined (i.e. What are the minimum sites necessary to address and attain the primary objectives? Which sites are necessary to demonstrate that the global sea level signal can be distinguished from the regional signal [New Jersey margin and Bahamas])?

512 Eastern Atlantis Ridge-transform intersection high
Lots of potential here for the study of an oceanic core complex
SEE DETAILED REVIEW.
512-Eastern Atlantis Ridge
A1, B1.1, B2.1, C2, D1, E2, E3, E4, E6, F2

513 Scott Plateau, Indian Ocean water mass history
More of a letter of intent.
Old-style review, send it back to proponents.
513- Scott Plateau
A1, B1.2, B2.1, C3, D1, E3, E4, E6, E8, F2

514 Timing and amplitude sea level variations Maldive
Sea level variations in the Maldives Archipelago. Large events on Exxon curve, not really well resolved on -^{18}O record. Need 6 to 8 pretty deep holes on two transects. No address of why it is any better here, a least it should be better developed. Incorporate tectonic study into a new proposal.
SEE DETAILED REVIEW.
514-Maldive sea level variation
A2, F2 LOI only

515 Pleistocene climatic cycles in the Black Sea
Letter of interest. High res climate record study. Terrigenous sediment input variations, two sources. Leg 42 drilled in south Black Sea, this is development of this. Anoxic basin with sea level drop. reported changes of 140 m in less than a couple of years.
SEE DETAILED REVIEW:
515- Black Sea climate cycles
A1, B1.3, B2.1, C2, D1, E8, F2, F5

Globally ranked proposals:

447-Woodlark basin-
SSEP NOTE-work owed panel-SSEPs need to revisit the progress made on requirements set by TECP. TECP had several items that they said must be addressed before this leg should sail. There is concern from this panel that these issues have not yet been resolved. Despite the fact that this leg is on the current drilling schedule. SSEP should follow up on these issues.
1) structure contour map of fault surface
2) 3.5 KHz over bathymetric escarpments - how do we know the fault is active
3) reprocessed critical seismic data
4) Seismic strat study of the region
5) Depth conversion of crtical seismic sections
6) Demonstrate that stress rotation can be measured with the tools/technology available.

431-ION-Western Pacific and Japanese trench sites
1A 2A 3A
Send for comment.

079-Somali basin
Old ocean history investigation. Utilitarian proxies will not work at this depth. Not revised since originally put in. The proponents are not willing to revise. Recommendation from SSEP that if the proponents want this reconsidered they should resubmit knowing that the proposal will go for external comment.
Do not send out for review.

LOI 69-Barbados CORK
Refer to PPG.

450-Taiwan Arc Collision
1A 2A 3A
Send for comment.

Proposals from Global Rankings 1996

480-Caribbean Createaceous Basalt Province
1A 2A 3A
Send for comment.
SSEP NOTE: Tectonic aspects should be developed fully, in particular the implications of southerly derived turbidites in terms of northern South American drainage and the eastward propagation of the Caribbean plate.

481-Red Sea Deeps
Don't send it out-undergoing revision. Political clearance and waiting on revision.

420-Evolution of ocean crust-
Dropped off active proposal list because no proponent has come forward to revise it.
Don't send it. Waiting for a new proponent and resubmission.

476-Hudson Apron
Slope failure investigation. Near New Jersey sites. Time, space, scale problem. wait until Leg 172 is over. Questions from TECP about if this was a good site or just a site of opportunity.
Don't send it out.

453-Bransfield Strait
Never revised after submitted. Proponents group have split. Let proponents resubmit if they want.
Don't send out for review. Have SSEP look and decide if they should rekindle interest.

491-Cyclic crustal evolution
1A 2A 3C
Long flow length dipping reflectors. Interest is high, but waiting for revised proposal requested in Spring 1996.
Don't send it out, forward to SSEP for consideration.

466-GAB-
Don't send out. Wait for revision.

468-Romanche and 376 VEMA
NOTE TO SSEP. Good idea to see revisions of these proposals get reviewed. Chairs of the new SSEP and SCICOM should encourage revised versions to be submitted for external review.

Potential reviewers

451- Tonga
Tony Crawford-Tas. , Jon Davidson-UCLA, Rene Maury, UBO Brest, Gail Mahood, Stanford, Jenny Collier, Cambridge; Fernando Martinez, Hawaii

455-Laurentide Ice sheet
Brian Bornhold (PGC), Bob Alley, Penn State; Gerrard Bond, Lamont; Michael Sarnthein, Kiel Tom Cronan, USGS, Reston; George Denton , Maine; John Knight, PetroCan; Doug MacAyel, Chicago.

463-Shatsky
GeoffDavies, ANU; Nick Arndt, Rennes; Mike Gurnis, Cal Tech; John Lassiter, DePaulo; John Diebold, LDEO, Tatsuro Urabe, GSJ

472-Mariana-Izu
Hubert Staudigal, Scripps; Stan Hart, WHOI; Rick Varne, Tasmania; Gretchen Fruh-Green, Zurich; Arima, Yokohama, Peter Vrolijk, EXXON

484- East Asian Monsoons
Mo Raymo, MIT; Peter Dimenocal, LDEO; Paul Tapponier, Paris; John Kutzbach, Wisconsin; Bob Thunell, S. Carolina; Tom Pederson; UBC; Gerold Wefer; Bremen; Thure Cerling, Utah; H Leloup,

485- Soutern Gateways
Paul Cieszilski, Florida; Chris Charles, Scripps; Eystienn Jansen, Bergen; Joann Stock, Cal tech; Peter Camp, New Zealand

489- Ross Sea Shelf
Dave Hodell, Florida; Scott Ishman, USGS Reston; Dieter Futterer, AWI; Anders Elverhoe, Oslo; Karl Hinz, BGR; Rob Dunbar; Rice

490- Prydz Bay
Philip Huybrecht, AWI or Ghent; Nils Reeh, Greenland Survey; David Piper, GSC Dartmouth; Woody Wise, Florida State; Dave Lazarus, Berlin;

503-East Antarctic,
Will Howard, Tasmania; Amy Laventer, Minn; Brian Huber, Smithsonian; Laurent Laboyria GIF; Jan Bachman, Stockholm;

511- Canterbury Basin
Neal Driscoll, WHOI, Cam Nelson,Otago,; New Zealand; Bil Haq, Oxford; Christian Ravenne; IFP Paris; Paul Weimer, Colorado; Louis Bartok, Alabama; Dick Walcott, Wellington

499-ION Equatorial Pacific
Roy Hyndman, GSC Victoria, Jim Kinoshita, JAMSTEC; Thorne Lay, Santa Cruz; George Zandt, Arizona; Sean Solomon DTM, John Vidali, UCLA; Ulrich Achauer , EOPG Strasbourg;

431-ION
Spahr Webb, Scripps; Jason Phipps Morgan, Scripps; Claude Jaupart, IPG Paris; Bernd Milkereit, Kiel; Christophe Sautin, Nantes; Hitashi Himamura, Hokkaido

496- Couvier margin
Bob White, Cambridge; Ulrich Von Rad, BGR, Steve Holbrook, WHOI; Godfrey Fitton, Edinburgh; Kaj Hoernle, GEOMAR;

426-Australian Antarctic Discordance
Vince Salters, FSU; Cathrine Chauvel, Rennes; Emily Klein, Duke; John Veevers, Macquarie, Uli Christensen, Gottingen

465-SE Pac Paleo,
Brad Linsley; Claude Hellaire Marcel, Quebec, Montreal; Rolf Tiedemann, GEOMAR; Dave Murray, Brown; Jean Pierre Caulet, Paris Nat Hist Museum, John Steinmetz, Montana

445- Nankai trough
Gaku Kimura, Tokyo; Jun ichiro, Tokyo; Graham Westbrook, Birmingham; Pascal Phillipo, Paris; Ben Davis, SUNY Stonybrook; Erwin Suess GEOMAR

450-Taiwan Arc collision
Pean Pierre Burg, Zurich; Xavier Le Pichon, Paris, Louis Teng, Taiwan National U; John Suppe, Princeton; Ray Price, Queens, Canada; John Platt, University College, London

442- N Mariana Rift
Kantaro Fujioka, JAMSTEC; Charlotte Keen, GSC Dartmouth; Yves Lagabrielle, BREST; Phil Gans, Santa Barbara; Phil Symonds, AGSO Canberra

467- Western Med
Bill Normark, USGS, Menlo Park; Roger Flood, LDEO Jean Mascle, Villefranche; Bill Ryan, LDEO; Dan Bernoulli, Zurich; P. Nicoleah, Trieste

486-Paleogene equatorial
Jim Zachos, Santa Cruz; Steve Hovan, Indiana of Penn; Brad Opdyke, ANU; Jim Wright, Maine; Isabella Prioli-Silva, Milan; Hans Thierstein, Zurich

355-Peru Gas hydrates
Darell Cowan, Washington; Ryo Matsumoto, Tokyo; Gerry Dickson, Australia via Michigan; George Spence, Victoria; Rienhard Hess, McGill

480-Caribbean Basalt Province
Martin Minschede, Tubigen; Peter Stoffers, Kiel; Dick Buffler, UTIG; Mike Perfit; Florida; Kevin Burke, Houston; Jim Pindell, S of England; Luc Beaufort, Bourdeax/ Marsseiles

John Ludden
Nancy, France
February 7, 1997

Janus Project

the ODP Data Management System Replacement Project

Background

Project Goal:

Primarily *"to improve the quality, productivity and visibility of the science resulting from ODP drilling by providing a data management environment which meets current and future needs of the scientific user community"* (from 1/95 Statement of Work).

Requirement:

A new relational computer database system, including hardware and software, is being deployed in 1997. The shipboard and shorebased systems will be fully integrated and usable via three client platforms (Unix, Mac, and MS Windows). Data acquisition and retrieval will be significantly improved by new applications and graphical user interfaces (Oracle). The Incremental Build Development Methodology (IBDM) has been adopted as the project development philosophy. The IBDM uses repeated cycles of analysis, rapid prototyping and continuous development. Strong user input from the scientific community and TAMU has been a critical element to the success of the project.

Project Participants and Their Roles:

Steering Committee (SC) JOI-appointed experts representing the end users of the ODP community and providing definitive direction to ODP/TAMU on the conduct of the project.

- •supply guidance and review of the project development (system requirements, design)
- •receive and coordinate end-user requirements regarding data types & queries
- •ensure that TAMU receives appropriate input from the user community
- •provide guidance to TAMU and Tracor in the nature & priorities of user requirements
- •provide JOI Inc. with at least quarterly progress reports & regularly update PCOM
- •serve as the conduit to the user sci. commun. for info on this system and its progress

Tracor (Analysis and Applied Research Division), aka "developer", "subcontractor".

- •design overall data management system & provide specifications of hard- & software
- •develop data capture and information retrieval applications
- •supply training and documentation for the system

ODP/TAMU project manager and tech. reps. of TAMRF given sole authorization

- •implement Tracor's transition plan
- •supply Tracor with info regarding the ship and shore environments
- •contractually monitor Tracor's technical progress
- •direct the purchase and installation of the hard- & software via TAMRF
- •provide info received from the SC to Tracor
- •implement the written direction from JOI (possibly resulting from SC suggestions)
- •accept, operate and maintain the final system

User Groups members and participants of the scientific drilling community selected by the SC for the purpose of preliminary definition, testing, and evaluation of Tracor's products.

- •one group of 10-15 users from the international community for each data type (eight in all)
- •each group has a subgroup of 4 users (and a chair) that will directly interact with Tracor in the development, testing and evaluation of software application products

•achieve as wide a consensus as possible on the usefulness & quality of Tracor's products

Project Management:

Overall guidance for this project will be provided by the SC. ODP/TAMU will consult with Tracor to incorporate the SC guidance. If ODP/TAMU feels it cannot follow the guidance of the SC, it will bring the matter to JOI Inc. for resolution.

JOI Inc. has the overall contractual authority with TAMRF, which in turn has contractual authority with Tracor.

Information will flow through the SC & its user groups, which will interact with Tracor & TAMU.

Progress reports will flow from Tracor to TAMU/TAMRF. Tech. reports, cost summary reports, and other pertinent info will be supplied to the SC by ODP/TAMU.

Personnel:

The current SC membership includes: Kate Moran (Chair, BIO, Canada), Carla Moore (NOAA), Phil Weaver (NERC-Wormley, UK), Nick Pisias (OSU), Eve Arnold (URI), Pat Castillo (Scripps), Will Sager (TAMU), and Steve Hurst (UI).

Tracor liaisons: Jerry Burke (leader), Glen Corser, Paul Albride, Jim Whitely

ODP/TAMU liaisons: Russ Merrill (project manager), Jack Foster, et al.

Other liaisons: Peter deMenocal (BRG), Paul Dauphin (NSF), John Farrell (JOI)

[reprinted from the March 1997 issue of the*JOIDES Journal*]

Janus in January

by Kate Moran

Chair of JOI's Janus Steering Committee

Janus, the new ODP computer database system, was successfully deployed this January on Leg 171B. In addition to drilling and core/sample information, the system now captures paleontological, MST (multi-sensor track), physical property, chemistry and X-ray data directly into the Oracle relational database.The Janus system enables data acquisition and retrieval through both manual and instrumented interfaces which significantly reduces errors, data collection time, and entry of redundant data. Other features include: (1) a bar code system for sample stickers; (2) use of the computer system at novice and expert levels so that it may be customized for personal preferences; (3) a consistent and user-friendly connection to the system through a graphical user interface; and (4) database output that can easily be imported into commercial software packages such as Excel and Kaleidagraph.The science party on Leg 171B were able to access and share much data using developmental software to "query" the database and receive the desired information in a useful format.

Visual description of the cores is now being accomplished with a software package called Applecore. This was first used on Leg 169 in its "off the shelf" mode, but was customized for ODP conventions for Leg 171B. This package is still under development, and additional modifications were incorporated into the version used on Leg 172. Applecore forms the basis of a new unified core description system for Janus. In the near future, Applecore will be modified to incorporate structural and hard rock data. The target for completion of these modifications is Leg 176 when Hole 735B will be deepened.

A software package named Paleo now links paleontological data captured directly to the Janus database. Data are entered as paleontological species are identified and species abundances determined. The data can be easily edited at any time so that scientists can be flexible with data entry. Reports are generated by direct queries to the database using the customized paleo software. For example, marker species, age, depth, and depth range can be downloaded from Janus into spreadsheets for interpretation of hole and site age models.

MST data, including GRAPE, P-wave velocity, magnetic susceptibility and natural gamma, were uploaded to Janus and made available to the shipboard party from any computer station. During Leg 171B, reporting software was written to download MST data into Splicer, the custom software used for construction of composite stratigraphic sections at multiple-hole sites. During the Leg 172 portcall, this reporting utility was improved in order to simplify access to Janus from Splicer.

Discrete physical property measurements have seen vast improvements over the past year with upgrades to the Labview interfaces for this diverse mix of instruments. With the new Janus database, the text files generated from these instruments are now uploaded using a simple windows environment. Given the diversity of measurements made in this lab, utilities will be developed for the physical properties specialists to upload and overwrite any data set.

Providing consistent and unified software systems for the chemistry lab has been a challenge during Janus development. Janus interfaces for chemistry are modeled after spreadsheets commonly used in this lab. The interfaces for interstitial waters, gas, and carbonate were completed and successfully tested during Leg 171B. Sample ID's are scanned into the system using a hand-held bar code scanner. The coulometer has recently been interfaced to a Labview application that automatically captures these data into spreadsheet form, reducing tedious data entry. The chemistry software systems will be completed during Leg 172 with the addition of wet rock chemistry and XRD data input and reporting utilities.

Drilling data are now captured to Janus. The drillers used Janus in real-time to track these operations and have suggested some improvements to their Janus data reports that will further assist them.

The highest priority for the next stage of Janus development is visual core description for hard rock and structures. Other developments will include the data capture for paleomagnetics, color reflectance, thermal conductivity and the routine downhole tools.

[reprinted from the March 1997 issue of the *JOI/USSAC Newsletter*]

The debut of Janus, the new kid on the boat

Name: Janus
DOB: January 8, 1997
Weight: eight terabytes, six gigabytes (and growing)
Height: DEC AlphaServer 2100 with 64-bit hardware

Like new parents, we're proud to announce the birth of Janus, the new ODP computer database system. Of course, as with any baby, the prenatal period was fraught with planning, interaction with experts and soothsayers (hence Oracle), and even a little hand wringing. However, thanks to the hard work of the dedicated delivery team of ODP/TAMU and Tracor Inc. personnel, this baby was successfully delivered (not contractually speaking of course) on the *JOIDES Resolution* in Barbados, at the beginning of ODP Leg 171B. All went well, despite the fact that the ship's doctor was busy conducting radio patches, and sparks flew when the cord was cut (on the old S1032 database).

The baby's not bad looking, as babies go, but it's still just a baby. It'll grow and do more with time. Patience is required. At this stage of development, Janus is doing a great job of capturing data through both manual and instrumented interfaces. This makes the lives of shipboard scientists easier because it reduces errors and the entry of redundant data and it decreases data collection time. Data from the following areas are being directly entered into the Oracle relational database: drilling, operations, core/sample, paleontology, multi-sensor track, physical properties, chemistry, and x-ray. A new visual core description package, Applecore, is now in use for digital capture of these data and an interface to Janus from Applecore is under development. Additional applications are being written to enter data from: age-depth models (new), sediment and hard rock description, color reflectance, thin sections, paleomagnetics, thermal conductivity, and the Adara tool. For details, see the article "Janus in January" in the most recent issue of the *JOIDES Journal* (vol. 23, no. 1) or at http://www-odp.tamu.edu/janus/joi/janus.html.

As babies grow and discover, so do their parents. ODP/TAMU personnel, shipboard scientists, and shorebased investigators accessing Janus online, will have to learn how to use this powerful research tool. Entering data into Janus is one thing, getting data out, and in a useful manner, is another thing, but that's where the power of a relational database becomes apparent. ODP/TAMU is rapidly providing reporting tools for easy access to Janus data. These reports provide simple steps for a shipboard scientist to pull data from Janus, in a relational fashion (e.g., "give me all the weight percent carbonate data and the dry density data from Miocene intervals drilled in the Atlantic at water depths between 3 and 3.3 km"). Currently, ODP/TAMU is developing reports using Java-based scripts that directly query the database. The most intriguing interface being examined at this moment is using JanusWeb/Netscape, a web browser approach.

Stay tuned. We'll provide a Janus update in the next issue of this newsletter, focusing on digital images, visual core description, and other developments from the toddler phase.

JOI Janus Steering Committee Meeting Minutes

14-16 February 1997

The Steering Committee met at the Charleston port call.

Meeting participants:

Paul Albright (Tracor)
Eve Arnold (SC)
John Beck (TAMU)
Jerry Burke (Tracor)
Pat Castillo (SC)
Glenn Corser (Tracor)

Peter deMenocal (LDEO)

Kay Emeis (SC)
John Farrell (JOI)
Jeff Fox (TAMU)
Steve Hurst (SC)
Terry Klepac (TAMU)
Matt Mefford (TAMU)

Bill Mills (TAMU)
Russ Merrill (TAMU)
Carla Moore (SC)
Kate Moran (SC)
Mike Ranger (Applecore)
Jim Whitely (Tracor)

Project status since the October Steering Committee

For the benefit of new members, John Farrell reviewed the role of the SC as one of providing advise and guidance to TAMU.

Kate Moran reviewed the following activities since the last SC meeting:
•Tracor/TAMU very successfully deployed the Janus software on 171B. Some minor problems were encountered, primarily with co-development software. Most problems were resolved during the leg.
•Contract amendment negotiations between Tracor and TAMU occurred from the end of October to the end of the calendar year. Major changes to the direction of the contract were discussed that included elimination of all project Tracor management, no plans for "below the line" tasks for completion of phase I, and a change to a personal services-type contract. In addition, the relationship between TAMU/TAMRF and Tracor continued to be one of confrontation, rather than partnership. During the December meeting of PCOM, these concerns were reported and PCOM made three Janus-related motions (voting either unanimous or 15 for - 1 absent for each motion). The first motion recommends that JOI direct TAMU to investigate and correct any management-related problems. The second motion reaffirmed PCOM's support for the completion of Janus phase I and phase II. The third motion recommends that TAMU regularly send personnel on drilling legs to improve and upgrade Janus software and that the capital costs for any new equipment include Janus interface software.
•SC access to information was limited. The SC was restricted from getting copies of contract amendments and letters related to the Janus project by TAMRF. This was resolved by Moran signing a confidentiality agreement with TAMRF. Other SC members can now have access to this information if they sign the same confidentiality agreement.
•During 171B, Jerry Burke sent a memo to TAMU that summarized recommendations from the Tracor developers onboard the ship. A conference call among TAMU, TAMRF, JOI and SC chair resulted in a review of all of the recommendations and implementation of some of the recommendations.

A discussion followed this review. There was general agreement that the major problem over the past several months was that the SC was not informed about overall budget and schedule changes in the Janus project. The SC and TAMU agreed that the role of the SC is to provide advice and guidance and should not be involved with management issues. However, the SC must be informed of any budget and schedule changes so that priorities can be set for completion of Janus phase I. Improved communications among TAMU, Tracor and the SC are required. **To improve**

communication, it was agreed that project status and phase I completion estimates would be reviewed bi-weekly by conference call.

JOI Report

John Farrell briefly reported on several JOI/JOIDES topics related to Janus. TAMRF recently issued an RFP for legacy data migration. At the final IHP meeting, Janus Phase I completion was recommended as a high priority. IHP/SMP/DMP have now been merged into a new JOIDES advisory panel, SciMP. The mandate of SciMP will include Janus. JOI recently developed a new sample distribution policy that was approved by both PCOM and EXCOM. The new policy may have a minor impact on Janus.

Review of Janus Deployment

Glenn Corser and Paul Albright, the Tracor developers who sailed on 171B reported to the SC. It was clear that deployment was very successful. Deployed software included all of UG1, UG2a, UG2b, UG3, and UG4a with the exception of Rockeval and XRD. The technical staff and Tracor ran both the new and old corelog for the entire leg and checked one against the other. The new corelog worked without error. Additional checks on corelog for upcoming legs are not required.

Software problems/issues that were identified during the leg include:
•bug in Neuron Data that shows up intermittently during corelog entry; Tracor is planning to follow up and correct this problem
• Bartender, the bar code printing utility requires technical upgrades; Tracor is planning to follow up and correct this problem
•Business Objects, the SQL reporting software, was used to generate 52 reports that work well on the PC. There is still a problem with using this utility on a Macintosh. Glenn and Paul recommended that the development of BO universes be more carefully thought out. Russ Merrill reported that Jack Foster is now responsible for BO reports and is organizing and maintaining the universes for relational database reporting.
•The MST data reporting for Splicer input needs to be streamlined; TAMU/Tracor were working on this during the portcall so that it could effectively be used during the upcoming high recovery leg.
•Chemistry requires additional reports; TAMU will be working on this during Leg 172
•The sample request code information was deleted (TAMU) from one of the sample screens which caused problems during 171B; TAMU corrected this problem prior to the portcall in preparation for 172.
•Samples taken at the same interval with the same code are not unique; Tracor will fix this problem by using the sample id generated in Janus as the unique identifier.
•TAMU developed a sample data entry screen that interfaces with Janus - it does not reference core type. The database identifies samples by leg, site, hole, core, coretype, section, top depth, bot depth; this and all other data entry screens should remain consistent to avoid problems with sample identification.
•Physical properties (discrete - UG3) needs a Janus editing utility because the data acquisition software does not restrict the user to one specific format.
•Core depths are recorded by the core techs and the drillers to different precisions. The database should be changed to allow for depth measurements of cm precision.
•Sample entry is still a duplication of effort for carbonate and discrete index properties (MAD). TAMU is installing bar code readers at these stations as an interim solution, but a database query would be the best solution to reduce this labour-intensive activity - one of the highest priority user requirements.

Matt Mefford and Terry Klepac, the two TAMU marine computer specialists (MCS) who sailed on Leg 171 reported to the SC about deployment. They concurred with Tracor about the success of Janus during 171B. The problems that were identified on previous legs where partial Janus

applications were tested did not occur on 171B. The database ran consistently and only shut down once for a period of 5 minutes. They suggested that, with increased use, the database will be accessed for more creative science and technical needs. The biggest problem is the limited reporting access. Reports should become a high priority for TAMU developers. The beginning-of-leg and end-of-leg (BOL/EOL) procedures went well. However, these have not yet been completed by TAMU personnel on their own and improvements may be required. **There may be a need for the TAMU database administrator to travel to the next several port calls to assist with the BOL/EOL tasks.** The database hardware and the Oracle software all worked extremely well.

Janus Phase I Acceptance

Jerry Burke and Russ Merrill reviewed acceptance criteria and timing. It was agreed that acceptance can occur for all Janus applications "above the line". This means that TAMU will evaluate Janus on a leg where no Tracor personnel are participating (e.g. Leg 172) and then develop a "punch list" of repairs that are needed. Upon completion of a build that includes these repairs, all manuals and documentation, then acceptance will be met. **It was agreed that the acceptance process could begin during Leg 172 or 173. The target completion date for acceptance is 31 March 1997.**

Training

Russ Merrill reviewed future Janus training. The odd number crew is well trained because of Leg 171B, with the Tracor developers onboard. The even number crew may still require additional training after Leg 172. Formal training in Business Objects will continue. The MCS's and other TAMU staff scheduled to sail on Leg 173 will go to Tracor for training. Russ Merrill reported that, for acceptance, Tracor has fully met all of the contractual training requirements.

Eve Arnold noted that training is required for staff scientists for Applecore. Eve wrote a "get started" document for sailing sedimentologists, but formal training is still required. **The SC suggested that Mike Ranger could provide Applecore training at TAMU for all TAMU staff scientists. Staff scientist training on the Janus Paleo application is also needed.**

SC Review of Deployed Software

Applecore

Applecore has been used on the ship since Leg 169 as a data entry system for sediment visual core description. Peter Blum prepared a detailed report that identified problems with Applecore, based on Leg 170 use. Eve Arnold reviewed Peter's report. All of the problems (with one exception) have either been addressed with existing modifications to the software or will be addressed with the planned modifications to the software in the current phase of Janus and for Phase II of Janus. The exception is the size of the data entry screen. The SC has requested that this change be incorporated into a future upgrade, but the possibility for this upgrade has not yet been confirmed by the developer, Mike Ranger. **Based on this review, the SC re-stated that Applecore is the primary Janus data acquisition software tool for visual core description.**

Eve also reported that the standard lithologies had not been completed for use in Applecore. Eve prepared a set of standard lithologies for use on the upcoming leg. **The procedure for establishing and maintaining standard lithologies in Applecore should be a TAMU responsibility with guidance from the new JOIDES Scientific Measurements Panel. The sediment handbook should also be changed to reflect the new software.**

The SC re-stated that Applecore output forms the baseline definitions for the data model of UG4b and some parts of UG5. Phase II funds in this FY should be allocated to begin the development of the data model because the Applecore text output forms the definition of fields for the visual core data model for both phase I and phase II of UG4b core description.

Depths/Corelog/Curation

The Janus Depths/Corelog applications worked well and, with the exception of a change in precision for recording depth (see page 1), no other changes are required. However, the depths function was not fully tested during 171B because mcd and compression functions were not utilized in reporting. These functions should be checked on legs where they see heavy use. The curation application is now a TAMU development and, as noted above, some problems occurred on Leg 171B. TAMU are correcting these problems for Leg 172.

Chemistry

Kay Emeis reviewed Chemistry with both the oncoming and offgoing technical staff. Gas, IW, carbonate, XRF (to a limited extent) were successfully used on 171B. The major problem with the Janus application in this lab is reporting. There will be no benefit for the sailing scientist to use the Janus interface for data upload unless the data are easy to retrieve from the database. **Thus, reporting utilities for the chemistry lab must be developed by TAMU as a high priority. Training in Business Objects for the chemistry technical staff should also be a high priority so that new reports can continue to be developed during a leg**. Kay will be communicating with the chemistry technical staff during Leg 172 for assessment of the chemistry user requirements.

Splicer/Clip

Peter deMenocal presented an overview of the core-log integration program software (CLIP) under development at LDEO. The development has two parts: Splicer and Sagan. Splicer has been used on several legs since Leg 154 and was used during the Leg 171B Janus deployment. Splicer imports MST data from multiple holes at one site. With user-defined tie points, Splicer is used to cross-correlates cores across holes. Two files are output from Splicer: an Affine table that lists the correlated offsets from mbsf depth for each core and the Splice table that lists the selected cores that provide the best continuous record for each site. The Affine table is used in Janus to calculate mcd for each core and section. Although mcd was not used from within Janus during 171B, Tracor successfully tested the upload of the affine table and checked that the depth offsets were calculated properly. The download of MST data from Janus into Splicer was cumbersome during 171B and will be improved for use on Leg 172. **TAMU should improve the upload of MST data into splicer by providing an easy reporting function for all file formats that can be read into Splicer from Janus.**

Sagan is software, under development, that will provide a tool to correlate core data with log data. The intention is to provide three correlation utilities: correlate individual cores to a log depth and output a dc offset for each core; correlate a spliced core record with the log data; and correlate an entire set of holes at one site to the log data. In the current phase of Janus, the database only includes core data that are referenced to the drill string depth. From a database planning viewpoint, there are two options that can be followed that would utilize the Sagan correlation tools: (1) maintain two separate databases for core and log data and use Sagan as an interpretation tool that would upload data from the separate databases; and (2) expand the Janus data model to include logs and log depths and use the output from Sagan to provide the offset depths for developing the relationships between the core and log data. These options should be evaluated when a beta version of Sagan is available.

MST/Physical Properties

The MST and physical property were successfully captured to Janus during 171B. The problems that occur with these instruments are changing file formats for upload to Janus. During 171B, there was a problem VS data where the transducer direction was stored incorrectly. Similar problems can still occur because of the flexibility of data storage files in the Labview interfaces. **TAMU should either fix the data output from these labs or provide training (and manuals) to the technical staff and scientists so that data are not incorrectly uploaded to Janus.** In addition, as noted above, duplicate sample entry is unacceptable for index properties and changes should be made to eliminate this step.

Review of software still to complete for Phase I

Age/Depth Function

The SC discussed and modified a strawman user-requirement for this utility that was developed by Jan Backman and reviewed by Phil Weaver. The user-requirement is defined by the steps listed here:

•Provide a data report from Janus (paleo application) that includes the defined timescale, marker species, age, and depth range for a selected hole.

•These data are then plotted by the user in a software package of their choice (e.g. Kaleidagraph), additional age events can be added (e.g. from paleomagnetics) and then age control points are selected.

•The age control points are listed in spreadsheet-form and should be uploaded into Janus in an easy way. This upload file will include leg, site, hole, core, coretype, depth range, and age for each control point. This file represents an age model for a specific hole that relates age to mbsf depth as a series of straight line segments.

•The reporting function should include the ability to output age vs. any depth scale; sedimentation rates vs. age or depth; and age vs. any measurement.

The SC discussed whether or not multiple age models should be stored in Janus. The decision must be based on the complexity (cost) of providing multiple age models in this function. **It was agreed that the initial user requirements would include one age model that could be modified up to the time of the first post-cruise meeting and the decision to provide multiple age models will be made once Tracor provides a cost estimate for this function.**

Janus Phase II/Hard Rock & Structural Visual Core Description

The SC met (in camera) to discuss the best approach for incorporating hard rock and structural visual core description into both phases of Janus. After the SC decided on the options for completion of phase I VCD, Mike Ranger was invited to provide input on the extent to which modifications to Applecore could meet some functions. The SC agreed that modifications to Applecore could be made to meet most of the structure user requirements for Phase I. A separate data entry utility is required for most of the hard core visual core description data entry. For a hard rock description, the user would follow these steps:

•Download the curated length of the section from Janus into a Neuron Data interface screen

•The petrologist would define the description intervals (aka pieces) in this interface window

•The petrologist would enter the descriptive information for the selected interval using an interface that was designed from the hard rock user specifications; these data would be uploaded to Janus on an interval or section basis

•These data would then be used in Janus to report the lithology in an Applecore-readable form

•The structural geologist would use Applecore to add the structural features and then upload these data into Janus in the same way that sediment core descriptions will be uploaded.

Janus Phase II will combine the sediment visual core description utility and the structure visual core description utility with an image of the core section or piece being described in the data entry window of Applecore. In addition, for Phase II, other datasets should be optionally available for display in the data entry window of Applecore (e.g., MST, XRD, thin section). The phase II Janus

software development is primarily a modification to the Applecore data entry window with some additional reporting utilities from Janus.

Eve Arnold, the UG4b chair, is coordinating the user requirements for visual core description. Working with Pat Castillo, Steve Hurst and Tim Byrne, she will provide the user requirements for these utilities to Jack Foster at TAMU within the next few weeks.

Russ Merrill, John Beck and Bill Mills reported to the SC on the status of the hardware for Janus Phase II (core image capture). The current thinking at TAMU is to design and build a unique track and camera system. The system would be capable of scanning two sections at a time with fixed cores and a moving colour line scan camera. However, this development depends on the status of TAMU personnel. TAMU have evaluated Peter Schultheiss's camera and track and have eliminated this option because the core moves past a fixed camera taking up too much room in the core lab. They have also evaluated the German DMT system which scans a fixed split core with a colour line scan camera. This system also has the advantage of providing a whole core scanned image that can be used to correlate hard rock cores with downhole FMS and Televiewer data. John Beck noted that the camera on this system suffers from a limited depth of field. A Japanese scanning system was also investigated and SMP, at their last meeting, was favourably impressed with it. **The SC looks forward to a definitive plan for provision of this hardware.**

Colour Reflectance

The user requirements for colour reflectance remain unchanged since SC members sailed on 166T. The data are collected using the Minolta spectrophotometer. A data file that includes
Leg, Site, Hole, Core, Type, Section, Interval, Munsell values, L*, a*, b*, and a series of spectral reflectance values from 400 to 700 nm in increments of 10 nm for each measurement must be parsed and uploaded to Janus. **TAMU should send example data files to Tracor early in April.**

Paleomagnetics/Tensor

The new cryogenic magnetometer is now running in the paleomagnetics lab with Labview software written by Bill Mills. These data are stored as files and should be parsed and uploaded to Janus. This instrument will likely generate most of the data from this lab. However, since the spinner is still used in some cases, a method for data upload to Janus for spinner data must be available. A simple data entry screen for spinner results would be suitable. **TAMU should send example data files for both the cryogenic magnetometer and the spinner magnetometer to Tracor early in April.**

Bill Mills is writing a new software interface for the Tensor tool . The upload Janus interface for this tool should be designed as a simple data entry screen for typed-in entry of the following fields (1 per core where the Tensor is used):
leg, site, hole, core, coretype, inclination, orientation angle, site variation, azimuth
TAMU should send example ranges of values for each of the measurement fields to Tracor.

Thermal Conductivity/Adara Tool

During Leg 171B, the physical property scientists exclusively used the single probe Teka thermal conductivity instrument rather than the older 5-probe instrument. This use did not interrupt core flow. The same techniques will be tested during Leg 172 where a higher core recovery is expected. **If the instrument is successful on 172, the SC will modify the user requirements for thermal conductivity to include the Teka system.**

The Adara APC temperature tool and the WSTP (water sampler and temperature probe) are the tools used for collecting in situ temperature data for determination of heat flow. TAMU has been

planning to upgrade the WSTP so that the software that captures the data from each instrument is identical. The WSTP upgrade has been delayed for over 1.5 years and may not be completed by the end of Janus Phase I. **The software upgrade to the WSTP should include a Janus upload utility once its delivered.** The Adara tool output files should be used to both develop the data model for Janus Phase I in situ temperature and the data file upload utility to Janus. **TAMU should send example Adara data files to Tracor early in April.**

Thin Section

The Janus data entry for thin section data will have a similar design as the old HRthin, but with some additions and modifications to the existing fields. The interface will likely be developed using Neuron Data which will eliminate the old problems with HRthin where screen data could not easily be edited and moving within the screen was cumbersome to impossible. **The user requirements for this utility will be forwarded from Pat Castillo and Steve Hurst to TAMU.**

Reporting

The development of reporting tools for all science data remains a high priority for the SC. The focus is currently on the use of Business Objects for development of reports from Janus. Carla Moore suggested that other utilities should be considered, e.g. Java-based web interfaces. Russ Merrill explained that there was a plan to purchase a $20k Oracle web server utility in the future for shore-based access. The SC suggested that there are other, less expensive options for providing this type of functionality and that TAMU should implement these options with shipboard access as the priority. **The SC urges TAMU to provide inexpensive web access on the ship for ad hoc development of simple web queries of the Janus database.**

TAMU/Tracor Co-developments

The deployed Janus software included several co-developments where TAMU developed the data acquisition software and Tracor developed the Janus upload software. Some examples are: MST, VS, MAD, and Coulometer. These deployments were successful overall, but many of the problems encountered were related to simple issues like consistent file formats. The SC was informed about these developments in a piece-meal manner where the data acquisition and the Janus interfaces were reported separately with the data acquisition reports lacking sufficient detail, in most cases. **In future, the SC would like to hear from the TAMU project manager about the overall status of these co-developments, including data acquisition and Janus upload software, and hardware decisions and issues. The co-developments for completion of Phase I include paleomagnetics, tensor, Adara, and visual core description for hard rock. Janus Phase II is also a co-development.**

Priorities

The SC reviewed the phase I items yet to complete and placed them in priority order as follows:

1. Visual core descrption Phase I completion:
    - •data model (Tracor)
    - •hard rock data input (Tracor)
    - •Applecore modifications for structure and some sediment changes (Ranger)
2. Age/depth function (Tracor)
3. Colour reflectance (Tracor)
4. Thin section (TAMU)
5. Paleomag/Tensor (TAMU or Tracor)
6. Thermcon (Tracor)
7. Chemistry QC (TAMU or Tracor)
8. Adara (Tracor)

The changes from the last priority list include elimination of log data, the section length measurement and the MST upload utility. There are several reasons for elimination of the log data

model from Janus phase I. LDEO/BRG are currently maintaining Oracle data tables for the processed log data. These tables change as the processing methods and tools change. All phase I Janus data are related by core depth and there is no relationship or method for relating (e.g. Sagan) log depth to core depth. These two data types (core and log) can be made easily accessible to the user from separate databases (Janus and BRG) by providing web links (or duplicate copies of the databases on several servers). On the ship, the processed data are now available on the ship server and can be readily downloaded to any (PC/Mac/Unix) machine over the ship internet. The section length measurement is an improvement to the existing method of core measurement. TAMU should work on this and provide Janus data upload once a new system is in place. The MST upload utility was a solution for an unacceptably slow data transfer rate and this problem was fixed during 171B and is no longer a problem.

There is only one development in Janus Phase II: digital image core description.

The SC discussed Janus issues related to the Legacy Data Migration project. In previous meetings, the SC recommended that Janus Phase I should be completed as a priority over data migration because the cost of migration increases with each leg where data are not directly captured into the database. The SC understands that there are "clients" other than the ODP science community who would place value on ODP legacy data and could potentially contribute to the cost of data migration. Given this potential "market", the SC recommends that a modest, but more focussed, migration effort take place in this fiscal year so that funds can be made available to complete all of the basic data capture for Janus Phase I. The SC suggests that a more focussed migration effort would place paleo data and physical properties as the highest priority datasets, but migrate them into Janus on a site priority basis, rather than by dataset type. The sites should be placed in a priority order to best meet the potential market (e.g., margin sites in the vicinity of current hydrocarbon exploration).

Other Business

The SC agreed to write a summary of Janus for the JOIDES Journal. Kate Moran and John Farrell agreed to coordinate this effort for timely submission.

The SC is concerned about the turnover in MCS's. With the new database, it is important to keep well-trained people in these positions as they play a critical role in the success of Janus. TAMU should review the reason for this turnover and make efforts to keep these staff.

Future Meetings

At the last meeting, the Halifax port call was suggested as a possible final meeting for the SC. It was agreed to wait until after Leg 172 and the start of the completion of phase I "below-the-line" tasks before deciding on the need/location for another SC meeting. Over the next several months, there may be a requirement for Eve Arnold, Pat Castillo, Steve Hurst, and Tim Byrne to meet to resolve user requirement issues for phase I/II.

New ODP Sample Distribution Policy

Introduction

A new ODP sample distribution policy will soon go into effect. This policy, a fundamental rewrite of the old one, is designed to maximize the scientific return from sample distribution in a responsive and flexible manner.

Background

Last year, JOI/ODP personnel decided that curatorial and core sample distribution procedures should be reviewed in light of community suggestions, recent advances in shipboard laboratories and scientific approaches, as well as in procedures (e.g., new publication policy and changes in the JOIDES advisory structure) and thematic directions (e.g., the 1996 ODP Long Range Plan). In response, JOI hosted a workshop in Washington, D.C. on November 18-19, 1996. It was attended by 20 participants* from the international scientific community, representing ODP/TAMU, several JOIDES panels, JOI, and other groups. The participants reviewed extant policy, discussed its scientific and programmatic implications, and ultimately decided to fundamentally revise the policy. The participants drafted a new set of procedures which was endorsed by the Planning Committee at their December 1996 meeting. After a second round of minor editing, the policy was presented to, and approved by the Executive Committee this past February. The final edits are being made (see below for the April 4, 1997 version) and then, once NSF approval is received, the policy will go into effect. It will be posted on the curation page of the ODP/TAMU web site at: http://www-odp.tamu.edu/curation.

Major differences between old and new policies

issue: curatorial supervision and authority
old: ultimately resided with ODP Curator, who received advice and guidance from the Information Handling Panel, now disbanded.
new: ODP Curator will supervise and implement the new policy. As we go to press, the interim Curator at ODP/TAMU is Dr. John Firth. Ultimate curatorial and sampling authority will reside with a "Curatorial Advisory Board", a standing body, which will serve as an appeals board and will consist of the ODP Deputy Director of Services (Dr. Jack Baldauf), the ODP Manager of Science Services (interim Manager is Dr. Jamie Allan), and two JOIDES-appointed members of the scientific community (serving four-year terms). These two will be selected by the new Scientific Measurements panel (SCIMP). On a leg-by-leg basis, sampling will be determined by a "Sampling Allocation Committee". One will be formed for each leg and will consist of the two Co-Chief Scientists, the ODP Curator/Curatorial Representative, and the ODP Staff Scientist. Because the SAC best understands the scientific needs of their leg, they will be vested with the authority and responsibility of making leg-specific decisions on sampling. This includes considering sampling requests from the scientific party, both before and during the leg. The SAC will disband and its authority will end at the conclusion of the moratorium, which extends from the beginning of the leg (i.e., when the ship sails), to 12 months after it ends (i.e., the ship returns to port). SAC decisions may be appealed to the CAB. Evenly split votes in the SAC and the CAB will be decided by the ODP Curator and the ODP Deputy Director of Services, respectively. SCIMP will be the guardian of the new policy and will provide advice and guidance as necessary.

issue: sample limits
old: 50 cc/meter (lifetime) in non-igneous materials, and 100 shipboard igneous samples per person per leg.
new: no preconceived set limit; will depend on scientific objectives, availability of material, and the SAC.

issue: archive core
old: half of every DSDP and ODP core (except from rarely cored "dedicated" holes) was conserved and preserved in the repositories as archive material and has rarely (if ever) been sampled.
new: policy defines a "minimum archive" for each site, which will often be significantly less than is currently archived. This minimum can be expanded, depending on the intentions of the SAC. This policy change will immediately increase the volume of core material accessible to sample requesters and may reduce coring time by requiring fewer holes. New policy will also permit sampling of the archive, under certain circumstances, and with CAB authorization.

issue: "Sampling Strategy"
old: evolved informally as the *Scientific Prospectus* was written, and fortuitously during (and sometimes after) the leg.
new: will formalize the development of a "Sampling Strategy". JOIDES proposal proponents, and ultimately the SAC, will be charged with the responsibility of constructing a sampling plan that is coordinated with drilling and logging strategies. This plan will be flexible and will evolve as scientific objectives solidify before, and even during the leg, depending upon core recovery. The strategy will consider all aspects of sampling, such as what core material will be designated "working" versus "archive" (beyond the required minimum), the anticipated number and frequency of samples to be taken by investigators and whether the samples will be taken on ship or shore, special sampling methods, needs, and storage. The purpose of developing a specific strategy is to best meet scientific needs.

issue: post-cruise sampling (within the moratorium)
old: occurred on a case-by-case basis
new: will be strongly encouraged when sampling demand is high (e.g., paleoceanographic legs). This will promote the best possible use of core and more judicious distribution of sample.

*Patricia Fryer, Brian Huber, Warner Brueckmann, Kate Moran, Tom Janecek, Kathy Gillis, Mitch Lyle, Jean-Pierre Valet, Alan Kemp, Kay Emeis, Rick Murray, Damon Teagle, Eve Arnold, Jamie Allan, Russ Merrill, Chris Mato, John Firth, Ellen Kappel, Dave Falvey, and John Farrell

ODP SAMPLE DISTRIBUTION POLICY (Draft)

version: 4/4/97

(previous versions were approved by PCOM, 12/96 and EXCOM, 2/97)

the text in CAPS are recent edits from the ODP/TAMU interim Curator, Dr. John Firth

1. Introduction

The international Ocean Drilling Program (ODP) collects and analyzes marine cores of rocks and sediments from the global ocean recovered by the research vessel *JOIDES Resolution*. These cores, as well as those from the Deep Sea Drilling Project (DSDP), are stored in four repositories located in the United States and Germany. This document (also available on the web at http://www-odp.tamu.edu/curation) outlines the policy and the procedures for distributing ODP and DSDP core samples to scientists, curators, and educators.

2. General Provisions

The overriding intention of this policy is to achieve maximum scientific return from sample distribution in a responsive and flexible manner. ODP and DSDP samples are given to people in the following four categories: (1) scientists who participate on specific drilling expeditions (or "legs") as shipboard or shorebased members of a "scientific party" that is formally approved by the ODP and the Sample Allocation Committee (see 3. Curatorial Authority); (2) scientists who want to conduct research on DSDP or ODP materials, and publish the results, but who are not necessarily associated with a specific leg; (3) curators of collections such as the JOIDES Micropaleontological Reference Centers (see http://www-odp.tamu.edu/mrc/mrcpage.HTML); and (4) educators. IN ADDITION, CORE MATERIAL MAY BE LOANED TO INSTITUTIONS FOR PUBLIC DISPLAY (SEE SECTION 6.6, REQUESTS FOR PUBLIC DISPLAY).

The objectives of this policy are to: (1) insure availability of samples to the scientific party members so they can fulfill the objectives of the drilling leg and their responsibilities to the ODP; (2) encourage scientific analysis over a wide range of research disciplines by providing samples to the earth science community; and (3) conserve and preserve core material as an archive for future description and observations, for non-destructive measurement and, if absolutely necessary, sampling. The aim of this policy, for both leg-specific and post-moratorium requests, is to provide samples for research efforts of a two to three year duration.

This policy is divided into two parts, reflecting the duality of ODP's shipboard and shorebased research. The first pertains to the previously defined "scientific party" that participates on a specified leg (see 5. Moratorium Sampling). The second relates to other sample requesters, such as scientists not necessarily associated with a particular leg, curators, and educators (see 6. Post-moratorium Sampling). Within the "moratorium" of each leg, which extends from the time the leg begins (i.e., the ship sails), to 12 months after it ends (i.e., the ship returns to port), only members of the scientific party are permitted to receive core samples from the ODP Curator (at Texas A&M University). Sample requests from scientists not formally associated with the scientific party will be considered after the moratorium has expired. This provision is designed to help the scientific party members meet their scientific and contractual obligations to the ODP. Requests from any scientist for samples from legs for which the moratorium has expired will be duly considered by the Curator.

3. Curatorial Authority

The authority and responsibility of making decisions regarding the distribution of DSDP/ODP samples, as per this policy, lies with the ODP Curator, the Sample Allocation Committee (SAC), and the Curatorial Advisory Board (CAB).

The Curator is responsible for the day-to-day implementation of this policy. The Curator maintains a record of all distributed samples, both on board ship and from the repositories. This record, which includes the recipients and the nature of the proposed research, and the status of the request is available to investigators upon request. THE CURATOR MAY ASSIGN A DELEGATE, SUCH AS A REPOSITORY SUPERINTENDANT, TO PERFORM THE ACTUAL

REVIEW/APPROVAL PROCESS OF A SAMPLE REQUEST. IN CASES WHERE GUIDANCE IS NEEDED OR A PROBLEM ARISES, THE REQUEST WILL BE HANDLED BY THE CURATOR.

For each drill leg, a SAC is constituted, comprising the Co-Chief Scientists, the ODP Staff Scientist, and the ODP Curator/Curatorial Representative. DURING THE LEG, the Curator's authority and responsibilities to the SAC are ceded to the shipboard Curatorial Representative. Because this group best understands the scientific needs of their leg, the SAC establishes leg-specific sampling policy and makes decisions on leg-specific sample requests received before and within the moratorium, but not after. Request approval (whether pre-cruise, at sea, OR WITHIN 12 MONTHS POST-CRUISE) requires endorsement by a majority of the SAC. In the event of an evenly divided vote, a decision will be made by the Curator. If so desired, the sample requester may choose to appeal the SAC's decision to the CAB.

The CAB is a standing body that consists of the ODP Deputy Director of Services, the Manager of Science Services, and two JOIDES (SciMP) -selected members of the scientific community who will serve four-year terms THAT OVERLAP BY TWO YEARS. Every effort will be made to insure that CAB membership represents as wide a variety of scientific disciplines as possible. The CAB will act as an "appeal board" vested with the authority to make final sample distribution decisions if and when significant conflicts or differences of opinion arise among any combination of the ODP Curator, the sample requester, and the SAC. In the case of an equally split vote among the four CAB members, the final authority rests with the ODP Deputy Director of Services. The CAB is also responsible for reviewing AND APPROVING requests to sample the "permanent archive" (defined below), AND REQUESTS FOR LONG-TERM LOANS OF ODP CORE MATERIAL FOR PUBLIC DISPLAY. To insure prompt decisions, CAB members will communicate via teleconferencing or e-mail.

4. Terminology and Curatorial Requirements

In this section, ODP-related curatorial terms, concepts and requirements are defined and explained.

4.1 Unique and non-unique intervals

A cored interval is designated "unique" if it has been recovered only once at a drill site. The most common occurrence of a unique interval is one that results when only one hole is drilled at a site. If the cored interval is recovered from two or more holes, then the interval is considered "non-unique". A critical exception to this definition occurs when drilling into igneous basement rocks, METAMORPHIC ROCKS, OR METALLIFEROUS DEPOSITS. Every hole drilled into THESE LITHOLOGIES is considered unique because of their inherent lateral heterogeneity. Lithostratigraphic analysis of advanced piston cores from multiple holes drilled at one site may reveal that short (generally less than two meter) sedimentary intervals are commonly missing between successive cores from any one drill hole, even where nominal recovery approaches 100%. These missing intervals can be disregarded when determining whether or not an interval is unique.

4.2 Archive and working halves

By tradition, and by shipboard procedure, drill cores are split into halves. One becomes the "working half" and the other becomes the "archive half". Before 1997, the sample distribution policy stipulated that the archive was preserved (unsampled) and conserved in the repository, available only for non-destructive examination and analysis. Samples for destructive analyses were taken exclusively from the working half. THE ENTIRE WORKING HALF IS AVAILABLE FOR SAMPLING. The procedure of splitting cores into working and archive halves will continue, for practical and database purposes, among others, but the concept and definition of an archive half

has now been expanded and modified. This will enhance scientific flexibility by enabling greater access to important, and often coveted material.

4.3 Permanent Archive

Archive core earmarked "permanent", is material that is initially preserved unsampled and is conserved in the core repositories for subsequent non-destructive examination and analysis. Thus, the definition of "permanent archive" is somewhat analogous to that of "archive" which was used prior to 1997. Under special circumstances, however, the permanent archive may now be sampled (see 6.4 Permanent Archive Sampling). The permanent archive is intended for science needs that may arise five years or more after drilling is completed.

4.4 Minimum Permanent Archive

A fundamental provision of this policy is that a "minimum permanent archive" will be established for each ODP drill site. In "unique intervals", this archive will consist of at least one half of each core, excluding whole-round samples (e.g., for interstitial water analysis). ALL CORES OF IGNEOUS/METAMORPHIC/METALLIFEROUS ROCKS ARE UNIQUE, AND THEREFORE 1/2 OF SUCH CORES FROM ALL HOLES WILL BE PRESERVED AS PERMANENT ARCHIVES. If so desired, the leg-specific SAC may choose to designate more, but not less, than this as the permanent archive. In "non-unique intervals", the permanent archive will consist of at least one half of one set of cores that span the entire drilled sequence, again, excluding whole-rounds samples. In practice, if holes are cored continuously, the minimum permanent archive may consist of half of the cores taken from the deepest hole drilled at a site. As such, the archive halves of cores from other holes drilled to equal or shallower depths, and that contain replicate copies of the stratigraphic interval constituting the minimum permanent archive, need not be designated as "permanent archive", but can be if so desired by the SAC. If not deemed "permanent archive", they are "temporary archive".

4.5 Temporary Archive

Cores taken from non-unique INTERVALS that are not part of the permanent archive will be split into working and archive halves just like all ODP cores. These archives halves, however, will be considered "temporary archives", unless stipulated otherwise by the SAC in the Sample Strategy. These halves may be sampled and treated as working halves WHEN EITHER the working halves have been depleted by sampling, OR WHEN PRISTINE, UNDISTURBED MATERIAL IS NEEDED FOR SPECIAL SAMPLING, SUCH AS U-CHANNELS, SLAB SAMPLES, ETC. THE SAC OR THE CURATOR WILL DETERMINE WHEN THESE CONDITIONS APPLY.

4.6 Critical intervals

Critical intervals are defined as lithologic spans that are of such scientific interest that there is extremely high sampling demand for them. These intervals may vary from thin, discrete horizons to thick units, extending over an entire core or more. Examples include: decollements, sediment-basement contacts, igneous contacts, impact/tektite horizons, gas hydrates, marker ash horizons, scaly fabric, MAGNETIC REVERSALS, and certain biostratigraphic levels. The SAC is responsible for anticipating the recovery of critical intervals and for developing a strategy for sampling and/or conserving them.

FOR POST-MORATORIUM SAMPLING, THE CURATOR WILL WORK WITH INVESTIGATORS TO ENSURE THAT PREVIOUSLY-DEFINED CRITICAL INTERVALS ARE SAMPLED ONLY WHEN NECESSARY FOR THE SUCCESS OF A STUDY. ADDITIONAL JUSTIFICATION FOR SAMPLING A CRITICAL INTERVAL MAY BE

REQUESTED OF AN INVESTIGATOR, IF THE ORIGINAL SAMPLE REQUEST IS NOT CLEARLY UNDERSTOOD.

4.7 NON-DESTRUCTIVE ANALYSES

REQUESTS FOR NON-DESTRUCTIVE ANALYSES OF CORES (E.G., DESCRIPTIONS, IMAGING, X-RAY, ETC.) SHOULD BE SUBMITTED TO ODP USING THE STANDARD ODP SAMPLE REQUEST FORM (APPENDIX B). INVESTIGATORS WHO PERFORM NON-DESTRUCTIVE ANALYSES OF ODP CORES INCUR THE SAME OBLIGATIONS TO PUBLISH AND PROVIDE DATA AS THOSE WHO REQUEST CORE SAMPLES (SEE SECTIONS 5.1 AND 6.2).

5. Moratorium Sampling

5.1 Leg-Specific Sampling Strategy

Leg-specific sampling, both shipboard and shorebased, will follow a "Sampling Strategy" established by the SAC. The development of this strategy begins in the initial stages of leg planning, when ODP drilling proposals are written and submitted to JOIDES. At this stage, proponents will develop a draft Sampling Strategy that will fulfill the scientific objectives of the leg. The strategy will integrate and coordinate the programs for drilling, sampling, and downhole measurement in order to best meet scientific needs. By necessity, the strategy will evolve over the course of leg planning, the leg itself (e.g., depending on drilling results), and in the post-cruise moratorium. Shipboard sampling and post-cruise sampling, immediately after the leg, but within the moratorium, should be carefully considered in the strategy. Whenever possible, sampling should be deferred to a coordinated shorebased sampling effort (commonly referred to as a "sampling party") in order to sample more efficiently, and with the perspective gained from having completed the leg. This will insure the best possible use of the core and distribution of samples. Shorebased sampling will be particularly appropriate for legs where many samples will be needed, such as those focusing on paleoceanographic objectives. Travel funds have been specifically allocated for this purpose in some ODP member countries.

Once a proposal has been scheduled by JOIDES for drilling, the SAC will WRITE AND PUBLISH A FORMAL, LEG-SPECIFIC SAMPLING STRATEGY IN THE ODP SCIENTIFIC PROSPECTUS. THIS STRATEGY WILL BE DESIGNED TO MEET THE SPECIFIC SCIENTIFIC OBJECTIVES OF THE LEG. The Sampling Strategy will ALSO form the basis of the shipboard and moratorium "sampling plan". THE SCIENTIFIC PROSPECTUS WILL be reviewed by the ODP Director and the Deputy Director of Operations BEFORE PUBLICATION, AND they will have an opportunity to provide guidance in the possibility that sampling issues of the broader (non-leg-specific) science community have been overlooked.

A SUCCESSFUL SAMPLING STRATEGY WILL ANTICIPATE AND ACCOMMODATE ALL OF THE SAMPLING THAT IS REQUIRED TO COMPLETE THE SCIENTIFIC OBJECTIVES OF THE LEG. A MAJOR CONSIDERATION OF THE SAC, AND HENCE THE STRATEGY, IS FORMAL DESIGNATION OF (AND ABIDING TO) A MINIMUM PERMANENT ARCHIVE AT EACH DRILL SITE. IN ADDITION, THE STRATEGY SHOULD:

(1) DEFINE THE AMOUNT OF CORE AVAILABLE TO THE SCIENTIFIC PARTY FOR SAMPLING BY DECIDING IF AND WHEN MORE THAN A MINIMUM PERMANENT ARCHIVE IS NEEDED;

(2) ANTICIPATE AND POSSIBLY PLACE LIMITS ON THE VOLUME AND FREQUENCY OF SHIPBOARD SAMPLING FOR ROUTINE ANALYSES, PILOT STUDIES, AND LOW-RESOLUTION STUDIES;

(3) CONSIDER THE APPROXIMATE SAMPLING FREQUENCY THAT WILL BE REQUIRED TO MEET THE OBJECTIVES OF THE LEG, AS PER SCIENTIFIC SUB-DISCIPLINE AND REQUEST TYPE, AND DETERMINE THE MAXIMUM NUMBER OF SAMPLES TO BE TAKEN BY ANY INVESTIGATOR;

(4) ANTICIPATE THE RECOVERY OF CRITICAL INTERVALS AND DEVELOP A PROTOCOL FOR SAMPLING AND/OR PRESERVING THEM;

(5) DECIDE WHERE AND WHEN SAMPLING WILL OCCUR. SACS ARE STRONGLY ENCOURAGED TO DEFER LARGE-VOLUME AND HIGH-FREQUENCY SAMPLING TO POST-CRUISE "SAMPLING PARTIES" AT ODP REPOSITORIES;

(6) CONSIDER ANY SPECIAL CORE STORAGE OR SHIPPING NEEDS (E.G., PLASTIC WRAP, FREEZING SECTIONS, ETC.);

(7) DETERMINE SPECIAL SAMPLING METHODS AND NEEDS (E.G., PRESSURE CORE SAMPLER, MICROBIOLOGY, WHOLE ROUNDS);

(8) IDENTIFY DISCIPLINES/PERSONNEL NEEDED FOR SHOREBASED SAMPLING.

ODP WILL ENCOURAGE A SAMPLING STRATEGY THAT LEAVES AS MUCH OF THE WORKING AND TEMPORARY ARCHIVE HALVES AS POSSIBLE FOR FUTURE RESEARCH. LARGE VOLUME REQUESTS COMMONLY INCLUDE: WHOLE ROUNDS AND 1/2 ROUNDS FOR POREWATER OR GEOTECHNICAL STUDIES, MACROFOSSILS OR LARGE GRAINED PLUTONIC ROCKS, AND SLABS FOR LAMINAE STUDIES AND U-CHANNELS THAT ARE TAKEN NEXT TO OTHER SAMPLES.

An example of a Sampling Strategy is provided in Appendix A.

5.2 Requests from Scientific Party Members

Scientific party members are requested to submit sample requests to the ODP Curator at Texas A&M University no later than three months prior to the start of the leg. This will provide sufficient lead time for planning. The sample requests will be reviewed by the SAC and approval will be based on compatibility with the Sampling Strategy. In cases where a sample request is considered incompatible, the SAC may REJECT IT, recommend modifications TO IT or, if appropriate, the SAC may modify the Sampling Strategy to accommodate the request. Requests submitted at sea OR WITHIN 12 MONTHS POST-CRUISE will also be considered by the SAC. Request approval (whether pre-cruise, at sea, OR WITHIN THE 12 MONTH POST-CRUISE MORATORIUM) requires endorsement by a majority of the SAC. In the event of an evenly divided vote, a decision will be made by the Curator. If so desired, the sample requester may choose to appeal the SAC's decision to the CAB. If a conflict arises over the allocation of samples, shipboard scientific party members have priority over shorebased members.

A sample request form is included in Appendix B, and Appendix C contains guidelines to assist the requester in estimating sample volumes.

5.3 SAMPLES FOR ROUTINE SHIPBOARD ANALYSES

DATA PRODUCED FROM SAMPLES TAKEN FOR ROUTINE SHIPBOARD ANALYSES (E.G., INDEX PROPERTIES, INTERSTITIAL WATER WHOLE ROUNDS, THIN SECTIONS, SMEAR SLIDES, XRD AND XRF SAMPLES, PALEONTOLOGY CORE-CATCHER SAMPLES, ETC.) BELONG TO THE ENTIRE SHIPBOARD PARTY. THESE ROUTINE SHIPBOARD SAMPLES OFTEN HAVE RESIDUES LEFT OVER WHICH ARE SENT, ALONG WITH THE CORES, TO A CORE REPOSITORY AFTER EACH LEG. THESE SAMPLES AND THEIR RESIDUES ARE NOT PART OF ANY INDIVIDUAL SAMPLE REQUEST UNLESS SPECIFICALLY ASKED FOR BY A SCIENTIST USING A SAMPLE REQUEST FORM. SHIPBOARD THIN SECTIONS AND SMEAR SLIDES ARE OF COMMON INTEREST TO MANY SHIPBOARD SCIENTISTS, AND ARE OFTEN STUDIED BY SEVERAL SCIENTISTS AFTER A LEG. BECAUSE OF THEIR BROAD USE, THIN SECTIONS AND SMEAR SLIDES MUST BE SENT TO THE CORE REPOSITORY FIRST, FOR INVENTORY, BEFORE BEING LOANED TO SCIENTISTS AFTER A LEG. EACH INVESTIGATOR MUST RETURN THESE SAMPLES DIRECTLY TO THE REPOSITORY AFTER COMPLETING THEIR STUDY. THEY MUST NOT FORWARD THEM DIRECTLY TO OTHER SCIENTISTS. THE REPOSITORY WILL INVENTORY THE SAMPLES BEFORE SENDING THEM TO THE NEXT INVESTIGATOR. LOANS OF SHIPBOARD THIN SECTIONS AND SMEAR SLIDES WILL BE NO LONGER THAN 1 YEAR FOR EACH REQUEST, AND MAY BE LESS THAN ONE YEAR IF DEMAND IS HIGH FROM OTHER INVESTIGATORS TO STUDY THEM.

OTHER SAMPLE RESIDUES, SUCH AS XRD/XRF POWDERS, SQUEEZE CAKES, THIN SECTION BILLETS, PALEOMAG CUBES, PALEONTOLOGY CORE CATCHER SAMPLES, ETC., MAY BE REQUESTED BY INVESTIGATORS AND USED THE SAME AS OTHER PERSONAL SAMPLES. THEY MAY BE SENT DIRECTLY TO SCIENTISTS AFTER THE LEG, ALONG WITH THEIR PERSONAL SAMPLES.

5.4 Responsibilities

Scientists who receive samples within the 12-month moratorium must:

(1) Submit a scientific research paper to be considered for publication. If the paper is destined for the ODP *Scientific Results* volume, it must be submitted within 28 months post-cruise for a specialty paper or 34.5 months for a synthesis paper (as per the publication policy). Manuscripts to a non-ODP publication must be submitted within 33.5 months post-cruise. And, as per publication policy, copies of all leg-related manuscripts must concurrently be forwarded to the leg's Editorial Review Board when they are submitted for consideration for publication.

(2) Acknowledge the international ODP and others as appropriate in all publications that use data collected from ODP samples.

3) Submit five copies of reprints of all published works derived from the ODP samples to the Curator, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77845-9547, U.S.A. These reprints will be distributed to the repositories and to the ship. The reprints will also be entered into an on-line bibliographic database.

(4) Submit all final analytical and/or descriptive data obtained from the samples to the Data Librarian, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77845-9547, U.S.A., as soon as they have been published or within five years post receipt of sampling, whichever comes first. Please call the Data Librarian (409-845-2673) for information on acceptable data formats. Investigators should be aware that they may have other data obligations under the U.S. National Science Foundation's Ocean Science Data Policy or under relevant policies of other funding agencies that require submission of data to national data centers.

(5) Return all unused and unprocessed samples no later than five years post cruise, TO THE APPROPRIATE CORE REPOSITORY.

(6) Comply with all written collaborative agreements as identified in the leg sampling plan.

Failure to meet these responsibilities will result in the rejection of future sample requests and may influence participation on future legs.

6. Post-moratorium Sampling

6.1 Introduction

Post-moratorium sampling is supervised by the Curator and the CAB. Core material recovered during a leg is available to the broader science community for sampling 12 months after a cruise has ended. Samples will be provided to any scientist, curator, or educator who has the resources to complete a scientific investigation, or prepare materials for curatorial or educational purposes. The sample requester must independently secure funds for sample-related research activities. Approval of sample requests will be based on the availability of material and the length of time it will take the investigator to complete the proposed project. Typical studies will take two to three years, but longer durations will be considered under certain circumstances. If a sample requester disagrees with the Curator's decision, the requester can appeal to the CAB.

A sample request form is included in Appendix B, and Appendix C contains general guidelines to assist the requester in estimating sample volumes.

6.2 Responsibilities

Scientists who receive samples after the 12-month moratorium must:

(1) Submit a progress report to the ODP Curator that outlines the status of the samples and the associated data no later than 36 months post receipt OF SAMPLES.

(2) Acknowledge the international ODP and others as appropriate in all publications that use data collected from ODP samples

3) Submit five copies of reprints of all published works derived from the ODP samples to the Curator, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77845-9547, U.S.A. These reprints will be distributed to the repositories and to the ship. The reprints will also be entered into an on-line bibliographic database. PUBLICATION REPRINTS SUBMITTED TO ODP WITHIN 36 MONTHS POST RECEIPT OF SAMPLES WILL MEET THE OBLIGATION OF A PROGRESS REPORT (SEE (1), ABOVE).

(4) Submit all final analytical and/or descriptive data obtained from the samples to the Data Librarian, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77845-9547, U.S.A., as soon as they have been published or within five years post receipt of sampling, whichever comes first. Please call the Data Librarian (409-845-2673) for information on acceptable data formats. Investigators should be aware that they may have other data obligations under the U.S. National Science Foundation's Ocean Science Data Policy or under relevant policies of other funding agencies that require submission of data to national data centers.

(5) Return all unused and unprocessed samples no later than five years post receipt, TO THE REPOSITORY FROM WHICH THEY ORIGINATED.

Failure to meet these responsibilities will result in the rejection of future sample requests and may influence participation on future legs.

6.3 Curatorial Duties

The Curator will receive post-moratorium sample requests and will evaluate them for completeness and for adherence to the provisions in this policy. If questions arise, the Curator will consult with the requester. If a sample requester disagrees with the Curator's final decision on a sample request, and wishes to appeal the decision, the Curator will forward the request to the CAB for resolution.

When considering a sample request, the Curator will ascertain whether the requested material is available in the working half or the temporary archive half of the core. If not available, the Curator will consult with the requester to determine if the range of the sought interval(s) or the sample spacing within the interval(s) may be modified. If the request cannot be modified because of scientific requirements, a request to sample the permanent archive can be considered (see 6.4 Permanent Archive Sampling).

To assist the sample requester, the Curator can provide relevant information on previous sample requests and resultant studies on the core interval in question. The Curator can also provide advice and guidance to the requester when considering sample volumes and frequencies (see Appendix C).

6.4 Permanent Archive Sampling

Sampling of the permanent archive is feasible five years post cruise if the working and/or the temporary archive halves of the core have been depleted, as judged by the Curator. As with all requests, those to sample the permanent archive should be sent to the Curator, who will forward them to the CAB, after preliminary review. The CAB will evaluate the request based on its scientific merit and on the extent to which the working half is depleted. If necessary, the CAB may also consult with members of the original SAC who were responsible for establishing the permanent archive being considered for sampling. The CAB will strive to maintain a representative continuous section of core material for archival purposes whenever possible. If the request is approved, the Curator will notify the scientific community that a specific portion of the permanent archive will be sampled. In order to give others in the scientific community a final opportunity to examine the archive interval in question, OR TO PROPOSE COOPERATIVE RESEARCH ON THE APPROVED ARCHIVE SAMPLES sampling by the requester will be deferred for six months from the time of CAB approval. In addition, the community will be notified by the Curator, in advance, about the impending sampling. Notification will most likely be sent via any or all of the following: the *JOIDES Journal*, the *JOI/USSSP Newsletter*, the ODP/TAMU Open Discussion listserver, and the ODP/TAMU curation home page on the web (http://www-odp.tamu.edu/curation). Scientists interested in the archive interval approved for sampling, but who are not associated with the original request to do so, will thus have six months to conduct non-destructive studies on the interval, OR TO PROPOSE COLLABORATION.

6.5 Educational Sampling

ODP coreS ARE AVAILABLE TO VIEW, DESCRIBE, AND SAMPLE for teaching and educational purposes. Typically, samples from core materials that are abundant in the collection and, thus, not in demand for research purposes are available to educators. Sample requests are approved by the Curator if the request does not deplete the working and/or the temporary archive halves of the core. THE STANDARD ODP SAMPLE REQUEST FORM (APPENDIX B) MAY BE USED FOR EDUCATIONAL REQUESTS. INVESTIGATORS SHOULD SPECIFY ON THE FORM THE EDUCATIONAL PURPOSE OF THE REQUEST. EDUCATIONAL

REQUESTS DO NOT INCUR THE RESPONSIBILITIES TO PUBLISH OR PROVIDE DATA THAT RESEARCH REQUESTS MUST FULFILL.

6.6 REQUESTS FOR PUBLIC DISPLAY

REQUESTS MAY BE SUBMITTED TO THE CURATOR FOR LOANS OF CORE MATERIAL FOR PUBLIC DISPLAY, SUCH AS AT MUSEUMS, MEETINGS OF PROFESSIONAL SCIENTIFIC ORGANIZATIONS, ETC. SUCH REQUESTS MUST INCLUDE THE DESCRIPTION, LOCATION, AND PURPOSE OF THE DISPLAY, HOW LONG THE DISPLAY WILL LAST, HOW THE CORES WILL BE STORED/CURATED DURING THE DISPLAY, AND WHO WILL BE RESPONSIBLE FOR OVERSEEING THE CORES. REQUESTS WILL BE REVIEWED BY THE CURATOR. DISPLAYS OF SHORT DURATION, SUCH AS FOR PROFESSIONAL MEETINGS OF A WEEK OR LESS, MAY BE HANDLED AS A REGULAR SAMPLE REQUEST AND APPROVED BY THE CURATOR. THE CURATOR MAY ALSO CONSULT THE CAB ON THESE TYPES OF REQUESTS, AS NEEDED. REQUESTS FOR LONG-TERM DISPLAY (WEEKS, MONTHS OR LONGER) MUST BE REVIEWED AND APPROVED BY THE CAB. A LOAN AGREEMENT FOR THE LATTER MUST BE SIGNED BY THE REQUESTER, COVERING SUCH ISSUES AS COST OF SHIPPING/DISPLAY/CURATION, IDENTIFICATION OF A PERSON RESPONSIBLE FOR THE SAFETY OF THE CORES, DURATION OF LOAN, ACKNOWLEDGMENT OF ODP'S RIGHT TO RECALL THE CORES WHENEVER NECESSARY, AND PROPER ACKNOWLEDGMENT OF ODP IN THE DISPLAY. REQUESTS FOR LARGE AMOUNTS OF CORE FOR DISPLAY (E.G., ONE OR MORE SECTIONS OF CORE) WILL LIKELY REQUIRE THE REQUESTER TO PAY FOR THE COSTS OF SHIPPING/STORING/CURATING THE CORES DURING THE LOAN PERIOD.

Appendix A - Leg-specific Sampling Strategy Example

Ultra-high resolution sites, such as: Site 893 (Santa Barbara); Site 1001 (Cariaco Basin); Sites 1033 & 1034 (Saanich Inlet).

Needs
Detailed sampling will be necessary to achieve the proposed science. Large-volume samples may be required.

Sampling Timetable
Detailed sampling of cores from a given site will proceed after a composite sampling splice has been constructed from cores from the two or more holes drilled at that site. The splice will be constructed and the stratigraphic information will be distributed to the scientific party after the site has been drilled, but in advance of post-cruise sampling, in order to facilitate planning and scientific collaboration. Requests to sample shipboard, for pilot studies or for projects requiring lower stratigraphic resolution, will be considered by the SAC.

General Sampling Procedure
Investigators should try to avoid sampling the center of the working and the temporary halves of the core. Sample plugs (e.g., plastic vials of 5 and 10 cc) and paleomagnetic cubes should be taken as close to the edges of the core half as possible. Samples may also be parceled out with the "scoop" tool, which inherently takes samples from the edges of the core half. Large samples taken with the "cookie-cutter" tool, often for lamina-scale studies, will be shared equally among the interested scientific party members.

Critical Intervals
Marker beds of volcanic ash layers or major transitions from oxic to anoxic layers may be encountered. They will be considered "critical intervals", and as such will not be sampled onboard the ship. Requests to sample these intervals will be evaluated by the SAC and sampling will occur at the post-cruise "sampling party" at the repository.

Permanent Archive
The permanent archive will be the ODP-defined "minimum permanent archive".

Temporary Archive
Once the working halves of the cores have been depleted, then the temporary archive will be accessible for sampling. When possible, one quarter of the core should be preserved by sampling off-center.

Appendix B - ODP Sample Request Form

OCEAN DRILLING PROGRAM SAMPLE REQUEST FORM

Mail to the ODP Curator, 1000 Discovery Drive, College Station, TX 77845; Phone: 1-409-845-0507, FAX: 1-409-845-0876, email: Curator@odp.tamu.edu, or use the World Wide Web form (http://www-odp.tamu.edu/curation). For requests related to upcoming legs, submit your requests to the ODP Curator at least three (3) months before the beginning of the leg.

Please review the current Ocean Drilling Program (ODP) sample distribution policy before completing this form (http://www-odp.tamu.edu/curation). Accepting samples implies responsibility on the part of the investigator(s) to fulfill certain obligations. Failure to honor these obligations will prejudice future sample applications.

Investigator Names: _____

_____ Date: Month_____Day_____ Year_____

Please fill in all investigator addresses on page 3.

1) Leg number(s):

2) Please check one of the following that applies to you:
a) Shipboard participant requesting samples on ship or within 12 month post-cruise moratorium ___.
b) Shorebased participant requesting samples on ship or within 12 month post-cruise moratorium ___.
c) Investigator requesting samples after 12 month post-cruise moratorium ___.

3) If this is a supplement to a previous request, please provide previous request number:_____.

4) Check all keywords in the tables below that apply to your research.

Specialty:

Sedimentology		Magnetic Properties		Petrology	
Geochemistry		Structural Geology		Microbiology	
Physical Properties		Paleontology		Other:	

Type of Material:

Gas		Igneous Rock		Vein Material	
Fluids		Metamorphic Rock		Fluid Inclusions	
Sediments		Metalliferous deposits		Other:	

Methods:

XRD		Petrography		Macropaleontology	
XRF		Density, Porosity		Carbonate Microfossils	
Microprobe		Consolidation/Strength		Siliceous Microfossils	
SEM/TEM		Thermal Conductivity		Organic Microfossils	
Inorganic chemistry		Permeability		Stable Isotopes	
Organic chemistry		Velocity		Radiogenic Isotopes	
Carbonate, silica		Magnetostratigraphy		Cultures/Tracers/Stains	
Grain Size		Rock Magnetism		Image Analysis/ CT-SCAN	
Other:		Other:		Other:	

5) Please list the types of analytical data you will generate (e.g., $\delta^{13}C$, major elements, biostratigraphic)

6) Please summarize the proposed research in 5-7 lines, and (optional) please attach a detailed description of the proposed project, including techniques of sample preparation and analysis, roles of individual investigators, etc.

7) You are requesting (please check all that apply):

Core Samples		Thin Sections		Describe cores at repository	
Porewater Splits		Smear Slides		Photograph/image/analyze cores at repository	
Sample Residues		Other:		Borrow cores from repository for display	

Provide more detailed explanation for above (if necessary):

USE TABLE 1 FOR SAMPLES FROM ODP REPOSITORIES OR TABLE 2 FOR SAMPLES FROM THE SHIP (ATTACHED). MAKE EXTRA COPIES, AS NEEDED. [NB: tables not attached to this draft document]

8) If you want to visit a repository, please check which one(s), and contact the repository to schedule a time to visit. BCR:_____ ECR: _____ GCR: _____ WCR: _____

Repository addresses: BCR (Phone: 49-421-396-6336; FAX: 49-421-396-6684; email: bcr@odp.tamu.edu); ECR (Phone: 1-914-365-8446; FAX: 1-914-365-8178; email: ecr@odp.tamu.edu); GCR (Phone: 1-409-845-5056; email: gcr@odp.tamu.edu); WCR: (Phone: 1-619-534-1657; FAX: 1-619-534-4555; email: wcr@odp.tamu.edu).

9) Please describe any special sampling, storage, and/or handling procedures for completing your request and/or shipping your samples. Please describe any special equipment or supplies that will be required - will you provide them?

Note: If your samples require special shipping procedures (e.g., frozen, u-channels, hydrates, sulfides, etc.), please provide the following additional information:

Airport	Airport City	Airport Country

Which investigator (or liaison) should we ship to? _____

Investigator address(es):

	Investigator 1	Investigator 2	Investigator 3
First Name:			
Middle Initial:			
Last Name:			
Organization:			
Department:			
Street:			
City:			
State/Province:			
Country:			
Zip/Post Code:			
Phone:			
FAX:			
Email:			
	Investigator 4	Investigator 5	Investigator/Liaison
First Name:			
Middle Initial:			
Last Name:			
Organization:			
Department:			
Street:			
City:			
State/Province:			
Country:			
Zip/Post Code:			
Phone:			
FAX:			
Email:			

For Internal ODP Use Only

Request Number:_____ Request Part: _____ Date Received at ODP: _____

	BCR	ECR	GCR	WCR	Ship
Date Received:					
Date Approved:					
Date Completed:					
Request Status:	----------	----------	----------	----------	

Comments:

Appendix C - Typical Sample Volumes

The following volumes are guidelines, not limits.

Thin Section Billets	10cc, up to 50cc for large grained plutonic rocks
alkenone (Uk37)	5cc
XRD	5cc
XRF	20cc (sediments), 20-50cc (igneous/sulfides - varies greatly depending on grainsize and homogeneity of rock)
Carbonate	2cc
Paleomag	7cc cubes, 12cc minicores
Index Properties	10-12cc
Grain Size	10-20cc depending upon coarseness
Planktonic Foraminifers	10cc
Benthic Foraminifers	10-20cc
Nannofossils	2cc
Diatoms	5-10cc
Radiolarians	10cc
Palynology	10-15cc
Organic Samples	20cc
Interstitial Porewaters	5 cm whole rounds, up to 10- 20 cm, based on water content
Inorganic Geochemistry	10cc
Organic Geochemistry	10cc
Sedimentology	10-20 cc.
Slabs (for laminae studies)	25-50 cc, depending on how long a slab is
Slabs (large grained plutonic rocks)	50-100cc, typically shared by scientists for multiple analyses

Electronic Publication - Proposal for a new "Electronic Publication" Strategy

Background/Need

In December, 1994, PCOM formed a "Publications Subcommittee" under Henry Dick, to review the scope and cost of ODP publications, particularly the *Initial Reports* (IR) and *Scientific Results* (SR) volumes. The key recommendations of this group, particularly those that recommended changes to contents, but retention of both the IR and SR, were variously considered by both PCOM and EXCOM through 1995. Not all of those recommendations (eg, format changes) were implemented by JOI, due to lack of significant cost savings and lack of unanimous support in the community.

In early 1996, the Publications Subcommittee revisited the issue of retaining both the IR and SR volumes. In April 1996, PCOM accepted a new subcommittee recommendation to combine the IR and SR into a single volume to be published 4 years post cruise, in a format similar to that of *Initial Reports* of the DSDP. The scientific party would be free to submit individually authored papers to the open literature after 12 months post cruise. This last recommendation was implemented by JOI in early May 1996. Changes to the IR/SR format have not been implemented at this time, again because of apparent lack of cost savings.

On 12 April, 1996 the Director of NSF's Division of Ocean Sciences wrote to the Director of ODP at JOI, delivering a copy of an "unsolicited" report to him from the Inspector General of the National Science Foundation. That report, entitled "Review of Publication Costs in the Ocean Drilling Program", makes two key recommendations:

- Cease publication of the *Scientific Results* volumes as soon as practicable, and

- Retain and expand electronic publication of the *Initial Reports* volumes on CD-ROM and the Internet, but cease publication of the printed version as soon as practicable.

The Inspector General has estimated a net saving of $1.1 million per year out of a current publications budget of just over $2 million per year. However, it must be noted that ODP-TAMU does not agree with these estimates. The Director of NSF's Division of Ocean Sciences asked both JOI and the JOIDES Advisory Structure to consider the report. PCOM asked JOI to prepare a draft response to the Inspector General's report for consideration by EXCOM at its June, 1996 meeting.

The need to review the scope and cost of ODP publications and databases also arises at this time as a result of an EXCOM Motion at its January, 1996 meeting. EXCOM Motion 96-1-14 stated that:

> *"EXCOM, having endorsed unanimously the scientific directions for the program embodied in the Long Range Plan recognizes the need for immediate and concerted actions to secure the necessary funds. The International Review embraced the LRP and recommended that to achieve its short-term goals (pre-2003) would require real growth in the budget of about 2½% a year.*

EXCOM requests the following actions be taken:

1. JOI, in consultation with PCOM & BCOM, examines the important new innovations in the program (Borehole Utilization, Legacy Holes, inter alia) and detail their costs. PCOM & BCOM should advise JOI on what existing components (publications, logging, indeed all components) might be dropped or reduced to accommodate these new initiatives and clearly label the costs, benefits and losses. This step is fundamental to addressing concerns from funders that all cost cutting measures have been examined prior to requesting additional funds. Action by June 1996."

Clearly, cost savings of the magnitude indicated in the Inspector General's report, if correct, cannot be ignored when seen against the need to fund a wide range of innovations viewed as central to the implementation of the 1996 Long Range Plan. Similarly, the advance of technology and the increasing use of the Internet as a medium of communication and information availability suggests a serious look at the broad model outlined in that report. While the immediate advice from PCOM is that hard copy publications of initial and scientific results should be retained for the foreseeable future, the implications of a longer term, say at least 4- to-5 year strategy for the implementation of full electronic publication at least needs to be explored.

This strategic discussion paper represents a management review of such a long term publication policy option. It also forms the basis of a suggested JOI/JOIDES response to the Inspector General's report.

A New ODP Publication Strategy

To make the full range of basic ODP shipboard core and sample descriptions, measurements, downhole masurements data, shore-based analyses and their integration and interpretation available to a broad, multi-national community of earth scientists in an efficient, functionally useful and cost-effective format, principally on both compact disc and the Internet, supported by a hard copy version as long as needed.

To introduce changes, beginning in FY1997, to achieve these strategic objectives by the start of FY 2001.

ODP Publications beyond 2000 - a Vision for the Future

In consultation with the Director of Science Operations and the Manager of Publications at ODP-TAMU, and a PCOM subgroup consisting of Henry Dick and Will Sager, JOI has developed the following draft of a new "ODP publications strategy" for consideration by EXCOM and advice to NSF. This publication strategy addresses a new approach to the rapid and cost-effective provision of ODP drill site data and resultant scientific analyses and interpretations to the world wide scientific community via CD-ROM and the Internet, with complete replacement of the current hard copy publications, within 5 years. It also encompasses the *integration* of these electronic publications with the soon-to-be-available JANUS database. The advantages of this style of information publication include availability, accessibility, adaptability, and cost savings. The *current* three key ODP "information products" are:

- *Initial Reports* volume - involves publication of a leg operational report, shipboard core and sample descriptions, measurements, wireline logging information, and limited shore-based analyses from each leg.

- *Scientific Results* volume - involves a more complete documentation of shore-based, leg related analyses and their integration and interpretation.

- Non-relational, VAX-based Database 1032 - hosts part of the shipboard measurement data to date.

Our vision for the future of ODP "publications" involves essentially full, downloadable, digital availability of all Program information and data on CD-ROM and on the Internet, at least in test mode, by the beginning of 2001 at the latest. It is envisaged that the new "publication products" will be:

- JANUS Database - will involve World Wide Web access to the vast majority of shipboard measurement and core descriptions through an ORACLE relational database host at ODP/TAMU. JANUS will be available in a restricted version from Leg 170 in December, 1996, and unrestricted in December, 1997. Migration of digital data from previous legs is planned to begin in FY1997. At this stage in its development JANUS is *not* intended to include any data generated post cruise.

- *Electronic Initial Reports* - The contents of the current, hard copy *Initial Reports* volume will be published on a CD-ROM. Public release of the CD will be 12 months post leg completion. The published data is envisaged to include the basic site information and site survey data, core photos, digital core descriptions, processed wireline logging data and any other high volume data sets. The CD-ROM would be packaged with a booklet containing a description of the leg, basic site information, and instructions on use of the CD. Publication of all IR material on a CD would ensure earliest availability of the basic results of each leg to all scientists in all member countries and worldwide. At the same time as release of the *Electronic Initial Reports* CD, all the digital and analog information on that CD would *also* be released on the World Wide Web. This duplication would ensure rapid and universal availability to all scientists, educators and students. Because access time to the Web is inherently slower than access to a CD, it is still expected that most users will use the CD where available. Even in the longer term, users with access to the CD will continue to use that medium to access some "static", large volume information, while other information would most commonly be accessed from the Internet. "Static" information includes site survey data, core photos, digital core descriptions and processed wireline logging data. Information on the CD and the Web could be accessed together, as well as separately. Other expanding data sets would be accessed from the Web.

- *Electronic Scientific Results* - The contents of the *Electronic Scientific Results* (ESR) will focus on peer reviewed synthesis papers, data reports, and technical notes. (See justification for SR in Appendix A--below.) Electronic preprints of accepted papers will be available on the Web as soon after acceptance as possible. The CD will be published 4 years post leg completion. Subsequent papers, based on analyses of ODP core material will be accepted for review and publication in the Web version of the ESR. A new and important feature of the Web version of the ESR would be the inbuilt provision of various "hot links" to the JANUS Database, in the first instance to basic data in the specific site, but through a number of preprogramed menus to anywhere else in JANUS. An important ramification of the proposed ESR-JANUS link would be the future enhancement of JANUS with post leg completion data and shore-based analyses. Scientists working on ODP core material post cruise will be required to submit a data report to the ESR, and

through the ESR, to JANUS. The JANUS Database would still be accessible through the World Wide Web independent of the ESR.

Constraints and Response Strategies

CONSTRAINT	RESPONSE STRATEGY
Scientists and publishers are not yet commited to electronic publication of scientific papers.	None. CD and Internet publication is already common in other professional fields, which suggests its inevitability.
Scientists are concerned that citation in the electronic literature will not be given the same weight for tenure purposes as the current system.	A 5 year strategy, with checks, should allow sufficient time for widespread professional acceptance & adaptation to a new publication citation system.
Scientists are also concerned that electronic journals will not replace paper journals	ODP is not attempting to lead this change. Implementation will follow the trend of major geoscience journals
ODP should not abandon book publication until electronic publication is universally accepted.	Volume publication is a 4 year process To facilitate anticipated change, planning must begin now.
There is no defined connection between ODP publications and the soon-to-be-released JANUS database system.	Full electronic publication should be directly linked to the JANUS database, as well as other related electronic databases and resources.
Some US and non-US partners in ODP do not have ready access to the Internet.	Increasing rate of access suggests full international availability in 3 to 4 years.
Internet access is slow, particularly across the Atlantic, and for graphic material globally.	Growth of demand for a high speed access to the Internet is likely to drive change. ODP is investigating the establishment of a European mirror site
Authors free to publish in the "open literature" will be less likely to submit quality papers to an ODP electronic 'SR' volume.	Linking ESR papers to background data should be a strong attraction for users, and thus a strong incentive to authors.
There is some duplication between the JANUS database and the proposed electronic IR "volume".	The EIR is an entry point to JANUS and contains supporting information and other data not in JANUS.

Electronic Publication - an Implementation Strategy

Current Status

Whilst the current publication of the IR and SR volumes is on archive quality paper, in hard covers, a modest foundation already exists for the implementation of a new system of Ocean Drilling Program electronic publication and information availability:

- The JANUS Database is expected to start to become publicly available on the World Wide Web in December, 1997.
- Processed wireline logging data is already available on CD.
- The *Scientific Results* volume for Leg 146, parts 1 & 2 (Santa Barbara Basin) and others have already been published as both hard copy and CD.
- Digital scanning of core photos in black and white began with Leg 151. Color scanning will begin with Leg 169.
- A start to development of a system for digital core descriptions should begin FY1997. Funds for data migration are also available in FY 97.
- Initial Reports volume for Leg 163 will be tested on the Web, as well as being published in hard copy and on CD in FY1997.

Transition Strategy

1. Leg 168 should be the last of the current hard copy IR volumes. Leg 169 should be the first *Electronic Initial Report* to be published solely on CD-ROM. for simultaneous release on the World Wide Web in October, 1997. It may not be possible to immediately hot link the Web version of the Leg 169 EIR to JANUS. An earlier start is not recommended because of the need for detailed forward planning, the projected state of JANUS Phase II development, and commitments already made to shipboard participants on publication formats.
2. Publication will be open to the outside literature 12 months post cruise from Leg 161. Publication in the outside literature or the ESR remains a requirement.
3. Abstract and citation lists will be posted on the Web for all leg-related publication from the outside literature beginning with Leg 161.
4. SR volumes 161 through 175 will be produced in book and CD (viewable volume) format. Beginning with Leg 176, all SR volumes will only be published on CD. If there is strong community support, this change over may be brought forward.
5. Web publication of SR manuscripts will begin by Leg 169. Papers will be posted as "in press" on the Web after acceptance and until publication of the SR volume.
6. By FY1998, the EIR will be linked to the JANUS Database.
7. By FY1999, ESR on the Web will be linked to the JANUS Database.
8. Subject to EXCOM endorsement of this strategy, JOI will establish a 3-year steering committee to monitor progress and community acceptance of this plan. JOI will report the findings of the steering committee at all future EXCOM and PCOM meetings. It is envisaged that the staged implementation of this scheme

should allow progressive acceptance by the scientific communities in all member countries. Serious problems in that acceptance should be sufficient grounds for redefining the implementation schedule.

9. Electronic capture and republication of *Proceedings* volumes 101 to 168 will begin in FY1997 as an X-based Project.

Target Implementation Schedule

Leg number	160	161	162	.....	168	169	.....	175	176	.....
Open Literature										
Scientific Results										
Traditional book										
500 page book						?		Oct 01	?	
CD										
WWW abstracts										
WWW										
Initial Reports										
Traditional book										
CD						Oct97				
WWW				Trial		?				

Indicative Savings on Publications and Information Services Budgets

This strategy has not been costed out in detail. However, approximately 40% of the current publications budget is expected to be saved when fully implemented.

Resource/Responsibility Assignments

Once a decision is made to implement a form of electronic publication, overall project coordination should be the responsibility of the Manager of Publications at ODP/TAMU.

Reporting Structure

Manager of Publications to Director, Science Operations, ODP/TAMU; JOI Steering Committee to Program Director to EXCOM.

(Prepared by David Falvey, Ann Klaus and Henry Dick)

ODP *Proceedings* Format

Electronic Publication Strategy (Directive given by JOI to TAMU 9/13/96)†

	Year Volume Produced*					
	FY97	**FY98**	**FY99**	**FY00**	**FY01**	**FY02**
Initial Reports:						
Book (site chapters and prime data) + **CD** (for viewable volume and data sets)	165, 166, 167, 168, 169S					
Book (site chapters) + **CD** (prime data, viewable volume, and data sets)	169	170, 171A, 171B, 172, 173, 174, 175				
CD viewable volume (site chapters, prime data, and data sets) + **WWW version**	Develop prototype all-electronic volume		176, 177, 178, 179, 180, 181	182, 183, 184, 185, 186, 187	188, 189, 190, 191, 192, 193	194, 195, 196, 197, 198, 199
Scientific Results:						
Book	150X					
Book + **CD** (for viewable volume and data sets)	152, 153, 154, 155, 156, 157	158, 159/159T, 160	161**, 162, 163	164, 165, 166, 167, 168		
CD viewable volume + **WWW version**					169S, 169, 170, 171A, 171B, 172, 173, 174	175, 176, 177, 178, 179, 180

† Format of *Proceedings* material may change, subject to new PUBCOM recommendations.
* FY = Fiscal Year (October – September)
** Beginning with 161, all SR books have 500-page limit.

IR Questionnaire Results 18-Feb-97				
	Already Installed	Installed from CD		
1. Did you have Adobe Acrobat on your computer, or did you install it from the CD?	8	5		
2. Were there problems with the installation?	no	yes		
	4			
3. I use the following system/s:	Mac	PC	UNIX	Other
	5	8		
	not useful	somewhat useful	very useful	
4. Overall, I find this CD:		4	7	
5. I found the electronic catalog of the volume to be:		1	9	
6. I found the electronic Citations to be:		4	10	
7. I found the electronic Compiled Index to be:	2	4	7	
8. For scrolling through the document the bookmarks were:		7	6	
9. For scrolling through the document the Article Tool was:		5	6	
10. I think the Acrobat FIND tool is:	2	5	6	
11. I think the Acrobat Search Engine is:		4	8	
	Never	Sometimes	All the time	
12. I used the README files for information:	2	11		
13. I used Adobe Acrobat HELP:	3	10		
14. I read the electronic IR volume:				
No I would only read a book	1			
I read on-screen	7			
I printed the document and read it	3			
I read the electronic volume and the book	4			
15. The PDF files are:				

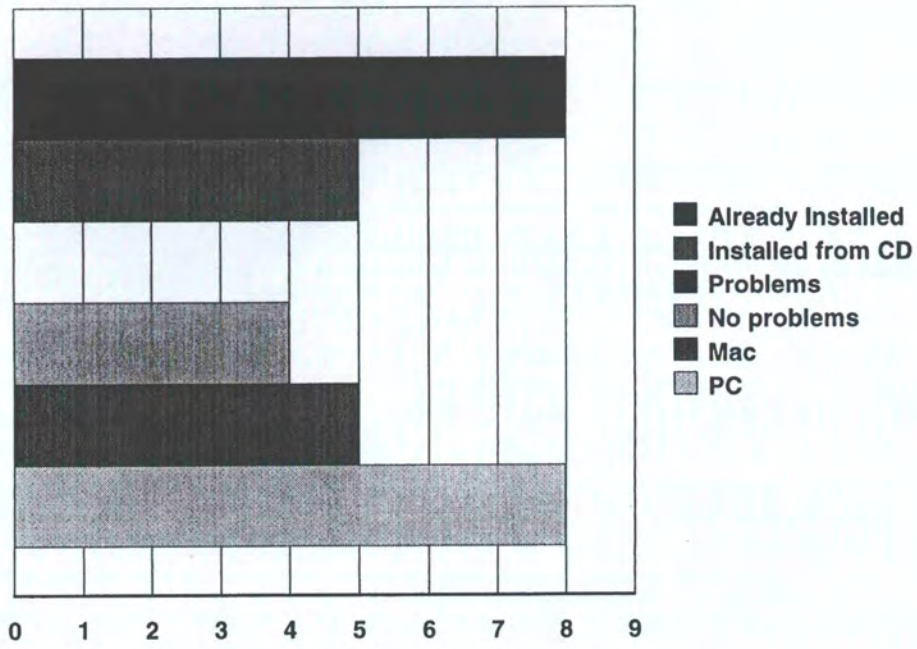
Too slow to work with	4
Just right (speed and resolution)	7
Fast enough, but still slow	2
16: Images were:	
Too slow to open	2
Not high enough resolution	
Just right (speed and resolution)	11

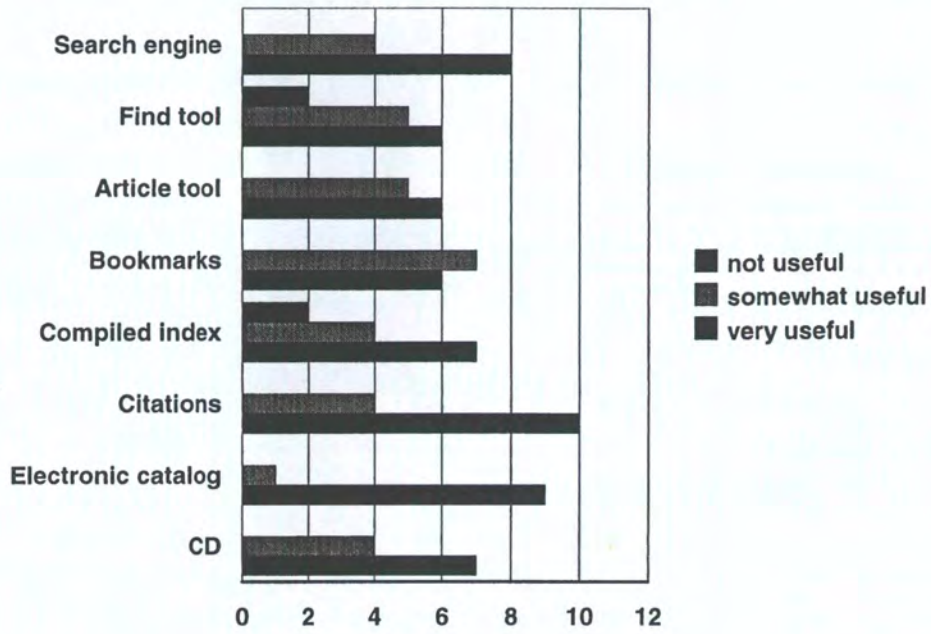
17. I would like to see barrel sheets and core images:	
On the same page/screen, even if it is slower to access	
Keep them separate. I will only open the photograph if I need to	11

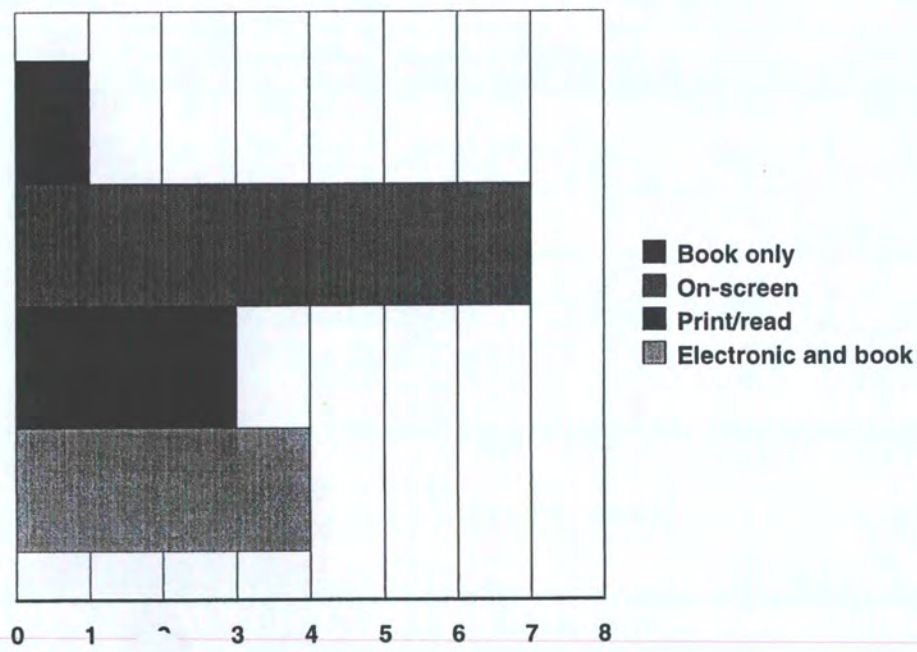
18. I have certain requirements for the core photographs.	
They are just right as they are	10
The files are too big to acess. Give me lower resolutoin files so I can access them faster.	
I want the highest resolution possible. I don't care how long it takes to access the file.	1

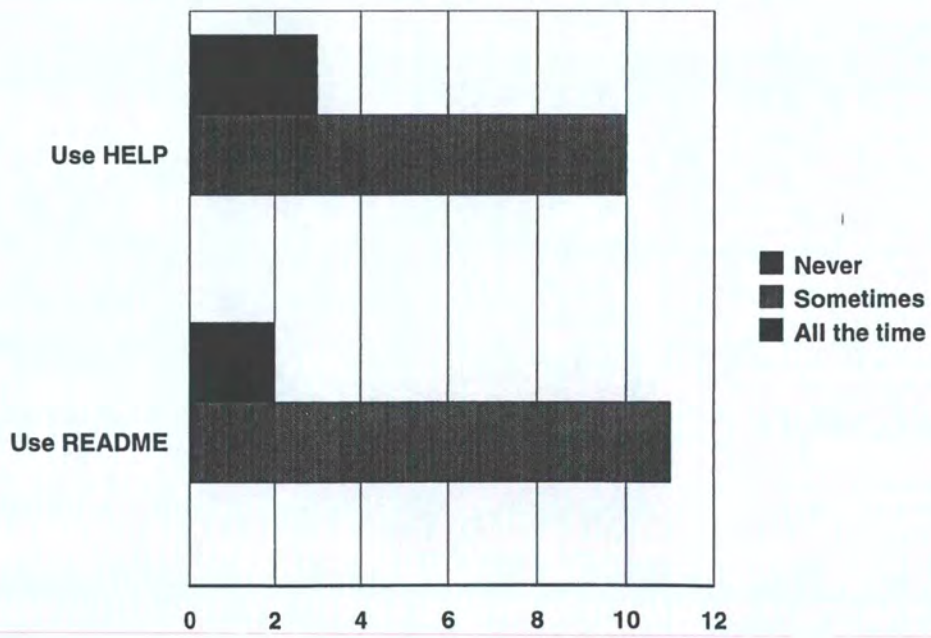
19. How high a resolution would you find useful?	
A little higher would be OK, but not at the expense of speed 600 dpi	

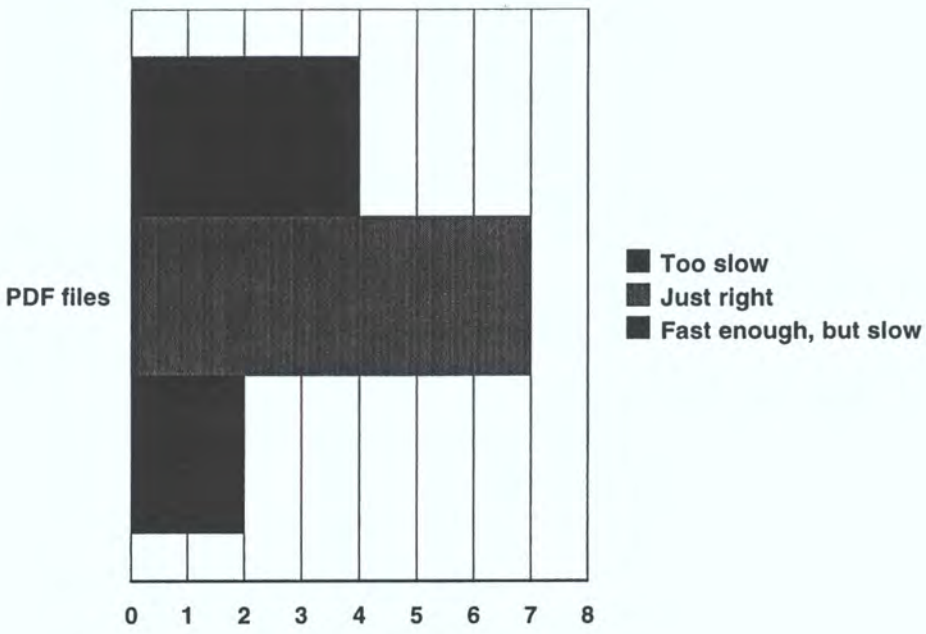
Additional comments:

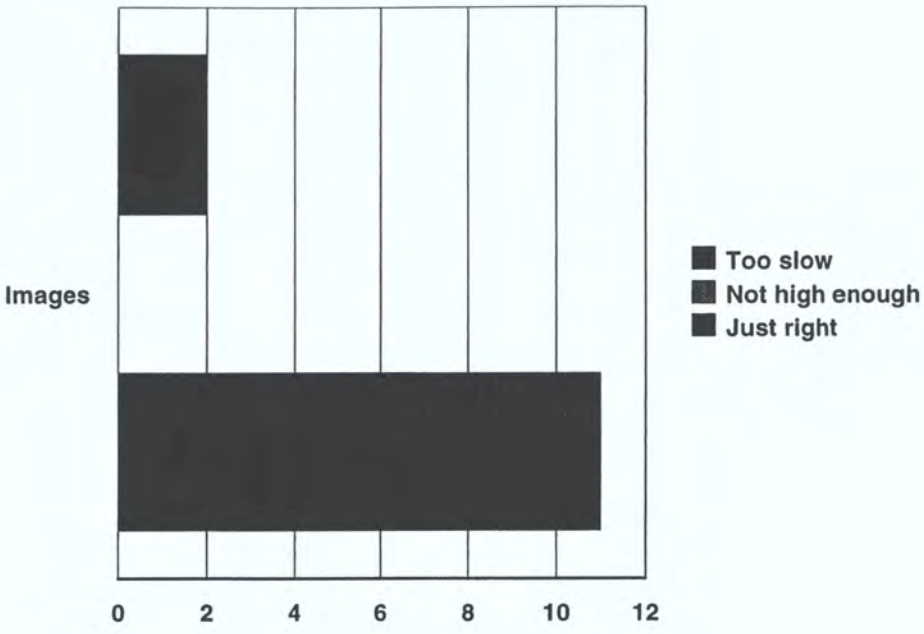

Already Installed
Installed from CD
Problems
No problems
Mac
PC
0 1 2 3 4 5 6 7 8 9

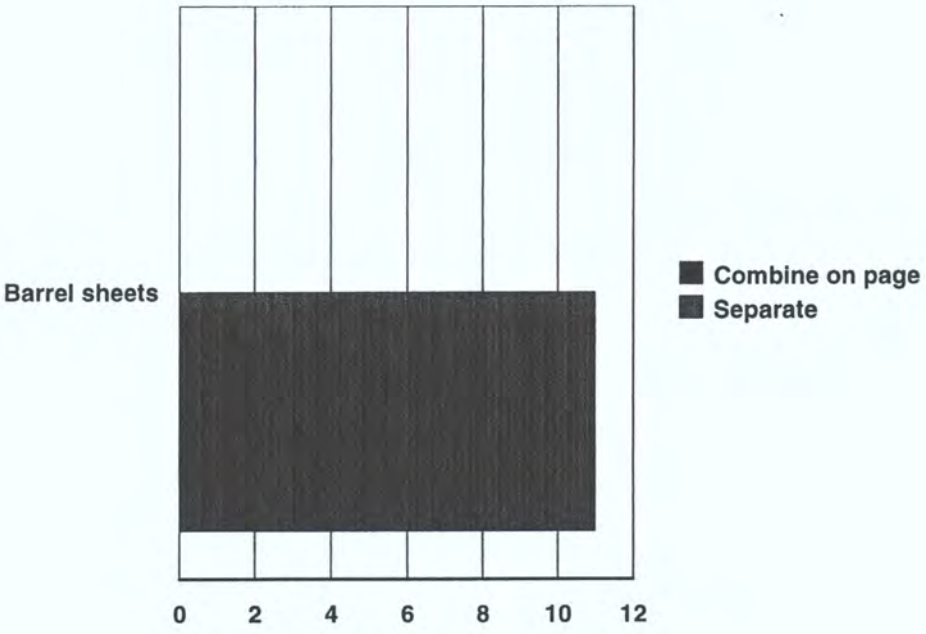

Search engine
Find tool
Article tool
Bookmarks
Compiled index
Citations
Electronic catalog
CD
not useful
somewhat useful
very useful
0 2 4 6 8 10 12

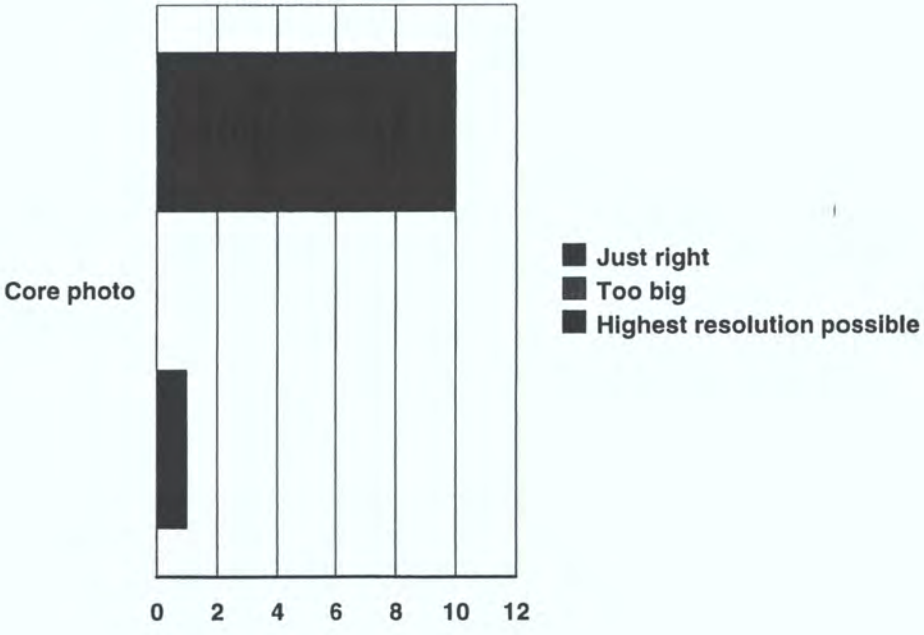

Book only
On-screen
Print/read
Electronic and book
0 1 3 4 5 6 7 8


Use HELP
Use README
Never
Sometimes
All the time
0 2 4 6 8 10 12


PDF files
0 1 2 3 4 5 6 7 8
Too slow
Just right
Fast enough, but slow


Images
0 2 4 6 8 10 12
Too slow
Not high enough
Just right


Barrel sheets
0 2 4 6 8 10 12
Combine on page
Separate


Core photo
0 2 4 6 8 10 12
Just right
Too big
Highest resolution possible

Electronic Equipment and WWW Questionnaire

CURRENT EQUIPMENT					
1. What model of computer/s do you use?	**Macintosh**	**PC**	**Sun**		
	30	23	10		
b. What make/speed?	**IICI**	**Powerbook**	**Sparc10**	**Quadra**	**Other**
	3	5	9	3	2
	486	**7200/90**	**6100/66**	**Other**	
	9	5	3	5	
2. What operating system do you use?	**Mac**	**Windows 3**	**Win 95**	**UNIX**	**Other**
	24	15	9	11	4
3. What size monitor/s do you have?	**12 Inch**	**14 Inch**	**17 Inch**	**21 Inch**	
	9	24	19	5	
4. What resolution is/are your monitor/s?	**800 x 600**	**1000 x 800**	**1200 x 1000**	**Don't Know**	
	12	7	4	23	
5. What type of printer/s do you have access to?	**Laser**	**Color**	**Inkjet**		
	44	16	8		
6. What printer resolution do you use?	**300**	**600**	**Other**	**Don't Know**	
	23	26	3	9	
b.What size paper do you regularly use in your printer?	**8.5 x 11**	**11 x 17**	**8.5 x 14**		
	34	1	2		
7. Do you have access to a CD-ROM drive?	**Yes**	**No**			
	34	9			
b. What speed is it?	**2X**	**4X**	**6X**	**Both**	**Don't Know**
	9	14	1	2	9
8. Do you have other exchangeable drives?	**Yes**	**No**			
	20	24			
b. What make?	**Zip**	**Syquest**	**DAT**	**Exabyte**	**Bernoulli**
	8	6	5	3	1
c. What size?	**44 MB**	**88 MB**	**100 MB**	**270 MB**	**Don't Know**
	2	3	6	2	6
FUTURE EQUIPMENT UPGRADES					
9. What computer do you expect to upgrade to?	**Macintosh**	**PC**	**No plans**		
	9	5	32		
b. When?	**1 year or less**	**> 6 mos.**	**>1 mo.**	**Don't Know**	
	3	4	2	5	
10. What size monitor do you expect to get with your next monitor purchase?	**21 Inch**	**17 Inch**	**14 Inch**	**No plans**	
	5	6	3	30	
b. When?	**1 year or less**	**> 6 mos.**	**Don't Know**		

3/28/97

	3	5	6		
11. What type of printer do you expect to purchase next?	**Laserjet**	**Inkjet**	**No plans**		
	6	1	38		
b. When?	**1 year or less**	**Don't Know**			
	1	6			
c. What resolution would you like to print?	**600 DPI**	**300 DPI**			
	6	1			
12. What speed CD-ROM drive do you expect to purchase?	**4X**	**6X**	**8X**	**No Plans**	
	5	2	3	34	
b. When?	**6-12 mos.**	**> 6 mos.**	**> 1 mo.**	**Don't Know**	
	2	3	1	4	
WORLD WIDE WEB					
13. Do you have access to the WWW?	**Yes**	**No**			
	44				
14. Is your access to the WWW fast enough to allow you to successfully review and retrieve material of interest?	**Yes**	**No**			
	30	14			
15. Does your organization have plans to upgrade your WWW access?	**Yes**	**No**	**Don't Know**		
	12	13	20		
b. When?	**6-12 mos.**	**Frequently**			
	6	6			
16. Do you log on to the WWW regularly?	**Yes**	**No**			
	31	13			
b. Why?	**Work**	**Research**	**Personal**	**All**	
	15	10	6	17	
17. When working with research or scientific material on the WWW, do you read onscreen or print to read?	**Onscreen**	**Print**	**Both**	**Neither**	
	19	8	16	1	
18. Do you do the majority of your web access while at work or when at home?	**Work**	**Home**	**Neither**	**Both**	
	40	2	1	1	
19. If at work, what speed is your connection to the Internet?	**56Kbps**	**T1**	**T3**	**Don't Know**	
	3	9	2	30	
20. If at home, what speed modem do you use or are you using ISDN, cable modem, ADSL, etc.?	**28.8**	**14.4**	**No response**		
	9	4	31		

SCIENCE PLAN FOR FY 1998

1. THE ODP LONG RANGE PLAN (LRP)

Scientific objectives of proposals considered for the FY 1998 (and the early part of FY '99) drilling program were linked to the 1996 ODP Long Range Plan (LRP) published by JOI. The LRP incorporates feedback from other international programs and partner countries, and includes information about scientific priorities for the post-2003 era. It also takes into account the scientific drilling advances that have occurred over the past five years, changes in societal pressures for scientific relevancy, new opportunities for drilling platforms, and greater internationalization of the operational aspects of the program. Two major research themes that encompass the vast range of fundamental scientific questions which can be explored by Ocean Drilling are identified in the LRP: The Dynamics of Earth's Environment and the Dynamics of Earth's Interior. Within these themes, ODP has emphasized three initiatives and one pilot project which capitalize on new drilling technologies and scientific approaches, frontiers, and collaborations to which scientific ocean drilling can make a unique contribution.

The LRP, which employs a three-phased approach, is intended to guide the program through the end of **Phase II,**(through 1998), **Phase III** (1999 to 2003), and into **Phase IV** (beyond 2003). Planning efforts beyond 2003 are already underway with the jointly sponsored Japanese/JOIDES CONCORD (Conference on Cooperative Ocean Riser Drilling) Workshop to be held in Japan in July, 1997. The purpose of the Workshop will be to formulate the main scientific objectives outlined in the ODP Long Range Plan that require riser drilling as part of the project plan, and to define the strategies and technology needed to achieve these goals. The workshop will also provide the final scientific background and documentation for the OD21 proposal to the Japanese government.

This Science Plan for FY 1998-99 includes comment on how each of the newly scheduled programs address goals outlined in the 1996 ODP Long Range Plan, and how their objectives link ODP with other international geoscience programs.

2. PROPOSAL REVIEW PROCESS

Drilling proposals considered contained information on site survey data, and strategies for drilling, sampling, and downhole measurements. Drilling proposals evaluated for FY 1998 drilling were reviewed by the Thematic Panels in March and October, 1996, following January 1 and July 1 deadlines for submission. The JOIDES Office returned comments, recommendations, and data package requirements to proponents in April and November.

Thematic Panel evaluations were based on the 1996 ODP Long Range Plan, individual panel mandates, experience and judgment of panel members, and the long-term scientific strategies of panels. In the spring, each thematic panel prioritized all "active proposals" within its mandate. The JOIDES Office summarized these rankings to produce a Global Ranking table (Table 2) which was used by PCOM to guide them in establishing a general four-year ship track in April. At its August meeting, PCOM selected 20 proposals and compiled them into a prospectus for the FY 1998 drilling consideration. The Prospectus was presented to the Thematic panels in the Fall for advice on their highest priorities. The Lithosphere Panel then added Proposal 508 (Ninety East Ridge Observatory) to the Prospectus. The top ranked proposals for Fall 1996 are shown in Table 3.

Proponents of proposals that were highly ranked submitted a site survey data package to the ODP Data Bank at LDEO by a July 1 or November 1 deadline. The proposals of highest interest were subsequently evaluated on their "site survey readiness" by the Site Survey Panel (SSP). The SSP review was based on identification of drilling target categories and site survey techniques that provide the optimal data set for each target. Ultimately the site survey package, as refined by SSP reviews, will serve as the basis for review by the Pollution Prevention and Safety Panel (PPSP) for those proposals scheduled as ODP Legs.

TABLE 2. 1996 Spring ODP Thematic Panels Global Rankings of active (updated within the previous three years) proposals in the ODP system.

RANK	LITHP	OHP	SGPP	TECP
1	448-Rev Ontong Java LIP	464-Southern Ocean Paleoceanography	481-Red Sea Deeps	450 - Taiwan Arc-Continent Collision 1
2	480 -Caribbean Cretaceous Basalt Province	441-Rev SW Pacific Gateway	445-Rev2 Nankai Trough	477-Rev2 Woodlark Basin
3	481 Red Sea Deeps	465-Add SE Pacific Paleoceanography	Antostrat	431-Rev Western Pacific Seismic Network
4	451-Rev3 Tonga Forearc	367-Rev3 Cenozoic Carbonates in the Great Australia Bight	367-Rev3 Cenozoic Carbonates in the Great Australia Bight	445-Rev2 Nankai Trough
5	Seismic Boreholes	484- East Asian Monsoon History	484 - East Asain Monsoon History	442- Northern Mariana Rift
6	457-Rev3 Kerguelen LIP	485 Southern Gateway - Australian Antarctica	476 Hudson Apron	484- East Asian Monsoon History

7	472- Izu-Mariana Mass Balance	499- Mesozoic Weddell Sea & 488- Southern Ocean Circulation (Weddell Sea)	472- Izu-Mariana Mass Balance	451-Rev3 Tonga Forearc
8	426-Rev Austlaia-Antarctica Discordance	452-Rev2 Antarctic Glacial History of Sea Level Change	455-Rev Laurentide Ice Sheets Outlets	Crust Structure
9	420 Evolution of Ocean Crust	455-Rev Laurentide Ice Sheets Outlets	453 Bransfield Strait Antarctica	Mass Balance
10	442-REV Northern Mariana Rift	483 ACC - Scotia Sea and Falkland Trough	355-Rev5 Gas Hydrates/ Peru Margin	457-Rev3 Kerguelen Plateau
11		457-Rev3 Kerguelen Plateau	478 East Nankai Multiple Shortening	463 Shatsky Rise
12		490 Prydz Bay - Glacial Sea Level History	464 Southern Ocean Paleoceanography	492 Taiwan Arc Continental Collision 2
13		477 Sea of Okhotsk and Bering Sea	471 Nicaragua Mass Balance	481 Red Sea Deeps

TABLE 3. Fall 1996 Thematic Panel Rankings of Proposals

RANK	LITHP	OHP	SGPP	TECP
0	**D C S Test**			
1	457 - Kerguelen LIP	464 - Southern Ocean Paleoceanography	ADPG -1 (W. Antarctic Peninsula)	447-Woodlark Basin
2	ION (431 W.Pac. Sites & NERO)	441 - South Pacific Gateway	445- Nankai Trough	431- W.Pac. Seismic Network
3	451 - Tonga Forearc	367 GAB Cenozoic Carbonates	367 - GAB Cenozoic Carbonates	451- Tonga Forearc
4	472 - Mariana-Izu	ADPG -1 (W. Antarctic Peninsula)	LOI 69 - Barbados Cork Refurbishment	450- Taiwan Collision 1
5	431 - Japan Trench sites	503 - Weddell Sea (ADPG 2)	472 - Mariana-Izu	445- Nankai Trough

6	447 - Woodlark	482 Ross Sea/Wilkes Land (ADPG 4)	447 - Woodlark Basin	472 - Mariana-Izu
7	450- Taiwan Collision 1	485 - S. Gateway: Australia-Antarctica	464 - Southern Ocean Paleoceanography	457 - Kerguelen LIP
8	079 - Somali Basin	472 - Mariana-Izu	451- Tonga Forearc	D C S Test
9			450- Taiwan Collision 1	485 - S. Gateway: Australia-Antarctica
10			441 - S. Pac. Gateway	441 - South Pacific Gateway
11			079 - Somali Basin	079 - Somali Basin
12			LOI- 72 LWD Eng.	
13			D C S Test	

3. PCOM DEVELOPMENT OF THE SCIENCE PLAN

Following a review and ranking of proposals in the FY 1998 Prospectus, and consideration of Proposal 508 (Ninety East Ridge Observatory), which was added to the prospectus in the Fall by LITHP, PCOM established a drilling schedule for FY 1998 (Legs 177 to 181) and into the next fiscal year, FY 1999 (Legs 182 and 183). This occurred at the Annual PCOM Meeting in December, 1996 at Biosphere 2 in Arizona. The meeting was chaired by Susan Humphris, the PCOM Chair, and attended by the JOIDES Office staff, all Thematic and Service Panel Chairs (except DMP), the Director of JOI, Inc., and the representatives of ODP/TAMU, WLS/LDEO, and NSF.

Drilling proposal presentations were delivered by relevant Panel Chairs arguing for their scientific merit, and each proposal under consideration was thoroughly discussed. The PCOM Watchdogs commented on the science advances likely to be achieved. Discussion of each proposal focused on the following topics: panel rankings, site survey readiness, potential safety considerations, scientific maturity, likelihood of success, technological considerations (core recovery, CORKs, LWD, MWD, use of re-entry cones), operational considerations (weather, ice cover, currents, and transit times between potential drilling sites), and environmental and territorial considerations related to drilling in the Antarctic (south of 60° S).

The proposed drilling program for FY 98 and the two legs scheduled for FY 99 that were approved by the Planning Committee are shown in Tables 4 and 5. LITHP and SGPP have two of their top five highest ranked proposals scheduled for drilling in FY 98 -99. TECP has one of its top five scheduled for drilling in FY 98. OHP has four of its top five proposals scheduled for drilling in FY 98.

TABLE 4. FY 1998 JOIDES Resolution Operations Schedule

Leg	Destination	Cruise Dates	Port of Origin	No of Days	Transit	On Site
***176**	Hole 735B	15 Oct.-10 Dec. 97	Cape Town 10-14 Oct. 97	56	16	40
177	Southern Ocean Paleoceanography	15 Dec. 97 - 9 Feb. 98	Cape Town 10-14 Dec. 97	56	16	40
178	Antarctic DPG 1 (W. Antarctic Peninsula)	14 Feb. - 11 April	Punta Arenas 9-13 Feb.	56	18	38
179	NERO/Hammer Drilling Test	16 April - 30 May	Cape Town 11-15 April	44	22	22
180	Woodlark Basin	4 June - 30 July	Singapore 30 May - 3 June	56	14	42
181	SW Pacific Gateway	4 Aug. - 29 Sept.	Townsville 30 July - 3 Aug.	56	15	41

*Note that Leg 176 was scheduled by PCOM at their December 1995 Annual Meeting in San Diego, California.

TABLE 5. FY 1999JOIDES Resolution Operations Schedule *(LEGS 182 AND 183)*

Leg	Destination	Cruise Dates	Port of Origin	No of Days	Transit	On Site
182	GAB Cenozoic Carbonates	4 Oct. - 29 Nov.	Wellington 29 Sept. - 3 Oct.	56	13	43
183	Kerguelen LIP	4 Dec. 98 - 2 Feb. 99	Fremantle 29 Nov. - 3 Dec. 98	60	TBA	TBA

4. PROGRAM DESCRIPTIONS FOR FY 1998

LEG 176	**RETURN TO 735B**
Proposal	**300-Add2, 300-Add, 300-Rev, 300**
Title	**Return to 735B: the Temporal and Spatial Variability of the Lower Ocean Crust at a Very Slow Spreading Ocean Ridge.**
Proponents	**H.J. B. Dick, S. Hart, J.H. Natland, P. Robinson, R. Stephen and R.P. von Herzen**

BRIEF DESCRIPTION

The exposures along the shoal bank at the Atlantis II Fracture Zone offer an unique setting to investigate the composition and structure of the lower oceanic crust. ODP Hole 735B, located on a 15 km long wave cut terrace 18 km east of the Atlantis II transform fault, was drilled on Leg 118 and represents the only existing deep penetration into plutonic basement in the oceans. The goal of Leg 176 drilling is to deepen Hole 735B to a nominal depth of 2 km sub-basement to directly determine the nature of the magmatic, metamorphic, tectonic and hydrothermal processes in the lower ocean crust at a slow spreading ocean ridge. While it is hypothesized that deepening Hole 735B may reach the petrologic Moho, the boundary between rocks that are the residues of the processes by which magmas form and migrate to the crust, and rocks produced by the crystallization of those magmas as they rise out and pool above the upwelling mantle peridotite, the recovery of a truly representative section of plutonic crust, will, by itself, be a major breakthrough in understanding the geologic processes occurring beneath ocean ridges.

RELEVANCE TO THE ODP LONG RANGE PLAN

Deepening Hole 735B is directly relevant to LRP Initiative III, "Exploring the Deep Structure of Continental Margins and Oceanic Crust". Within this initiative, ODP has emphasized the goal of "penetrating hitherto inaccessible regions beneath the sea floor to explore the underlying processes that form continents, rifts, oceanic crust and economic resources". The scientific objectives and technological initiatives of Leg 176 clearly represent a start towards meeting this challenge.

LINKS TO OTHER GEOSCIENCE INITIATIVES

ICDP, MARGINS.

LOGGING PLAN November 1995

The establishment of the depth/seismic tie by the means of a VSP and synthetic seismograms are essential to identify deep crustal reflectors. During the first phase of drilling Hole 735B during Leg 118, geochemical data from the GLT, the compressional and shear wave velocity and amplitude logs, the borehole televiewer (BHTV), and magnetic susceptibility were especially useful in delineating structural and stratigraphic features of magmatic layering and fractures. In anisotropic formations such as those at Site 735, the shear wave velocity and amplitude measured at different azimuths in the borehole may indicate fracture orientation and the regional paleostress direction. The Formation Micro Scanner (FMS) high-resolution images will also vastly improve the determination of the fracture and alteration zone distribution in the crust and should be given high priority. Magnetic susceptibility was useful to identify metallic oxides that are quite abundant in the upper 500 m of the hole and a proposal for a third-party magnetometer should be considered. Log resistivities were as high as 40,000 ohm-m in the upper 500 m of the hole and the dual laterolog (DLL) is recommended in such high-resistivity environments.

In summary, the Quad, GLT (providing low core recovery necessitates it), dipole sonic, DLL, FMS, and BHTV toolstrings, should be run in the proposed deepening of Hole 735B. In addition, a vertical-incidence VSP and a third-party magnetometer are recommended.

Site	Position	Water Depth	Sediment Thickness	Penetr. Depth	Logging Operations
735B	32.72 S; 57.27 E	740	0	2000	Quad, GLT, DLL, FMS, BHTV, dipole sonic, magnetometer

QUESTION FOR LDEO. Has the VSP experiment been dropped?

LEG 177

PROGRAM	**SOUTHERN OCEAN PALEOCEANOGRAPHY**
Proposal	**464 (replacing 458 - Transo, and 430 - Sub-Sat), 464-Add, 464-Add2, 464-Add3**
Title	**Paleoceanographic Transect across the Southern Ocean - Atlantic Sector**
Proponents	**R. Gersonde, D. Hodell, G. Bohrmann, C.D. Charles, P.N. Froelich, D. Futterer, K. Gohl, J.P. Kennett, G. Kuhn, H. Miller and D.A. Warnke**

BRIEF DESCRIPTION

The goal of Leg 177 drilling in the Atlantic sector of the Southern Ocean is to recover a latitudinal and depth transect to study the paleoceanographic and climatic history of the southern high latitudes. The drilling targets, which span a latitudinal transect across the Antarctic Circumpolar Current at water depths from 2100 to 4700 m, will provide the sedimentary sequences needed to expand the biostratigraphic, biogeographic, paleoceanographic, and paleoclimatic history of the Southern Ocean during the Cenozoic. This period was marked by major changes in Southern hemisphere paleogeography, including the gradual isolation of the Antarctic continent and the opening of the Drake Passage. Specifically, this part of the drilling program will study the:

- evolution and stability of the Antarctic ice sheet;
- thermal isolation of the Southern Ocean surface waters by the development of the Antarctic Circumpolar Current (ACC), its associated frontal systems and the Antarctic sea-ice field;
- development of the Southern Ocean biogenic silica belt, nutrient cycling and their role in global biogeochemical cycles and the CO_2 budget.;
- changes in the production and mixing ratios of various deep and bottom water masses in the Antarctic (e.g. NADW) and their role in influencing climate in the southern high latitudes and globally;
- southern high-latitude calcareous and siliceous stratigraphic biozonations; and
- paleoenvironmental impact of the Antarctic cooling on the evolution of the southern-high latitude biosphere.

Some Leg 177 target sites exhibit average sedimentation rates in the late Pleistocene as high as 20-30 cm per ten thousand years, offering the opportunity to construct continuous high and ultra- high time resolution records. Thus, a second major objective of Leg 177 is to obtain expanded sections of late Neogene sediments in order to resolve the timing of Southern Hemisphere climatic events relative to those previously documented in ice cores from Greenland and Antarctica, as well as those sediment records that have been or will be recovered from the North Atlantic (ODP

Leg 162, Leg 172), the low-latitude Atlantic (ODP Legs 154, Leg 165 - Site 1003), the South Atlantic (ODP Leg 175), the eastern North Pacific (ODP Leg 167, Leg 169S, Site 893), and the Antarctic (ODP Leg 178). The recovery of these high and ultra-high resolution sequences will permit the study of:

- the timing and response of the Southern Ocean surface and deep waters to external forcing, including the phase relationships to climatic changes in the low-latitudes and high latitude northern hemisphere; and
- rapid (suborbital) climate change in the Southern Ocean by correlation and comparison of ultra high-resolution signals from the Southern Hemisphere with polar and ice core and marine records.

Leg 177 will contribute significantly to understanding the Earth's climatic system by extending the present latitudinal and depth coverage in the Southern Ocean permitting paleoclimatic and paleoceanographic studies on both the long (Cenozoic) and short (orbital and sub-orbital) time scales in a remote region that has not been well explored, yet is a key component of Earth's climate system.

RELEVANCE TO THE ODP LONG RANGE PLAN

This program is relevant to the scientific objectives summarized in the ODP Long Range Plan under the "Understanding Earth's Changing Climate". In addition, the recovery of cores at high sedimentation rate sites will directly contribute to LRP Initiative 1, "Understanding Natural Climate Variability and the Causes of Rapid Climate Change", by expanding the global array of high resolution climate records to include the high latitudes of the Southern Hemisphere where little is known about abrupt climate change.

LINKS TO OTHER GEOSCIENCE INITIATIVES

ANTOSTRAT, IMAGES, MARGINS, NAD.

DRILLING STRATEGY

To be inserted by TAMU.

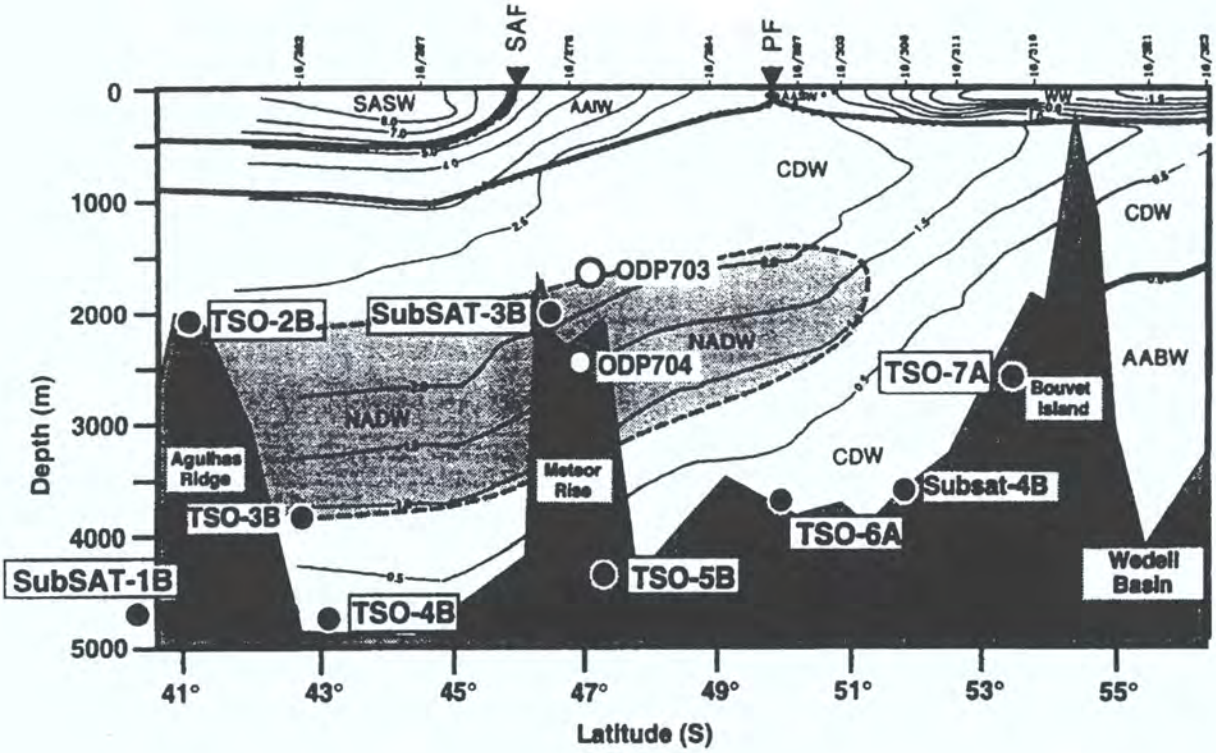
LOGGING PROSPECTUS NOVEMBER 1996

Sediments encountered at these sites will consist of periodically alternating layers of biosiliceous and carbonate sediments, with variable amounts of fine (clays) and coarse (ice-rafted debris) terrigenous clastics. Because of the strong density and porosity variations associated with this lithologic variability, core and log physical property indices will very likely be extremely valuable proxy measurements for reconstructing sediment composition time series. Some sites evidently have very high

sediment accumulation rates so there will be a great potential for generating very high-resolution records of regional paleoclimatic and paleoceanographic variability.

This leg offers one of the best opportunities to date for reconstructing continuous records of Southern Ocean paleoclimate variability using core and log data. Previous ODP logging at some of the sites described in this proposal indicates that these sites have strong physical property variability related to the paleoclimatic opal-carbonate-terrigenous bedding cycles. The deployment of the FMS and the GHMT at each site is strongly recommended based on their critical contribution toward developing continuous high-resolution paleoclimate records.

Site	Position	Water Depth	Sed. Thick	Penetr. Depth	Logging Operations
SubSAT 1C	40° 54.8′ S 9° 55.5′ E	4620	700	700	None
SubSAT 3B	46° 24.7′ S 7° 4.8′ W	2008	200	200	None
SubSAT 4B	52° 3.0′ S 4° 31.0′ W	3661	800	800	None
TSO-1A	35° 50.8′ S 18° 5.8′ W	2949	1000	1000	None
TSO-2A	41° 8.2′ S 13° 33.7′W	2090	800	800	Triple, FMS/Sonic, GHMT
TSO-3C	42° 54.8′ S 8° 54′ S	3718	800	800	None
TSO-4A	44° 12.0′ S 11° 43.6′ W	4630	800	800m	Triple, FMS/Sonic, GHMT
TSO-5B	47° 7.22′ S 5° 50.7′ W	4418	200	200	None
TSO-6A	49° 58.6′ S 5° 51.9′ W	3680	700	700m	Triple, FMS/Sonic, GHMT
TSO-7A	53° 10.5′ S 5° 7.7′ W	2850	730	730	None



LEG 177

Schematic representation of the vertical distribution of potential temperature on a transect in the eastern Atlantic sector of the Southern Ocean (Agulhas Ridge - Bouvet Island) relative to TSO and SubSAT sites, and ODP Sites 703 and 704 on Meteor Ridge.

LEG 178 : ANTARCTIC DPG DRILLING PLAN 1

PROGRAM	**ANTARCTIC GLACIAL HISTORY & SEA- LEVEL CHANGE**
Proposal	**452-Rev2, 452-Add2, 452-Add3**
Title	**Antarctic Peninsula Pacific Margin: Antarctic Glacial History and Sea-Level Change**
Proponents	**P.F. Barker, R.D. Larter, C.J. Pudsey, A. Camerlenghi, M. Rebesco, L.A.P. Gamboa, D.E. Hayes, J.P. McGinnis, J.A. Austin, D.H.N. Barker, P.J. Bart & A. Maldonado**

PROGRAM	**PALEOPRODUCTIVITY IN THE ANTARCTIC COASTAL OCEAN**
Proposal	**502, LOI 68**
Title	**Holocene Paleoproductivity Signal of the Antarctic Coastal Ocean: Linkages among the Sun, Atmosphere, Ocean, Sea Ice and Biota**
Proponents	**E. Domack, R.W. Murray, T. Janecek, S. Ishman, A. Leventer, J. Kennett, S. Brachfeld**

BRIEF DESCRIPTION

The Antarctic ice sheet is a major component of the Earth's climate regime which influences the meridional temperature gradient, global deep and bottom water formation, and sea level change. At present, knowledge of the history of the Antarctic ice sheet is fragmentary. Current hypotheses regarding its history have been inferred from low-latitude oxygen isotope measurements and the record of eustatic sea-level change interpreted from sediments on low latitude margins. These inferences, however, are ambiguous and in disagreement. By conducting a series of Antarctic drilling legs, ODP aims to obtain information about the timing, extent, and variability of glaciation of the Antarctic continent in order to better understand its effect on global sea level, and its influence on the surrounding ocean. This multi-leg drilling strategy was developed by the ODP Antarctic Detailed Planning Group in 1996. The overarching goal is to extract a direct record of Antarctic Cenozoic glacial history by sampling sediments that have been transported at the base of grounded ice sheets to the Antarctic continental margin, and deposited on the shelf and slope as progradational wedges and on the continental rise in drifts.

Leg 178 is the first step towards accomplishing the broad objectives of the Antarctic Detailed Planning Group by drilling on the Pacific margin of Antarctica, an area that is adjacent to the most climatically sensitive part of the continent. The glacial prograded wedges of the Western Antarctic Peninsula margin are particularly well-

developed, and their glacial record well-preserved for several reasons, including the margin's tectonic youth, and the high snowfall accumulations. In addition, the associated terrigenous hemipelagic drifts on the adjacent continental rise contain a continuous, high-resolution record of continental climate, which will serve as a reference section for records of the shelf. Specifically, ODP drilling will yield high-resolution records of continental glaciation in the last 10 Ma from the glacio-marine sequences deposited on the shelf, slope and rise (drift deposits) on the Pacific Margin of Antarctica which can be compared with each other; document the history of grounded-ice volume fluctuations which can be compared with low-latitude records of sea level change; assess the controls on sediment dispersal on Antarctic margins; and extract the record of climate on Antarctic Peninsula prior to ridge collision against the margin.

A single site within the Palmer Deep will also be drilled on Leg 178 to obtain a Holocene record of paleoproductivity for the Antarctic coastal ocean. Palmer Deep is a small depression located on the western side of the Antarctic Peninsula south of Anvers Island. Here, high accumulation rates of 0.39 cm/year over the last 14,000 years will permit a high-resolution study of paleoproductivity and Holocene climate fluctuations which can be compared with the results of the Saanich Inlet, Cariaco Basin, and Santa Barbara drilling efforts.

In summary, the results of Leg 178 drilling on the western margin of the Antarctic Peninsula will provide an unprecedented high-resolution record of Antarctic continental climate over the past 6-10 Ma and a direct check on the presumed glacio-eustatic origin of global sea-level change over the same period. Leg 178 holds the promise of significantly advancing our understanding of the role of the Antarctic ice sheet in global climate dynamics.

RELEVANCE TO THE ODP LONG RANGE PLAN

This program will address objectives contained in Initiative 1, Understanding Natural Climate Variability and the causes of Rapid Climate Change, and two sub-themes under the major research themes of the Dynamics of Earth's Environment: Understanding Earth's Changing Climate, and the Causes and Effects of Sea-Level Change.

LINKS TO OTHER GEOSCIENCE INITIATIVES

The goals of Leg 178 are intimately tied to those of **ANTOSTRAT**. The primary objective of ANTOSTRAT, which was set up in 1989 by SCAR (Scientific Committee On Antarctic Research), is to extract a direct record of Antarctic Cenozoic glacial history from sediments that have been transported at the base of grounded ice sheets to the Antarctic continental margin. The results of Leg 178 will also complement the **Cape Roberts Project**, a joint venture involving scientists from Germany, Italy, New Zealand, the UK and the US, which seeks to recover core cores from a 1500 m thick

sedimentary sequence off Cape Roberts in the southwestern Ross Sea. This will be done by continuous coring from a land rig on fast ice on the flank of Victoria Land Basin.

IMAGES, MARGINS,NAD.

DRILLING STRATEGY

ODP/TAMU input

LOGGING PROSPECTUS NOVEMBER 1996

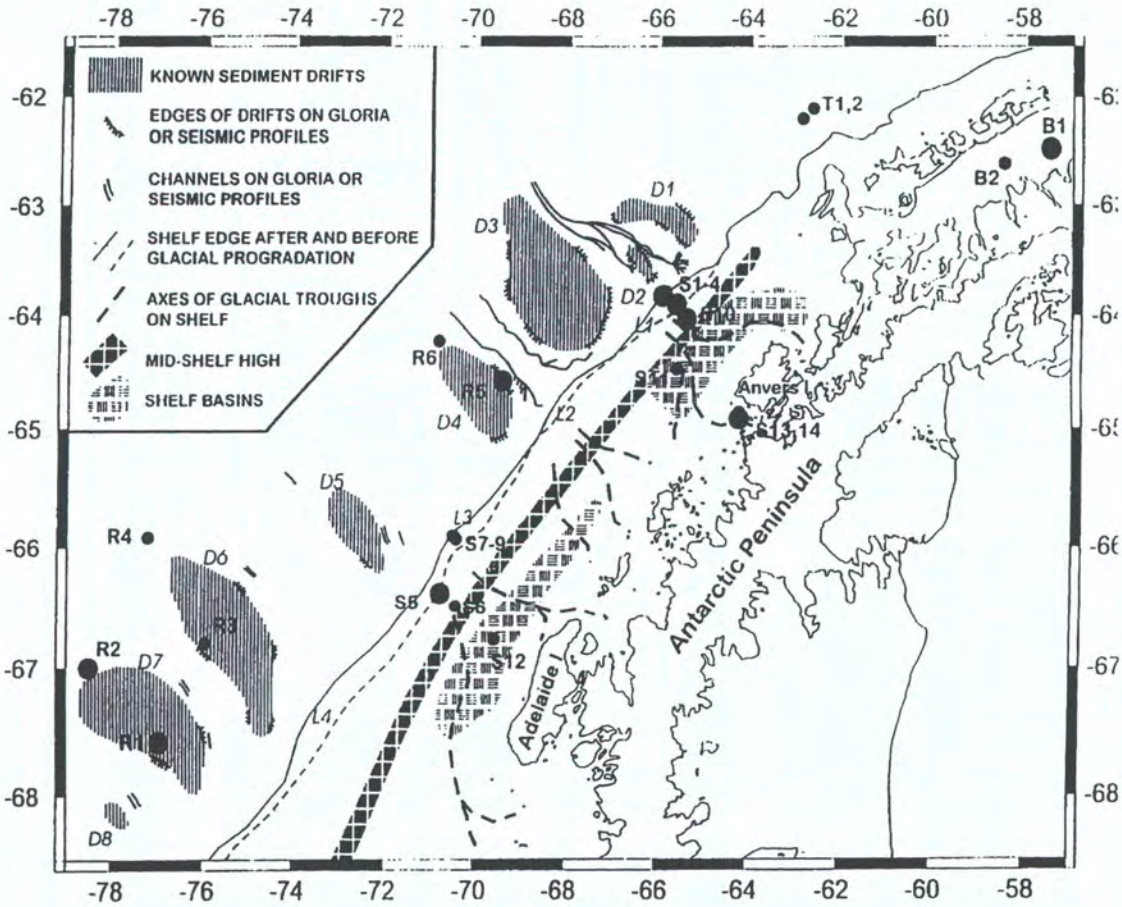
Prior ODP/DSDP experience in Antarctic margins (Legs 28, 113 and 119) has shown that core recovery, particularly in diamictons, can be poor. Although only limited logging was attempted during Legs 113 and 119, the good quality results (sonic-resistivity, lithoporosity) underscore the potential contributions of wireline logging to this program. These include:

- Characterization of the stratigraphic response of the margin to sea-level and ice volume changes, using FMS and geophysical logs. The integration of logs with core data has the potential to offset the anticipated low core recovery, particularly on the shelf sections.
- Characterization of the fine scale bedding on the slope and drift deposits using FMS images. This may be of particular significance to assess cyclicity in the sedimentary section and help evaluate the climatic forcing functions and to refine timing by tuning the downhole log records.
- Site-to-site correlation, both on the shelf and from shelf to rise. These correlations can be facilitated if a magnetic reversal sequence is obtained with the GHMT. Previous dating in the Antarctic has relied on diatom biostratigraphy and magnetostratigraphy from core samples. Given that recovery is likely to be low at some sites (particularly in the shelf-slope), the GHMT could be an important tool to help date the sedimentary record.
- Seismic calibration with check-shot surveys.

The deployment of the two standard suites is recommended: the IPLT-DIT combination for lithoporosity-resistivity data and the FMS-sonic combination. In addition, the GHMT should be deployed at all sites for magnetostratigraphy and correlation purposes, and the seismic calibration tool (WST) be deployed at selected sites.

As noted above, the GHMT data will allow improved correlation across the transect sites using magneto-stratigraphy derived from the logs, as well as complement the chronostratigraphy. On the drift sites, magnetic susceptibility records, together with other geophysical logs, will help decipher the climatic signals recorded through changes in the proportion of pelagic vs. margin derived sediments, as well as to provide excellent records for detailed core-log integration (e.g., Leg 162 results).

Site	Position	Water Depth	Penetration Depth	Logging Operations
APRISE-1A	67°34.0′ S 76° 57.8′ W	3200	700	IPL, FMS-SDT, GHMT, WST
APRISE-2A	66° 59.9′ S 78° 29.2′ W	3850	550	IPL, FMS-SDT, GHMT
APSHEL-1A	63° 48.2′ S 65° 51.5′ W	450	505	IPL, FMS-SDT, GHMT, WST
APSHEL-2A	63° 52.0′ S 65° 44..7′ W	440	560	IPL, FMS-SDT, GHMT, LWD
APSHEL-3A	63° 52..9′ S 65° 42..7′ W	440	505	IPL, FMS-SDT, GHMT, WST
APSHEL-4A	63° 56.5′ S 635° 34.6′ W	490	785	IPL, FMS-SDT, GHMT, WST
APSHEL-13A	64° 51.7′ S 64° 12.5′ W	1040	60	no logging
APRISE-5A	65° 35.1′ S 69° 24..3′ W	2850	1000	IPL, FMS-SDT, GHMT, WST
APSHEL-5A	63° 23.6′ S 70° 545.4′ W	600	785	IPL, FMS-SDT, GHMT, WST



LEG 178

Western Antarctic Peninsula. Map showing broad shallow glacial troughs (ice stream paths at the Last Glacial Maximum) crossing the continental shelf, progradational lobes (L1 - L4), and hemipelagic drifts (D1 - D8) . Dots represent proposed drilling sites (larger dots are higher priority).

LEG 179

PROGRAM	**ION OBSERVATORY AT THE NINETY EAST RIDGE**
Proposal	**508**
Title	**Ninety East Ridge ION Observatory (NERO)**
Proponents	**J. P. Montagner, R. Schlich, J.F. Karczewski, K. Suyehiro, P. Tarits, G. Roult, P. Patriat, M. Schamming**

BRIEF DESCRIPTION

On Leg 179, ODP will drill a borehole into basement on the Ninety East Ridge in the Indian Ocean to provide a site for the installation of a broadband ocean seismometer and instrument package for the International Ocean Network (ION) program. This Observatory (NERO) will expand the International Ocean Network (ION) to fill a gap in the Global Seismic Network and permit study of the dynamics of the Indian Plate. Drilling plans entail the reoccupation of either ODP Leg 121 Site 756 (primary target) or Site 757 (alternate target), with the placement of a re-entry cone, drilling and installation of casing to basement, and penetration of basement to a minimum of 100 m to allow for the subsequent installation of the instrument package by submersible.

RELEVANCE TO THE ODP LONG RANGE PLAN

This drilling program is directly relevant to the scientific objectives summarized in the ODP Long Range Plan under Initiative II, "*In Situ* Monitoring of Geological Prodcesses" and ODP's commitment to providing boreholes for conducting long-term experiments.

LINKS TO OTHER GEOSCIENCE INITIATIVES

ION, BOREHOLE.

DRILLING STRATEGY

ODP/TAMU input

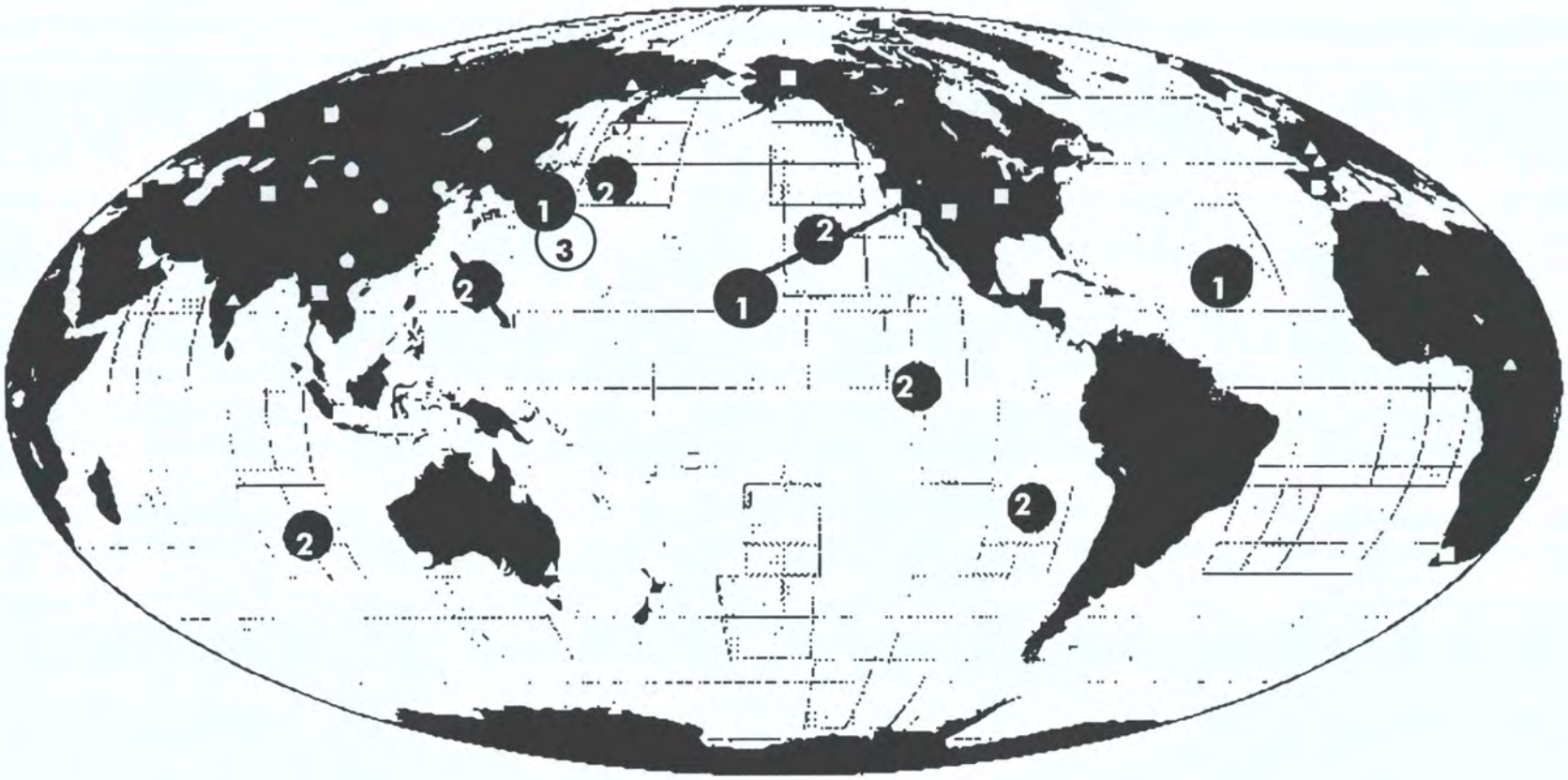
LOGGING PROSPECTUS NOVEMBER 1996

The logging program in this hole is designed to measure physical properties, anisotropy, and hole shape, objectives that are identical to the objectives at a previous site, OSN-1 (ODP Hole 843B). An azimuthal resistivity tool (ARI) will be used in place of the laterolog to measure electrical anisotropy with approximately 1-

m resolution, complementing high-resolution FMS images. Standard geophysical logs should be used to measure physical properties; fracturing and borehole shape should be measured using a UBI log in the basement. A sonic bond log and UBI log are also recommended to evaluate the grouting quality of the casing. In open hole sections, high resolution temperature logs should be run to identify permeable zones and in-flow/out-flow from both drilling-induced and natural fractures in the hole that may affect the placement of downhole seismometers and data quality. In summary, the recommended logging program at this site is: 1) triple-combo, with ARI; 2) FMS/Sonic, and 3) UBI. Three logging runs in this shallow hole will require approximately 1day of ship operations.

Site	Position	Water Depth	Sed. Penetr.	Bsmnt. Penetr.	Logging Operations
ODP-756	27° 21 S 87° 35 E	1520	340	200	Triple combo, ARI, FMS/sonic, UBI

LEG 179. ION GLOBAL SITING PLAN



LEG 179: Open symbols are selected land/island global seismic stations. Stippled squares (20 deg. x 20 deg.) are where landmass is missing. FDSN and ION endorse to cover the globe with a density of about 1 station per box. No. 1 are where pilot experiments are carried out in drilled holes, 794D (Japan Sea), 396B (Atlantic), and 843B (Oahu). No. 2 are prototype station sites for global/regional objectives. Two sites can make use of the retired undersea telecommunication cable. No. 3 shows the Japan Trench site for active process objectives.

HAMMER DRILL SYSTEM TEST: To be added by ODP/TAMU

LEG 180

PROGRAM	**WESTERN WOODLARK BASIN**
Proposal	**447, 447-Rev**
Title	**Active Continental Extension in the Western Woodlark Basin.**
Proponents	**B. Taylor, J. Mutter, F. Martinez, A. Goodlife, S. Scott, V. Benes, G. Abers, C. Mutter, H. Davies , R. Rogerson.**

BRIEF DESCRIPTION

Although the basic structure and evolution of divergent margins is reasonably well known from the study of ancient systems, fundamental questions about the physical processes and mechanics of lithospheric extension remain. Chief among these is the role of low-angle normal faulting in continental break-up. Leg 180 drilling will address the nature of low-angle faulting, continental break-up, and the evolution of conjugate rifted margins in the western Woodlark Basin, Papua New Guinea. Seafloor spreading magnetic anomalies indicate that during the last 6 Ma the formerly contiguous, eastward extensions of the Papuan Peninsula (the Woodlark and Pockington Rises) were separated as a westward-propagating spreading center opened the Woodlark Basin. Farther west, extension is accommodated by continental rifting, with associated full and half graben, metamorphic core complexes and peralkaline rhyolitic volcanism. The lateral variation from active continental rifting to seafloor spreading within this small region makes the western Woodlark Basin an ideal setting in which to investigate the mechanics of lithospheric extension.

ODP will drill a transect of sites across the asymmetric conjugate margin to study the nature and deformational history of an active, low-angle fault which earthquake and seismic reflection data indicate is active in the region of the incipient continental separation and an important mechanism of extension in this basin. In the Woodlark Basin, the seismic reflector correlated to the low-angle fault has an emergent segment along the northern flank of Moresby Seamount and underlies an asymmetric rift graben filled with more than 2 km of sediment. The locus of current rifting is separating a block-faulted southern margin from a broadly down-flexed northern margin. Drilling will (1) initially characterize, and subsequently monitor, the *in situ* properties (stress, permeability, temperature, physical properties, and fluid pressure) of the active low-angle fault zone; and (2) determine the vertical motion history of both the down-flexed upper plate and the unloaded lower plate and hence estimate the timing and amount of extension prior to spreading.

RELEVANCE TO THE ODP LONG RANGE PLAN

The LRP identifies the investigation of extensional boundaries as a key objective in the sub-theme, "Investigating Deformation of the Lithosphere and Earthquake Processes", under the "Dynamics of Earth's Interior". In addition, the study of rifted margins is

identified under LRP Initiative III, "Exploring the Deep Structure of Continental Margins and Oceanic Crust".

LINKS TO OTHER GEOSCIENCE INITIATIVES

The objectives of Leg 180 are closely tied to the MARGINS geoscience program, a multi- institutional research initiative that seeks to focus studies on an understanding of the basic processes that operate on all plate margins.

DRILLING STRATEGY

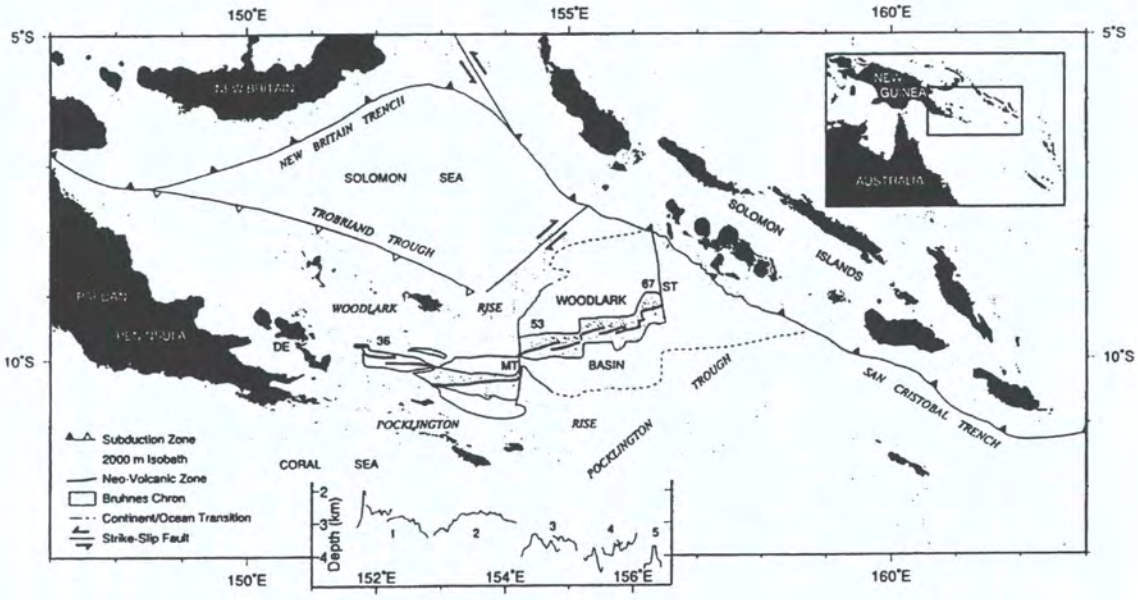
ODP/TAMU input

LOGGING PLAN NOVEMBER 1996

The scientific objectives of the project can be expressed in terms of structure, stratigraphy, physical properties, and stress history. For structure and stress, FMS electrical images will provide high resolution images to detect, identify, and map bedding, fractures, and faults. In order to determine present tectonic stress orientation and deviations from borehole breakouts in the vicinity of active zones, BHTV images will be recorded whenever basement penetration is proposed.

The determination of changes in physical properties in the vicinity of the fault requires acoustic characterization of the fault structure and good core-log integration. Standard logs will be used in each of the holes, either in the sedimentary deposits or in basement. To measure resistivity (and resistivity anisotropy) in igneous environments, the Azimuthal Resistivity Imager (ARI) is recommended. Geochemical logs will contribute to complete basement identification. Standard logs also provide a means to compute synthetic seismograms, hence linking borehole data to large-scale MCS profiles. The Array Seismic Imager (ASI) is recommended in the deepest cased hole to accurately tie the well to regional MCS data. The GHMT, with the identification of paleomagnetic field reversals from the total field measurement, can provide continuous dating of sedimentary sequences, and hence, constraints on basin development and extension. The magnetic susceptibility log can also aid core-log integration via shipboard magnetic susceptibility data.

Site	Position	Water Depth	Sed. Thick	Total Penetr.	Bsmnt. Penetr.	Logging Operations
ACE-1A	9° 35′ S 151°34.4′ E	2350	950	1000	50	Triple,FMS/Sonic, BHTV, GHMT, ARI,
ACE-3C	9° 47.6′ S 151°34.5′ E	386	300	500	200	Triple,FMS/Sonic, BHTV, GHMT, ARI,
ACE-7A	9° 27.3′ S 151°34.4′ E	2160	700	700	0	Triple,FMS/Sonic, GHMT
ACE-8A	9° 44.6′ S 151°37.5′ E	3189	900	1200	300	Triple,FMS/Sonic, BHTV, ARI, GHMT, ASI



LEG 180 - Major physiographic features and active plate boundaries in the Papua New Guinea - Somomon Islands region. The stipled area encloses oceanic crust formed during the Brunhes chron, at spreading rates labeled in mm/yr. MT and ST = Moresby and Simbo Transform Faults, respectively; DE = DEntrecasteaux Islands. The depth profile at the bottom is along the axis of the Woodlark Basin spreading center, with the five first-order spreading segments numbered.

LEG 181

PROGRAM	**SOUTHWEST PACIFIC GATEWAY**
Proposal	**441-Rev**
Title	**Southwest Pacific Gateway: Palaeohydrography of the Deep Pacific Source**
Proponents	**L. Carter, R.M. Carter, K.B. Lewis, I.N. McCave, C.S. Nelson, P.P.E. Weaver and B. Alloway**

BRIEF DESCRIPTION

Leg 181 is another in the series of ODP Legs (151, 154 , 162, 172, 177) to examine the Global Conveyor Belt Model of Ocean circulation in key "gateway" areas where major water masses enter the world ocean, or flow from one basin to the next. An essential feature of the Global Conveyor Belt Model is the circulation of cold, deep Antarctic Bottom Water (AABW), which is believed to be particularly important in controlling Earth's climate. Today, forty percent of this water enters the world ocean through the Southwest Pacific Gateway as a thermohaline-driven Deep Western Boundary Current (DWBC). South of 46°S, the DWBC merges with the wind-driven Antarctic Circumpolar Current (ACC). The evolution of the ACC-DWBC system has taken place since 32-20 Ma, when plate movements created the first deep-water oceanic gaps south of Australia and South America. An excellent stratigraphic record of these events, and of the development of the modern ACC-DWBC, exists in oceanic waters east of the New Zealand micro-continental plateau.

Leg 181 will drill a suite of seven sites along a depth and latitudinal transect on the eastern New Zealand Plateau and its abyssal margins to reconstruct the stratigraphy, paleohydrography and dynamics of the DWBC and related water masses since the early Miocene (ca. 20 Ma). The sites span a broad range in water depths (300 m to 4,500 m) and latitudinal range (39°S to 51°S) in a region which is presently poorly represented by ODP/DSDP drill sites. Specifically, Leg 181drilling will study the:

- Neogene fluctuations in Deep Southern Pacific thermohaline ocean circulation;
- reconstruction of glacial-interglacial fluctuations in Circumpolar Deep Water flux rates, the zonal position of the Sub-Antarctic Front, and Sub-Antarctic surface productivity;
- paleoceanographic linkages between Southern and Northern Hemispheres throughout the Neogene; and
- timing and origin of millennial-scale Antarctic climate change events.

The results of Leg 181 drilling will provide important information about the development of the Pacific DWBC, which is fundamental to understanding world oceanic and climatic histories, and will yield the sedimentary sequences needed to

address a range of other high-priority problems in Southern Ocean Neogene palaeohydrography, sedimentology, paleoclimatology and micropaleontology.

RELEVANCE TO THE ODP LONG RANGE PLAN

Leg 181 will address objectives contained in Initiative 1 of the ODP Long Range Plan, "Understanding Natural Climate Variability and the Causes of Rapid Climate Change", and the sub-theme of "Understanding Earth's Changing Climate" under the major research theme of the "Dynamics of Earth's Environment".

LINKS TO OTHER GEOSCIENCE INITIATIVES

IMAGES.

DRILLING STRATEGY

ODP/TAMU input

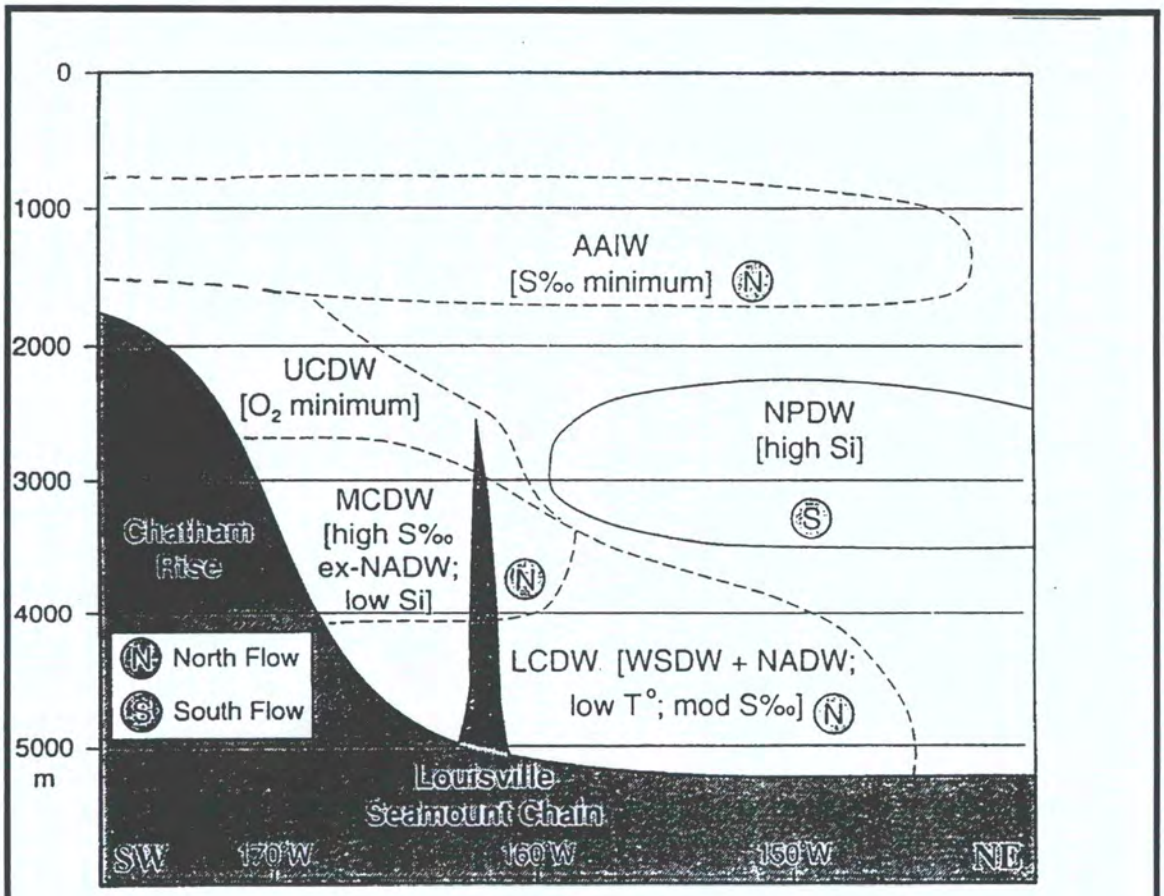
LOGGING PROSPECTUS 1996

Sediments encountered during Leg 181 will vary widely and will likely include coarser sediment drift deposits, turbidites, pelagic carbonate sediments and red clays, and interbedded siliceous-terrigenous clastic sediments. The drilling strategy is to recover complete and continuous sediment records spanning the Neogene for a total of seven drill sites. Sediments encountered at these sites will consist of periodically alternating layers of biosiliceous and carbonate sediments, with variable amounts of fine (clays) and coarse (ice-rafted debris) terrigenous clastics. Because of the strong density and porosity variations associated with this lithologic variability, core and log physical property indices will very likely be extremely valuable proxy measurements for reconstructing sediment composition timeseries. Some sites evidently have very high sediment accumulation rates so there will be a great potential for generating very high-resolution records of regional paleoclimatic and paleoceanographic variability. All proposed sites have penetration depths exceeding 300m and will be logged with the Triple Combination, FMS, and GHMT logging tools.

Site	Position Depth	Water Depth	Penetration	Logging Operations
SWPAC 1B	44° 41.8′ S 172° 36.0′ E	320 m	600m	Triple, FMS/Sonic, GHMT
SWPAC 2A	43° 12.0′ S 177° 16.0′ W	585m	520m	Triple, FMS/Sonic, GHMT
SWPAC 5A	41° 44.0′ S 171° 31.0′ W	3325m	700m	
SWPAC 6A	50° 3.0′ S 173° 24.5′ E	960m	500m	Triple, FMS/Sonic, GHMT
SWPAC 7A	50° 55.0′ S 171° 6.0′ E	4390m	450m	Triple, FMS/Sonic, GHMT
SWPAC 8A	46° 34.5′ S 177° 23.0′ W	4460m	600m	Triple, FMS/Sonic, GHMT
SWPAC 9A	39° 21.0′ S 176° 22.0′ W	4170m	800m	Triple, FMS/Sonic, GHMT

SWPAC 3A	1320m	625m	Triple, FMS,/Sonic GHMT

NOTE to WLS/LDEO: This site **has been dropped. Will this logging program be applied to Site SWPAC 5A?**



LEG 181 - Southwest-northeast section across the DWBC system and related water masses, from north Chatham Rise to the Louisville seamount chain and beyond.

5. SCIENCE PLAN FOR FY 1999

5.1 PROGRAM DESCRIPTIONS FOR LEGS 182 AND 183

LEG 182

PROGRAM	**CENOZOIC CARBONATES OF THE GREAT AUSTRALIAN BIGHT**
Proposal	**367-Rev3, 367-Add3**
Title	**Cenozoic cool-water carbonates of the Great Australian Bight: reading the record of Southern Ocean evolution, sealevel, paleoclimate and biogenic production.**
Proponents	**D.A. Feary, N.P. James and B. McGowran.**

BRIEF DESCRIPTION

The southern continental margin of Australia has been the site of predominantly cool-water carbonate shelf deposition since the Eocene, resulting in the development of the largest cool-water carbonate shelf on Earth today. It is characterized by a detailed accretionary history of progradation, erosion and biogenic mound growth and contains fundamental geological and paleoceanographic information of global importance. Leg 182 will drill an array of 10 holes across the Cenozoic carbonate shelf in the Great Australian Bight to 1) document the way in which this large, high-to mid-latitude shelf carbonate platform evolved throughout the past 65 Ma. in response to oceanographic and biotic change; and to 2) extract information contained in the carbonate sediments about global sea level fluctuations, physical and chemical paleocean dynamics, biotic evolution, hydrology and diagenesis.

Leg 182 has the potential to make major scientific advances with global impact in several areas. First, the results of Leg 182 will complement the findings of the New Jersey (ODP Legs 150 and 174A) and Bahamas (ODP Leg 166) sea level transects and thereby contribute to ODP's dual approach to understanding sea-level fluctuations. The first approach tests models of sea-level (eustatic) change on a global scale by examining highly precise geologic correlations obtained from a variety of geological settings. The second approach tests stratigraphic models of sea-level by conducting transects of drill sites across continental margins and carbonate platforms of various ages and tectonic settings. Leg 182 drilling will also provide a more detailed understanding of the history of southern hemisphere climates and global deep water circulation patterns throughout the Cenozoic evolution of the Southern Ocean. Finally, because of architectural and compositional similarities of the Great Australian Bight carbonates with many older Phanerozoic carbonate platforms, the findings of leg 182 will be important for modeling ancient open platforms and ramps.

RELEVANCE TO THE ODP LONG RANGE PLAN

Leg 182 drilling is directly relevant to ODP's long-standing goal of understanding sea-level fluctuations, highlighted in the 1996 ODP Long Range Plan as "Causes and Effects of Sea Level Change". This program will also address objectives contained in the other two LRP sub-themes, "Sediments, Fluids, and Bacteria as Agents of Change" and "Understanding Earth's Changing Climate", under the core research theme of the "Dynamics of Earth's Environment:".

LINKS TO OTHER GEOSCIENCE INITIATIVES

IMAGES, NAD, ANTOSTRAT, MARGINS, ICDP

DRILLING STRATEGY

ODP/TAMU input

LOGGING PROSPECTUS November 1996

Many of the objectives of Leg 182 rely heavily on a detailed sequence stratigraphic interpretation and thus detailed correlation between cores and logs to the seismic reflection data will be required. The proponents have amassed a great deal of stacking velocities from the multi-channel seismic data. For this reason, it is highly recommended that seismic calibration experiments be performed at several of the sites along the transect, in order to minimize the uncertainties regarding core-seismic correlation. In addition to providing good ties to the seismic reflection data at individual sites, the wireline logs will be of key importance for detailed inter-site correlations, helping to refine the seismic interpretation.

Geophysical logs also will be helpful in evaluating the lithostratigraphic response of the carbonates to sea level and climatic change. The fine-scale characteristics of the bedding, including pore spaces, bioturbation, fractures and stylolites may be imaged with the FMS. Integrated interpretation of FMS and geophysical logs will provide a good complement to cores in describing the lithostratigraphy.

Diagenesis in carbonates is usually well expressed through changes in porosity and chemical precipitation of soluble elements (such as uranium). All of these lead to large changes in log properties seen through sonic, resistivity, density and neutron logs, as well as gamma-ray. Thus, the diagenetic changes in the carbonate sediments, another key objective of the leg, may be evaluated through the petrophysical response measured in the wireline logs.

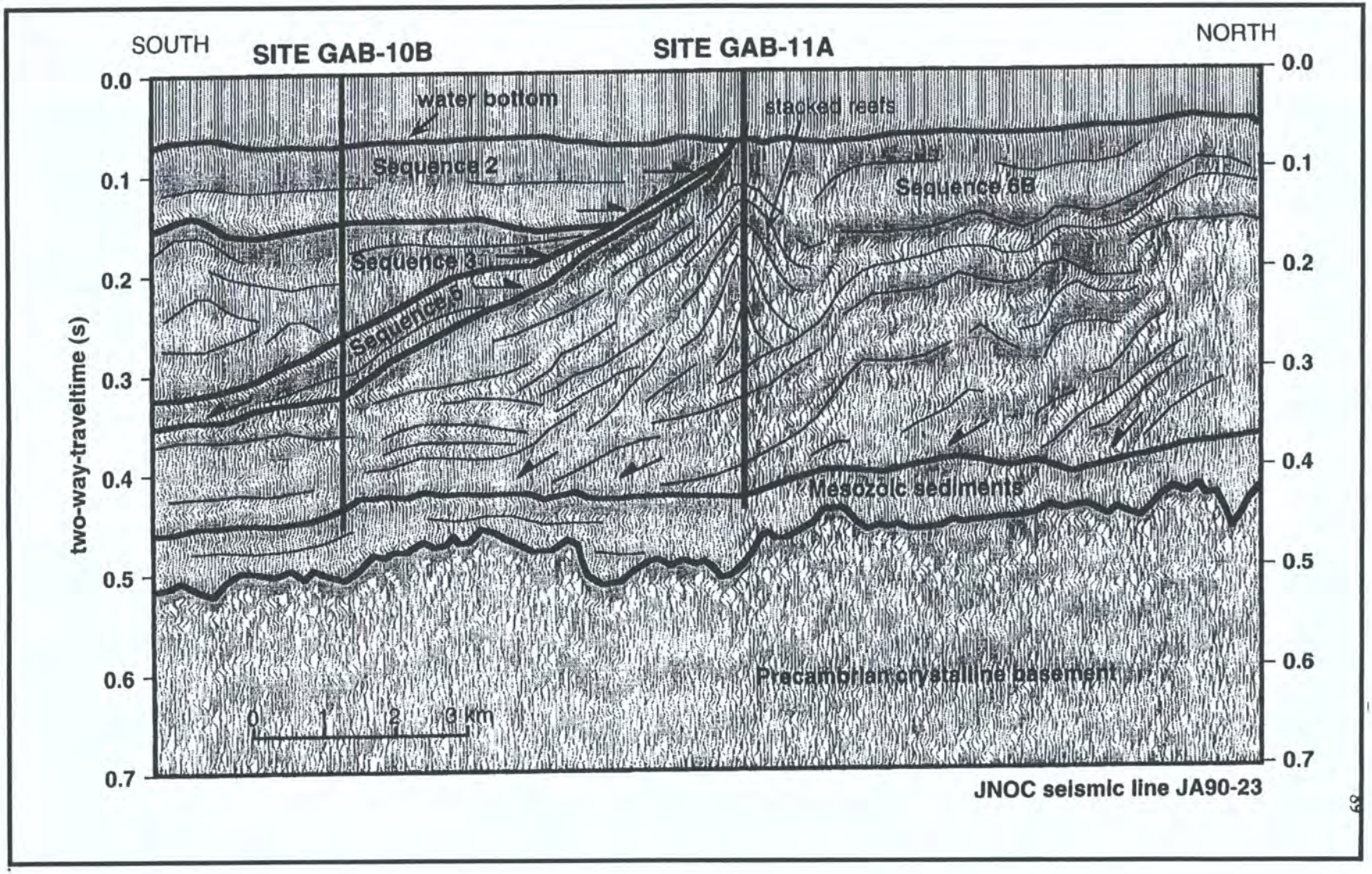
With respect to the fluid flow objectives, logging data may be of secondary importance to interstitial fluid characterization from core. However, the assessment

of fracture networks and basic fluid properties using sonic and resistivity logs, together with FMS images, will provide an important contribution to this leg objective.

The two standard suite of logs, Triple combo and FMS/Sonic, will be deployed at all sites. In addition, check-shot surveys with the WST for seismic-log calibration will be performed in as many sites as possible along the transect to ensure an accurate time-to-depth conversion. The proponents have also requested the deployment of the GHMT and the GLT at several sites. Some of the sites where penetration is beyond 1000 meters will require logging in two sections (in two separate holes) to ensure better quality holes (and data). Since some sites are too shallow for useful deployment of the CSES, detailed attention must be paid to drilling and hole stabilization procedures.

Site	Position	Water Depth	Penetr. Depth	Logging Operations
GAB-1B	34° 23.4 S 127° 35.3 E	3887	740	Triple, FMS/Sonic, WST, GHMT
GAB-2B	33° 32.2 S 128° 54.2 E	1043	1575	Triple, FMS/Sonic, WST, GHMT, GLT
GAB-3A	33° 30.4 S 127°14.5 E	682	545	Triple, FMS/Sonic, WST
GAB-4A	33° 29.3 S 128° 02.6 E	753	680	Triple, FMS/Sonic, WST
GAB-5B	33°25.1 S 127°36.1 E	488	620	Triple, FMS/Sonic, WST
GAB-6B	33°18.6 S 127°36.1 E	220	725	Triple, FMS/Sonic, WST, GHMT, GLT
GAB-7A	33° 21.3 S 128° 28.5 E	480	615	Triple, FMS/Sonic, WST
GAB-8A	33° 19.3 S 128° 28.5 E	332	670	Triple, FMS/Sonic, GHMT
GAB-9A	33° 17.2 S 128° 28.5 E	200	630	Triple, FMS/Sonic, WST
GAB-13B	34° 45.5 S 127° 35.4 E	4465	985	Triple, FMS/Sonic, WST, GHMT, GLT

Leg 182 Figure. The stratigraphic and geological interpretation of seismic line JA90-23 across a section of the Great Australian Bight carbonate shelf and the location of Site GAB -11A on that line.


SOUTH
SITE GAB-10B
SITE GAB-11A
NORTH
water bottom
stacked reefs
Sequence 2
Sequence 3
Sequence 5
Sequence 6B
Mesozoic sediments
Precambrian crystalline basement
0 1 2 3 km
two-way-traveltime (s)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
JNOC seismic line JA90-23

LEG 183

PROGRAM	**KERGUELEN PLATEAU**
Proposal	**457-Rev2, 457 Rev, 457**
Title	**Future ODP Drilling on the Kerguelen Plateau and Broken Ridge: Determining the Origin, Growth and Evolution of a Very Large Igneous Province in the Southern Indian Ocean.**
Proponents	**F. A. Frey, M. Coffin, D. Weis, M. Schaming, M. Munschy, L. Konnecke, J. Zachos, M. Storey, A. Sanders, R. Duncan, M. S. Pringle and S. L. Goldstein.**

BRIEF DESCRIPTION

Large Igneous Provinces (LIPS) represent the products of the largest volcanic events in Earth history and are believed to indicate major episodic transfers of heat and mass from the mantle to the lithosphere. Despite their huge size and distinctive morphology, LIPs remain among the least understood features in the ocean basins. LIPs are important because they may comprise future building blocks of continental crust and may be a principal mechanism for stabilizing crust on the Earth's surface. They also provide information about mantle composition and dynamics, which is not reflected by volcanism at spreading ridges. Finally, evidence suggests that the intense episodic nature of their formation results in the rapid release of large quantities of volatiles, such as CO_2, into the waters and atmosphere of the planet. In this way, they may have had an impact on past climate and may have displaced large volumes of seawater, potentially causing sea level fluctuations.

Leg 183 represents the first leg in a proposed two-leg program to investigate the origin, growth, compositional variation, and subsidence history of the LIP formed by the Kerguelen Plateau and Broken Ridge in the southeastern Indian Ocean. This will be achieved by drilling an array of holes, of approximately 200 m basement penetration, through the northern, central and southern portions of the LIP and by an offset drilling program in the vicinity of major fault scarps (~200 m) where tectonic processes have exposed deeper crustal levels.

Specifically, Leg 183 will aim to:

- determine the length of time required to form the Broken Ridge-Kerguelen Plateau System and establish the volume of magmatic products as a function of time;
- examine the mechanism of plateau growth, including the relative importance of vertical versus lateral accretion;
- understand the role of the Kerguelen Plume so as to determine the relative roles of the plume, asthenosphere and continental lithosphere as a function of time in forming this LIP;

- determine the vertical tectonic history of the Kerguelen Plateau and Broken Ridge (initial uplift and subaerial volcanism resulting from the plume, the subsequent cooling and subsidence into a submarine environment, and the abundant post-emplacement deformation which records the post-emplacement stress regimes);
- obtain a complete record of Cenozoic sediments from a transect on the Southern Kerguelen Plateau that will provide high resolution geochemical and mineralogical data that can be used to constrain changes in high latitude climate and in the composition and circulation of intermediate and deep water in the southern oceans.

RELEVANCE TO THE ODP LONG RANGE PLAN

The study of LIPs is a high priority in the ODP Long Range Plan. The topic is highlighted under Initiative II, "In Situ Monitoring of Geological Processes", and under the sub-theme of "Exploring the Transfer of Heat and Material to and from Earth's Interior under the core research theme of the Dynamics of Earth's Interior"

LINKS TO OTHER GEOSCIENCE INITIATIVES

LIPs, IAVCEI, InterRIDGE

DRILLING STRATEGY

To be inserted by ODP/TAMU

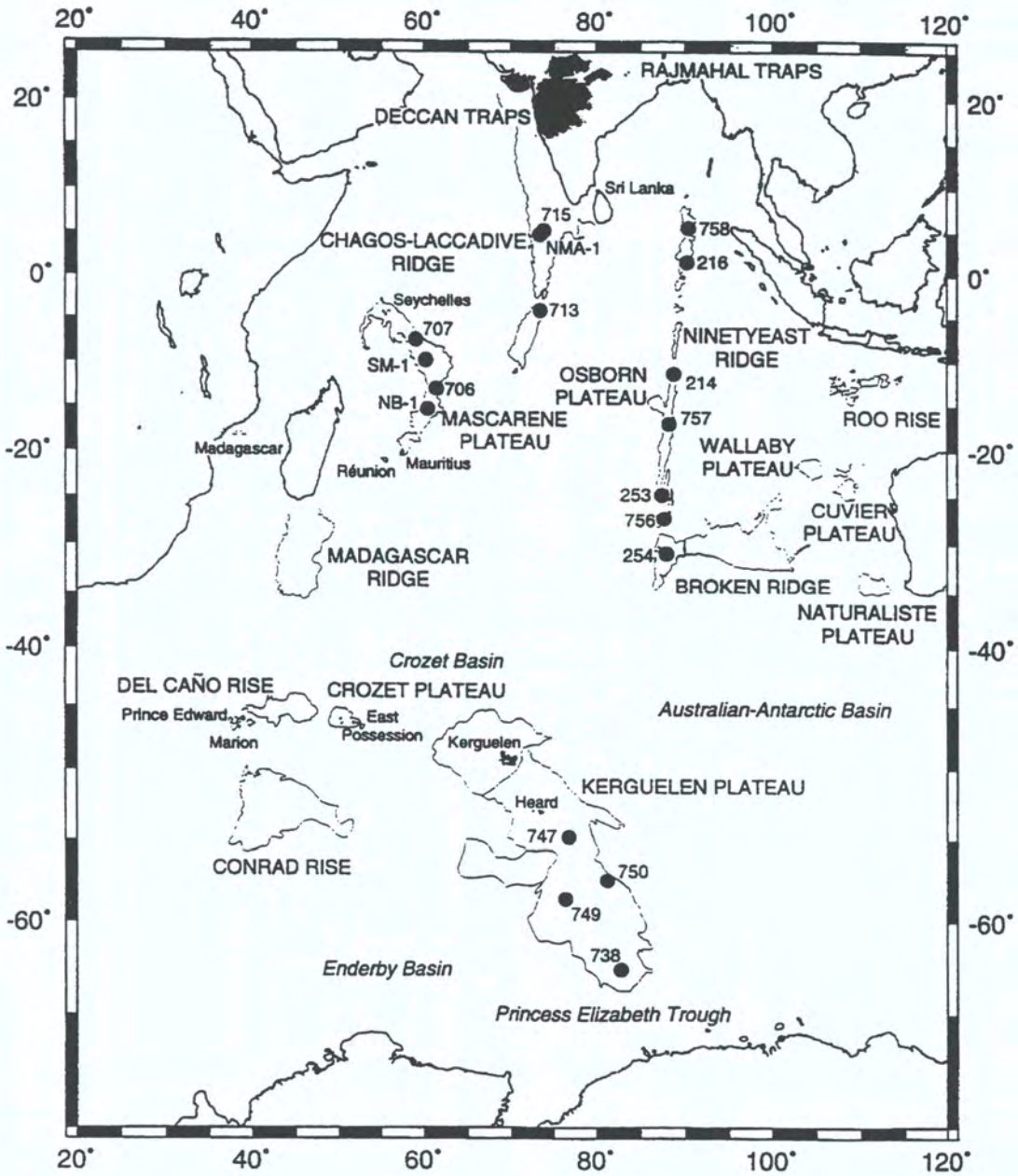
LOGGING PROSPECTUS NOVEMBER 1996

Downhole measurements will primarily contribute to the scientific objectives of Leg 183 through studies of volcanic stratigraphy, the geochemical evolution of the Kerguelen plume, and the analysis of tectonic stresses. The standard geophysical and FMS logs will be run at each of the proposed sites. The recording of physical property information from the geophysical string is essential to core-log integration studies. A key point in this project is determining the degree of continental involvement in the mantle source for the Kerguelen Plateau. The geochemical logs, successfully used in a similar environment in the Ontong-Java Plateau, will address the geochemical evolution of lavas enabling a chemical stratigraphy to be established at each site and the possible correlation between sites across the plateau. The standard geophysical suite will provide a detailed volcanic stratigraphy and log-based synthetic seismograms can be integrated with regional seismic data for accurate time-depth conversions. To measure resistivity in igneous environments, deployment of the Azimuthal Resistivity Imager (ARI) is recommended.

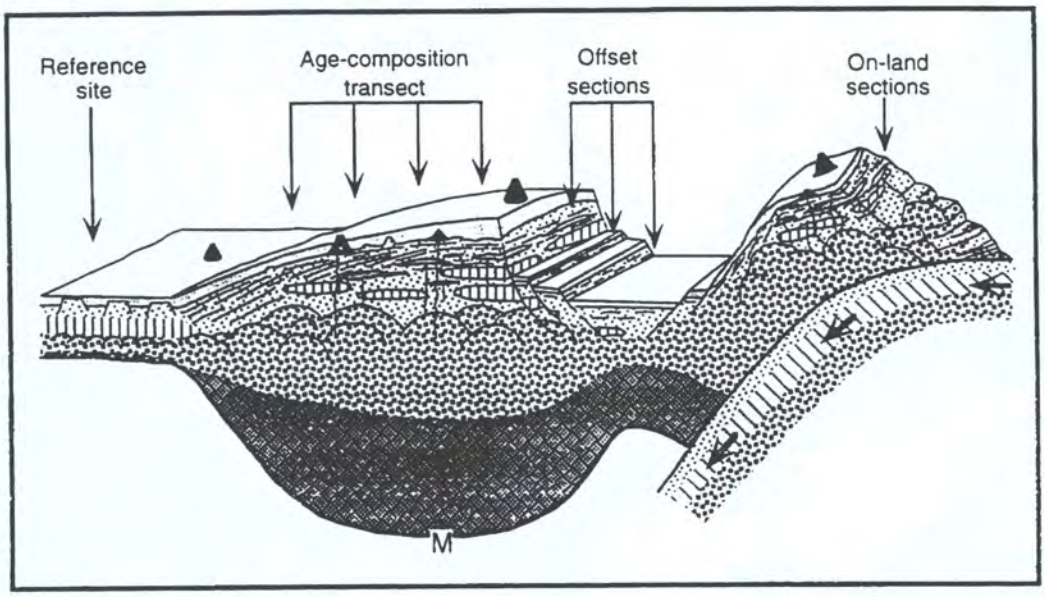
The BHTV will be deployed to image stress-induced borehole features. High-resolution FMS images will allow accurate description of the volcanic stratigraphy

including bed dips, evidence of weathering, the style of volcanic emplacement, and the presence and orientation of fractures, as was successfully shown on Leg 152. Structural information from the FMS is particularly important for assessing the degree of the syn- and post-emplacement tectonism. The WST should be used for check shot surveys and a shear wave sonic tool (SST) is recommended to measure shear wave velocity anomalies associated with the tops of flows.

Site	Position	Water Depth	Sed. Thick	Penetr. Depth	Bsmnt Penetr.	Logging Operations
KIP-2A	47° 22′ S 64° 22′ E	3150	250	450	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST
KIP-3A	51° 10′ S 70° 55′ E	600	600	800	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST
KIP-6B	56° 55′ S 68° 00′ E	1000	300	500	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST
KIP-7A	53° 50′ S 75° 35′ E	1200	650	850	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST
KIP-9A	32° 19.7′ S 98° 4.1′ E	1325	100	300	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST
KIP-12A	60° 45′S 81° 40′ E	1800	550	750	200	Triple, ARI, DSI/SST, GLT, FMS, BHTV, WST



LEG 183 - Location of the Kerguelen Plateau and Broken Ridge in the Indian Ocean. Locations of DSDP, ODP, and industry volcanic basement sites are indicated by solid circles. After Coffin (1992)



LEG 183 - This figure from the LIPS section of the in preparation report of the May 1996 meeting "The Oceanic Lithosphere and Scientific Drilling into the 21st Century" shows the concept of a transect drilling program for studying a large LIP.

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Box 25046 M.S. 939
Denver Federal Center
Denver, Colorado 80225

IN REPLY REFER TO:

March 23, 1997

To: Susan Humphris, Chair, JOI-SCICOM

From: Mahlon M. Ball, Chair, JOI-PPSP

Subject: PPSP meeting of February 20-21, 1997

This meeting was held in the La Jolla room of Sea Lodge on La Jolla Shores Beach, La Jolla, California.

Attendance:

Mahlon Ball
George Claypool
John Farre
Dietrich Horn
Hans Juvkam-Wold
Barry Katz
James Lowell
David MacKenzie
Yoshihisa Okuda
Ed Purdy
Joel Watkins

ODP-TAMU-SP
Kevin Burke
Martin Hovland
Thomas Thompson
Henk Wories

ODP-TAMU
Tim Francis

JOI-PCOM
Susan Humphris

JOI-SSP
Shiri Srivastava

JOI-ODP-Data Bank
Dan Quoidbach

NSF-ODP
Bruce Malfait

Chief Scientists
Leg 164 -Charles Paull
Leg 175-Wolf Berger
Leg 175-Volkhard Spiess
Leg 177-Rainer Gersonde
Leg 180-Brian Taylor

Guest
Robert Cunningham-Exxon

Mahlon Ball opened the meeting requesting self introductions and circulating a signature list.

Wolf Berger, S10 Host, made housekeeping announcements. Minutes of the last meeting were approved.

Francis then reported on drilling status for legs 169, Middle Valley; Juan de Fuca; 170, Costa Rica Accretionary Wedge; 171A, Barbados Accretionary Prism; and 171B, Blake Nose Paleooceanography.

Susan Humphris reviewed the 1998 drilling schedule with the aim of helping select PPSP meeting dates to insure appropriate safety reviews. Humphris highlighted the new JOI organization plan emphasizing PPSP's input to Opcom (Operations Committee) in the chain of command: Excom-Scicom-Opcom.

John Farre (PPSP, Exxon) and Bob Cunningham (Exxon) led off discussions relating to reconsideration of the safety review for leg 175, Benguela Current, Paleooceanographic sites, north of Walvis Ridge. They showed Exxon's isopach of sediments above the BSR of this region. A main point of Exxon's regarding scientific drilling in areas of active commercial oil and gas exploration and production activity like the Angola and Congo offshore, is that involvement of the Safety Panel, with input from industry, should be done as early as possible.

Barry Katz (PPSP, Texaco) and George Claypool (PPSP, Mobil) made comments reinforcing the need for extreme care in the scientific drilling off Angola and the Congo.

Wolf Berger and Volkhard Spiess then refreshed panel members memories regarding the regional geology, geophysics and scientific objectives for Leg 175, north of Walvis Ridge. They then led the site-by-site discussion connected with the safety review. Review results follow in table 1 (compiled by Spiess).

Rainer Gersonde described the regional geology, geophysics and scientific objectives for Leg 177, South Atlantic Paleoceanographic Transect. He than led the site-by-site discussion connected with the safety review with the following results:

Site	Latitude	Longitude	Depth (m)	Penetration (m)
TSO-2B	41°08.20'S	13°33.65'E	2104	800
SubSAT-1C	40°54.835'S	9°55.482'E	4620	300
TSO-3C	42°54. 828'S	8°53.994'E	3718	200
TSO-5B	47°7.22'S	5°50.68'E	4418	200
TSO-6A	49°58.58'S	5°51.92'E	3680	700
TSO-6B	50°00.98'S	5°50.13'E	3679	700
TSO-7A	Move to CDP 660 on AW1-94080		2925	730
TSO-7B	53°12.95'S	5°08.07'E	2925	680
TSO-4A	Move to CDP 3850 on AW1-94100		4650	500
SubSAT-3B	46°24.7'S	7°4.79'E	2008	200
SubSAT-4B	52°3.01'S	4°31.01'E	3661	800
SubSAT-4C	51°59.08'S	4°31.00'E	3701	800

PPSP Meeting San Diego, 20-21 Feb., 1997

Modified Site Proposals for ODP Leg 175 - Benguela Current

Lower Congo Basin, LCB (= Northern Angola Basin, NAB)

Site	Seismic Line AWI	Seismic Line GeoB	CDP 12.5 m CDP# new	CDP 12.5 m moved from CDP#		CDP 25 m original CDP#	approved coring depth m	Location latitude	longitude	Location latitude	longitude	Water Depth m
LCB 1 = (NAB1)	93021	93-001	**22990**	23038	=	11519	**200**	-5,06890	11,10160	**5° 04,1°S**	**11° 06,1°S**	1408
LCB 2 = (NAB2)	93021	93-001	**20850**	20748	=	10374	**200**	-5,10860	10,86380	**5° 06,5°S**	**10° 51,8°S**	1811
LCB 3A = (NAB3A)	93021	93-001	**17000**	17022	=	8511	**400**	-5,17930	10,43600	**5° 10,8°S**	**10° 26,2°S**	2392
LCB 3B = (NAB3B)	93021	93-001	**16415**	16384	=	8192	**200**	-5,18950	10,37090	**5° 11,4°S**	**10° 22,3°S**	2500
LCB 3C = (NAB3C)	93022	93-002	**6015**	5970	=	2985	**200**	-4,75020	10,48400	**4° 45,0°S**	**10° 29,0°S**	2435
LCB 3D = (NAB3D)	93022	93-002	withdrawn	6578	=	3289						
LCB 4 = (NAB4)	93022	93-002	**9750**	9770	=	4885	**200**	-4,78550	10,07490	**4° 47,1°S**	**10° 04,5°S**	3000

Mid Angola Basin, MAB

Site	Seismic Line AWI	Seismic Line GeoB	CDP 25 m CDP# new	CDP 25 m original CDP#	approved coring depth m	Location latitude	longitude	Location latitude	longitude	Water Depth m
MAB 1	93041	93-015	**8550**	8392	**200**	-11,92010	13,40030	**11° 55,2°S**	**13° 24,0°S**	432
MAB 2	93041	93-015	**8150**	8177	**200**	-11,92960	13,03910	**11° 55,8°S**	**13° 02,3°S**	722
MAB 3	93041	93-015	7280	7306	not approved					
MAB 4	93041	93-015	**6950**	6936	**200**	-11,95750	13,03560	**11° 57,5°S**	**13° 02,1°S**	1348
MAB 5A	93041	93-015	**6540**	6539	**200**	-11,96700	12,94210	**11° 58,0°S**	**12° 56,5°S**	1545
MAB 5B	93041	93-015	withdrawn	6295						

Mid Angola Basin, MAB

SAB 1	93060	93-030	**2870**	2780	**600**	-16,66070	10,95030	**16° 39,6°S**	**10° 57,0°S**	2558
SAB 2	93060	93-030	**2167**	2167	**600**	-16,56110	10,82200	**16° 33,7°S**	**10° 49,3°S**	2843

Brian Taylor described the regional geology, geophysics, and scientific objectives for Leg 180, Woodlark Basin. He then led site-by-site discussion in connection with PPSP's preview of this leg. The panel concludes that safe locations can be selected for this leg. Structure maps should be made on reflections at total proposed penetration times in the vicinity of sites ACE-1 and ACE-7 to insure that those sites can be positioned structurally low.

Charles Paull led a discussion of results from Leg 164, clathrates. The pressure core sampler (PCS) performed well during this leg. Hydrate zone encountered was 200-250 m thick and free gas was encountered beneath the hydrate base. Clathrates appeared to occupy veins and in one instance possibly a fault plane where a sample of ice 200 m thick was recovered. The gas composing the ice was 99%. methane and 1% CO_2 . H_2S was a problem on cores recovered from the Carolina Trough dome. Paull concluded that drilling clathrates at higher latitudes wehre colder water will inhibit melting during core recovery would facilitate ongoing hydrate studies.

It was decided that CDP, should no longer be used to specify site locations. Shiri Srivasfava, SSP Chair, agreed to make this decision known to proponents and chief scientists in connection with the site survey panel's assessment of scientific data supporting drilling proposals.

It was decided that the next PPSP meeting would take place on May 26-27, 1977 in Sydney, Australia. David Feary of the Australian Geological Survey Organization will host this meeting.

Leg 175 File

MEMORANDUM

February 24, 1997

TO: Wolf Berger — Leg 175 Co-Chief Scientist
Gerold Wefer — Leg 175 Co-Chief Scientist
Volkhard Spiess — Leg 175 proponent
Ron Grout — Leg 175 Operations Manager
Carl Richter — Leg 175 Staff Scientist

FROM: Tim Francis Tim Francis

RE: Leg 175 Approvals for Sites North of the Walvis Ridge

As you know, some of the proposed Leg 175 sites north of the Walvis Ridge, which were discussed at PPSP last week, gave rise to concerns in that panel. Not all the sites were approved, or approved to the depth requested. Following the PPSP meeting I met with the TAMU Safety Panel, who expressed further concerns and recommended changes to some of the PPSP approvals. Below is the definitive list of approved sites and depths of penetration for this area of drilling.

1. **The following sites are approved to 200 mbsf, or APC refusal, whichever comes first.**

LCB-1 (formerly NAB-1) moved to CDP 22,990 on line 93-001.

LCB-2 (formerly NAB-2) moved to CDP 20,850 on line 93-001.

LCB-3A (formerly NAB-3A) moved to CDP 17,000 on line 93-001.

LCB-3B (formerly NAB-3B) moved to CDP 16,415 on line 93-001.

LCB-3C (formerly NAB-3C) moved to CDP 6015 on line 93-002.

LCB-3D (formerly NAB-3D) withdrawn by proponents.

LCB-4 (formerly NAB-4) moved to CDP 9750 on line 93-002.

I am waiting on John Farre (Exxon) to provide me with a contact in the Congo National Oil Company to help expedite the clearance process. Note that Sites LCB-1 and LCB-2 are in Block "Mer Profonde Nord" licensed to Exxon, whose permission we will also need for these two sites.

2. **Middle Angola Transect**

MAB-1 at CDP 8550 on line 93-015. Approved to 200 mbsf or APC refusal, whichever comes first.

Ocean Drilling Program
e of the Director
s A&M University Research Park
0 Discovery Drive
College Station, Texas 77845-9547 USA
(409) 845-8480
Telex Number: 62760290
FAX Number: (409) 845-1026

MAB-2 at CDP 8150 on line 93-015. Approved to 120 mbsf or APC refusal, whichever comes first.

MAB-3 Not approved.

MAB-4 Not approved.

MAB-5A Not approved.

MAB-5B Withdrawn by proponent.

The above three sites were not approved because they are located in a pockmark field, with evidence of migrating hydrocarbons on the seismic records and the possibility of small gas pockets between pockmarks.

I am waiting on Barry Katz (Texaco) to provide me with a contact in Sonangol, the Angola National Oil Company. Leasing of Angola Block #24 is scheduled for later on this year and may complicate permission for the MAB sites.

3. **Southern Angola Transect**

SAB-1 at CDP 2870 on line 93-030. Approved to 600 mbsf, as requested.

SAB-2 at CDP 2167 on line 93-030. Approved to 600 mbsf, as requested.

Note that the Southern Angola Basin is not an area of great interest to the oil industry. It is south of the salt. Nothing is leased or pending in this area.

PPSP encouraged us to have good experienced organic geochemists on Leg 175. Coring will have to wait on gas chromatograph measurements when C1/C2 ratios fall below the normal range.

Finally it is possible that live oil (fluorescence) will be encountered at the LCB or MAB sites even in unconsolidated sediments. Persistent oil seeps occur in this area and surface slicks are observed on satellite imagery. If oil is found at any site, subsequent holes at that site will be restricted to shallower depth.

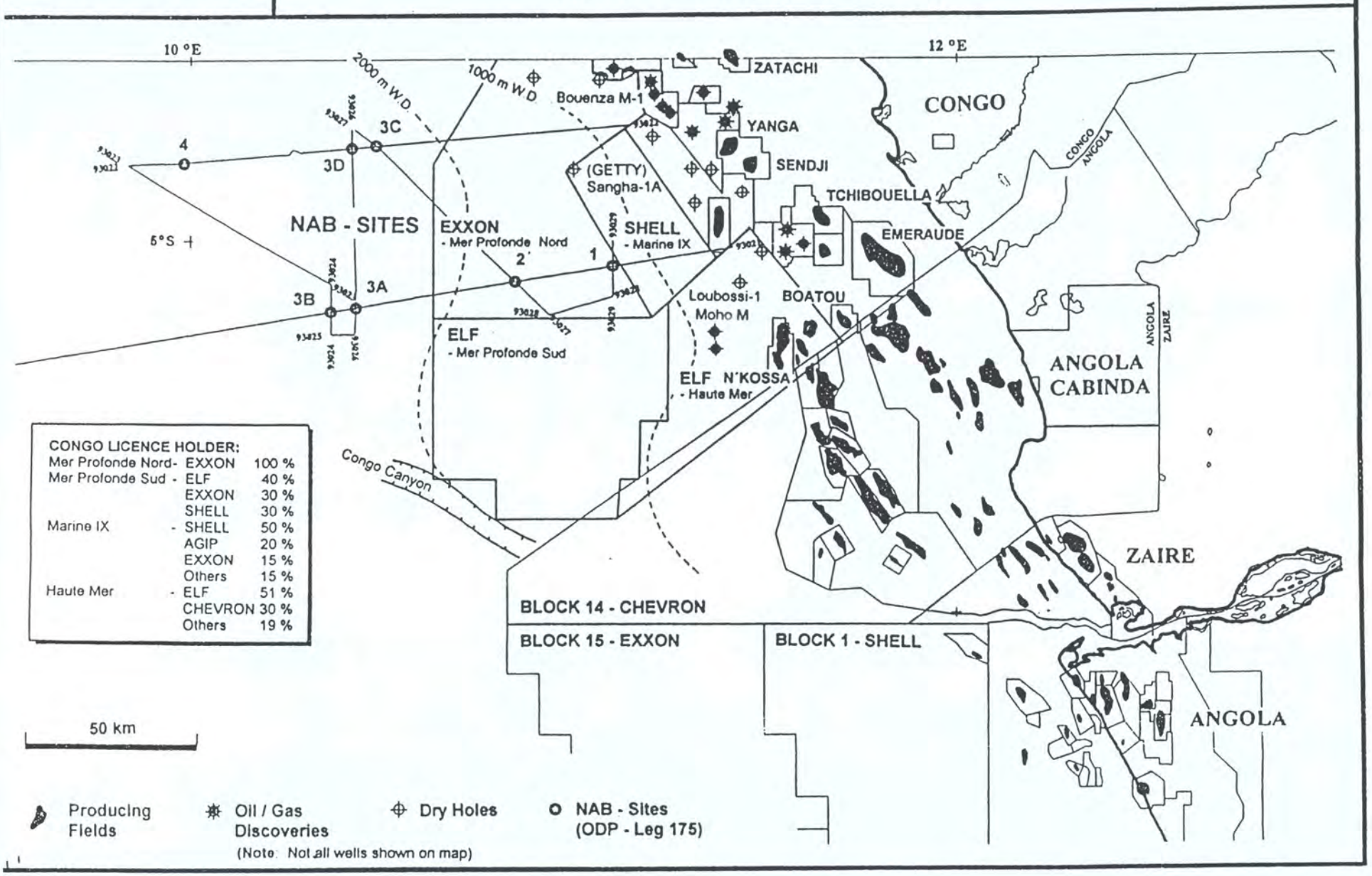
TJGF:am

Attachments

xc:	Susan Humphris	Chair, SCICOM/OPCOM
	Mahlon Ball	Chair, PPSP
	Jeff Fox	
	Jack Baldauf	
	ODP Managers	

ODP - LEG 175

NORTH ANGOLA BASIN

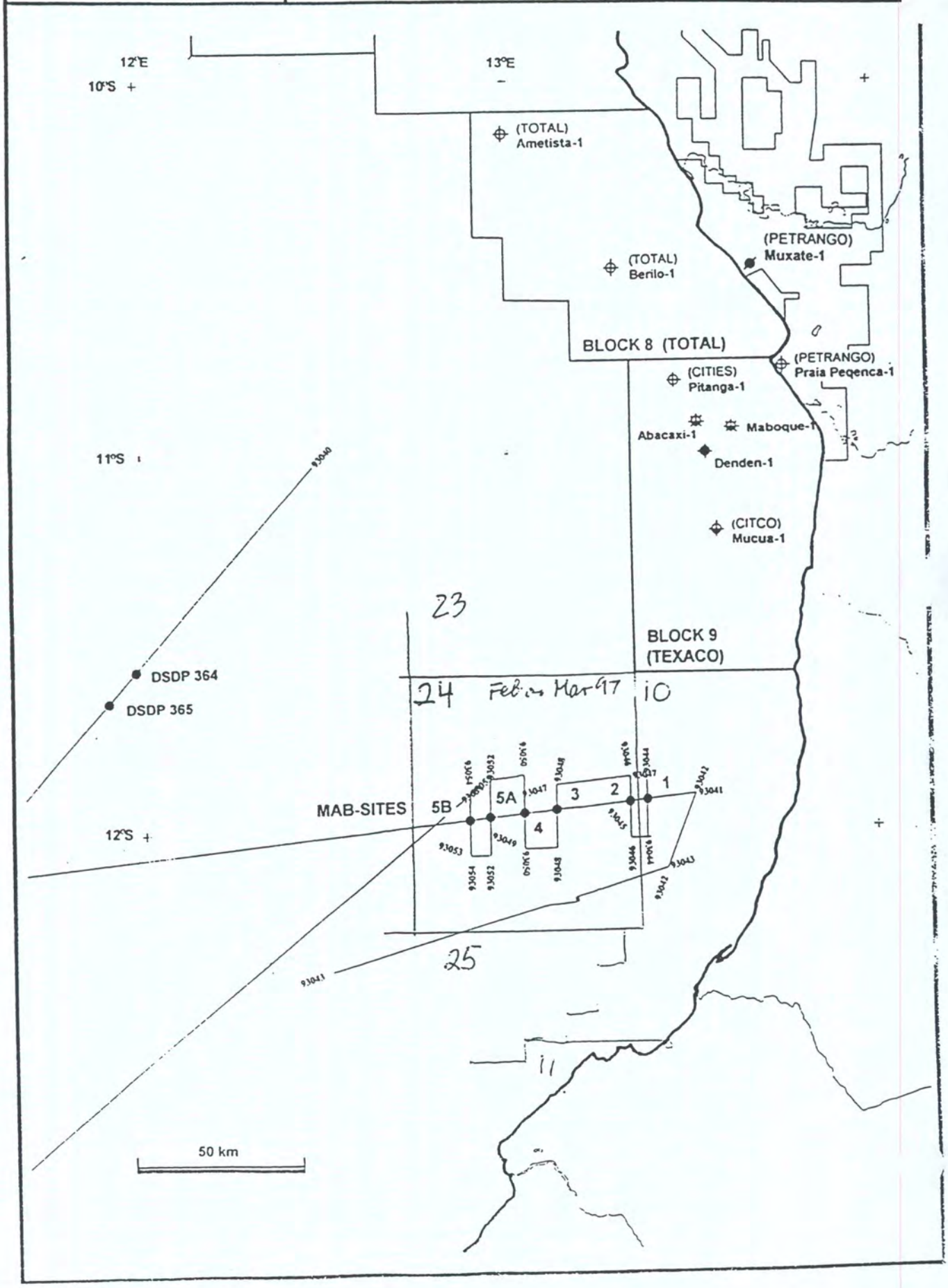


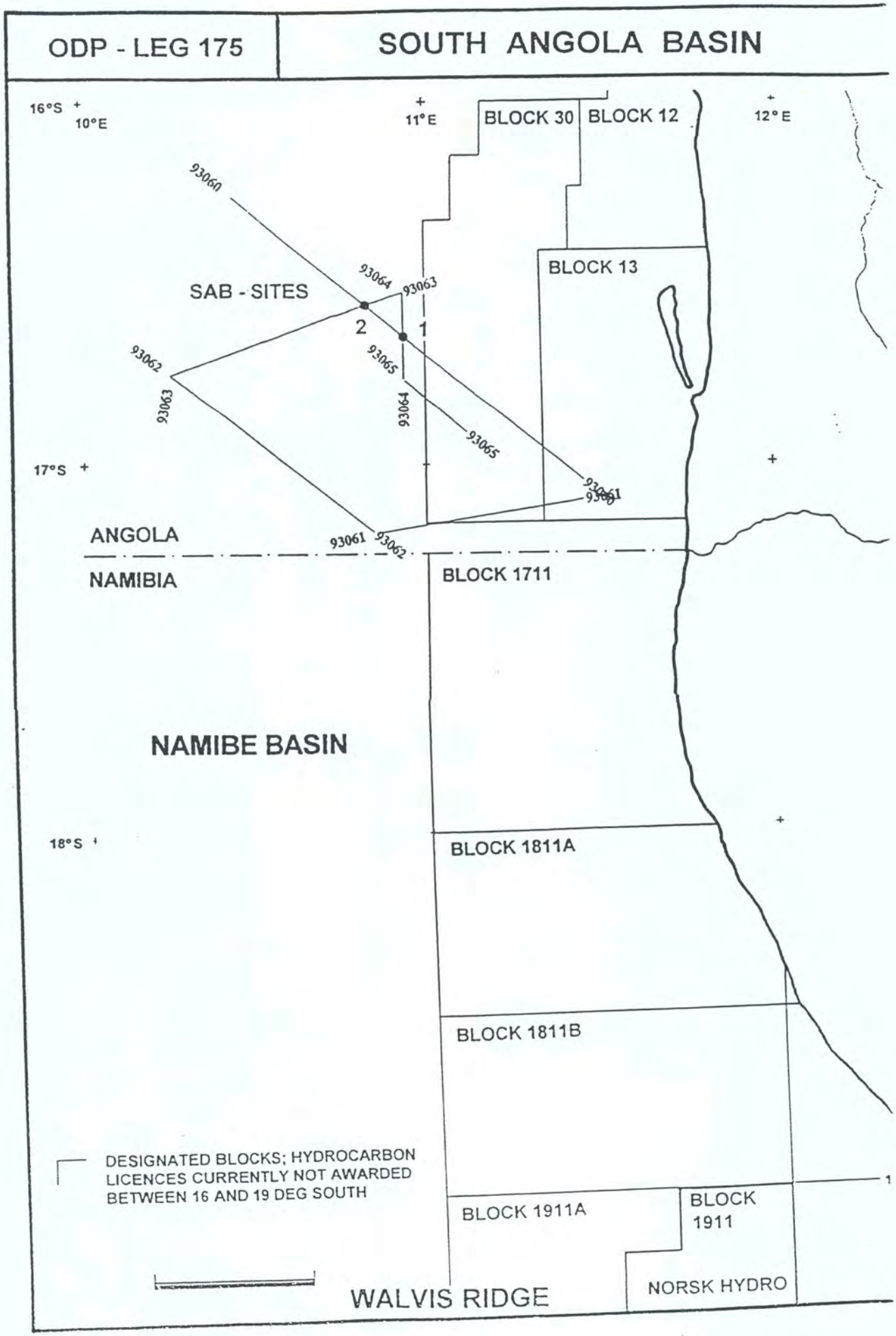
CONGO LICENCE HOLDER:

Mer Profonde Nord-	EXXON	100 %
Mer Profonde Sud -	ELF	40 %
	EXXON	30 %
	SHELL	30 %
Marine IX	- SHELL	50 %
	AGIP	20 %
	EXXON	15 %
	Others	15 %
Haute Mer	- ELF	51 %
	CHEVRON	30 %
	Others	19 %

ODP - LEG 175

MID ANGOLA BASIN




ODP - LEG 175
SOUTH ANGOLA BASIN
16°S
10°E
11°E
12°E
17°S
18°S
BLOCK 30
BLOCK 12
BLOCK 13
SAB - SITES
2
1
93060
93064
93063
93062
93065
93061
ANGOLA
NAMIBIA
BLOCK 1711
NAMIBE BASIN
BLOCK 1811A
BLOCK 1811B
DESIGNATED BLOCKS; HYDROCARBON LICENCES CURRENTLY NOT AWARDED BETWEEN 16 AND 19 DEG SOUTH
BLOCK 1911A
BLOCK 1911
WALVIS RIDGE
NORSK HYDRO

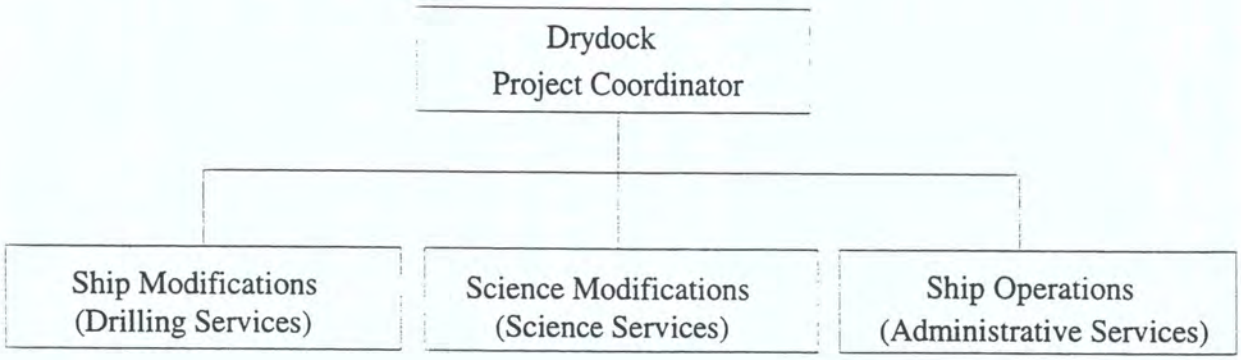
1999 DRYDOCK REQUIREMENTS
A PRELIMINARY OVERVIEW

The following narrative is a first attempt to draft a proposal and to define a project team for the 1999 drydock project. The project will draw upon the expertise of many ODP personnel from different departments. Therefore, the way work areas have been defined at this early stage in the project delimits areas of expertise, and should not be interpreted as detracting from the team ethos and project management style. Time constraints did not allow for the securing of bids or quotes for work and equipment, so it would be wise to treat the numbers presented here as an estimation of the real figures.

As the program begins to focus on achieving the objectives of the Long Range Plan, it becomes apparent that much in the way of increased flexibility and endurance will be asked of the *JOIDES Resolution* in the coming years. Deep drilling and operations in extreme weather environments will challenge the vessel up to its full capabilities. As the Scientific Community's goals for the program emphasize continued operations for the *JOIDES Resolution* in hostile and challenging environments, the program must look to the 1999 drydock as the ideal opportunity to "dress" the vessel to meet its operational obligations. In this way, the amount of quality science that can be realized from these exciting opportunities will be maximized.

Maintaining the *JOIDES Resolution's* current ABS (American Bureau of Shipping) classification dictates that the vessel should undergo a major drydock and hull inspection every 5 years. The process of classification must be satisfactorily completed for insurance purposes. Also, and of overriding importance, the current contract with the vessel's owners, which provides for continued use of the *JOIDES Resolution*, ends on 30 Sept. 1998. In 1992 a MOA was produced that laid the groundwork for extending the contract for an additional 5 years (to 2003). This agreement was contingent upon the ODP contribution of up to $5.0 million in 1992 dollars for capital investment, and ship repairs needed by the vessel, to continue an additional 5 years of operation in an efficient manner. The owner of the *JOIDES Resolution*, Overseas Drilling Limited, a joint venture of Sedco Forex and Sondenfjeld, has also indicated a willingness to contribute to the costs associated with drydock and upgrades related to the contract extension. This opportunity to extend the contract for the *JOIDES Resolution* is of significant benefit to ODP, as the day rate of approximately $45,000 is far cheaper than what a comparable drillship could be obtained for today, let alone in 1998.

During the basic drydock/classification process (planned for June/July 1999) essential repairs and upgrades should also be performed, notably to the Automatic Station Keeping (ASK), the drilling systems, and all propulsion systems. It is proposed that these and other important changes be project managed under the direction of one project coordinator with input from three project managers overseeing the three key areas (shown in the figure overleaf).



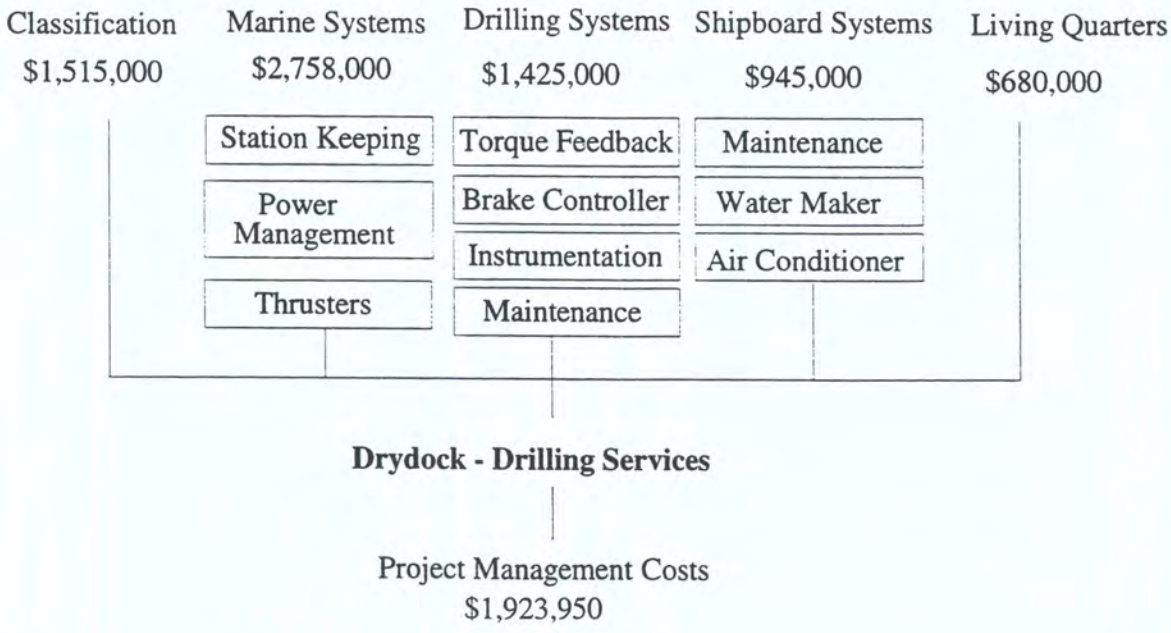
Ship Modifications

Ship modifications will be managed through the Drilling Services department. The project manager will be charged with the oversight of

- The classification process, and upgrades and maintenance to the:
- Marine systems;
- Drilling systems;
- Shipboard systems;
- Living Quarters.

A breakdown of tasks associated with these areas can be seen with their approximate costs below, a more detailed breakdown can be seen in Table 1, and also in the supplement that follows.

The current Automatic Station Keeping (ASK) system is outdated for a modern, well-equipped



vessel. Technology has moved on. Shortcomings of the present system are seen in poorer operating limits (when compared to a modern system) and poor integration with other navigation systems that negatively impacts the ship's utilization for science. It can also be "priced" in terms of excessive fuel oil consumption. In addition, removal and replacement of the ASK would allow for the recovery and conversion of the dynamic positioning area into additional berthing spaces (Two 2-man cabins) or allow the expansion of proposed conference facilities. A new system should also provide the *JOIDES Resolution* with an increased capacity to operate safely in confused seas (with an associated beam loading, wind or sea). The reduction in fuel oil consumption (estimated at 10%-15% while on site) would significantly reduce the ship's operating costs. Intimately associated with the ASK would be an upgrade of the thrusters and possibly the Data Management System (DMS). The DMS controls the power distribution to equipment on the vessel. Currently the power system is not particularly effective due to poor power factors. A new system could increase fuel savings and reduced engine operation and maintenance. Also, fuel savings could be realized by increasing the generator sizes.

Maintenance of the *JOIDES Resolution* drilling systems is required to ensure the continuation of current coring capabilities. However, enhanced core recovery can be achieved by minimizing torque oscillations building up as the core is being cut. It is anticipated that, if core could be cut with less torque variations, it would suffer less disturbance during coring, and consequently give scientists less-deformed core for analysis. The provision of a torque feedback system that would deliver this capability is highly recommended. The need to upgrade a 1970s vintage drilling instrumentation package is also evident. A new package will provide for increased efficiency in core recovery by enhancing the drillers ability to monitor, record, and therefore improve control of the drilling and coring parameters. These advances should be seen as pivotal as the ODP continues to pursue its scientific themes, especially in terms of the adequate sampling of oceanic crust and sediment layers at continental margins, recovering more complete sections through hydrothermal deposits, etc.

Shipboard systems encompass the necessary hull blasting and painting, and a major overhaul of the cranes. The addition of a second water maker to the vessel and improvements to the air conditioning system are required to maintain a reasonable level of 'comfort' on board. Improvements to the living quarters will take the form of noise reduction measures, room upgrades, and improved ventilation and air conditioning.

Essential to the whole drydock project are the services associated with project management. These services include mostly ODL related costs such as: travel and logistics of ODL staff, engineering and project management expenses, shipyard services and a contingency of 15%.

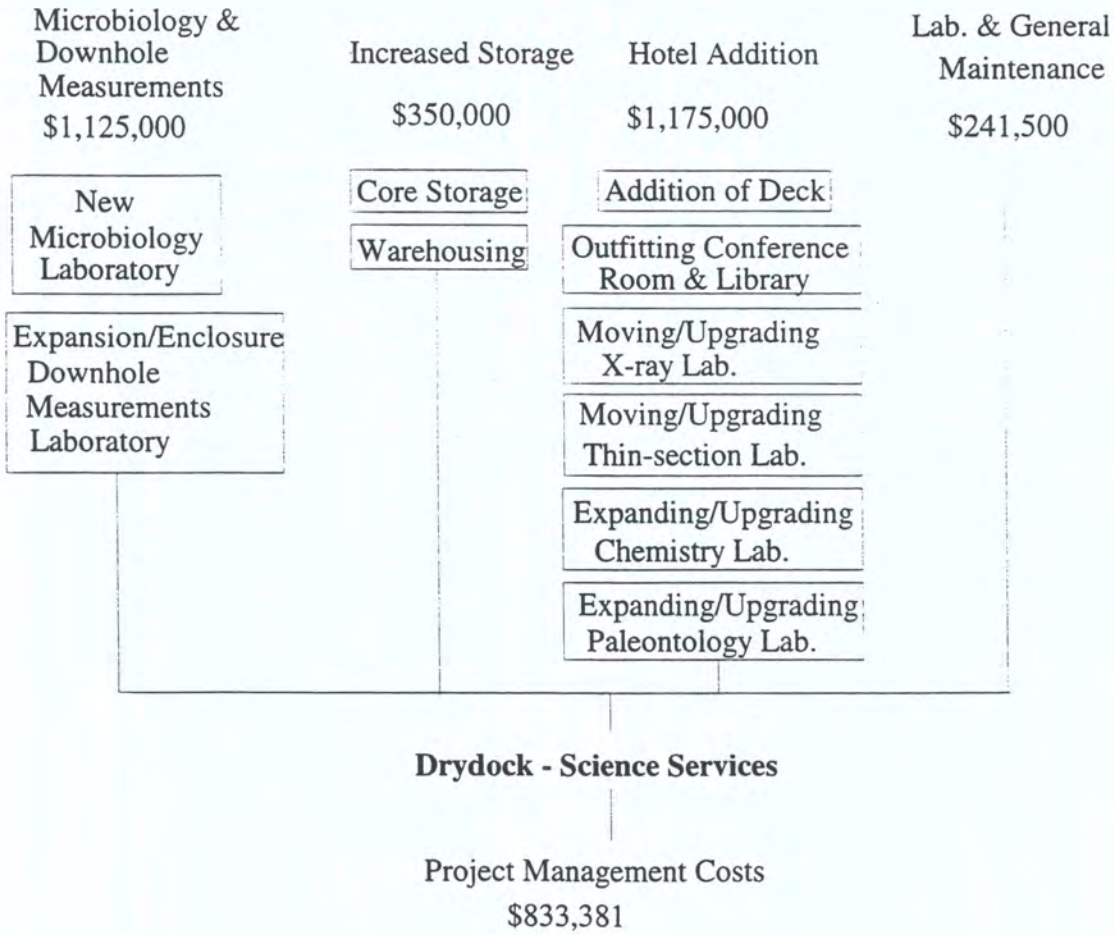
Science Modifications

Science modifications will be managed by the Science Services department. The project manager will be charged with the oversight of:

- Microbiology and downhole measurements laboratories;
- Additional core storage for high recovery legs, and providing storage space above the gym;
- Addition to the "hotel";
- Other laboratory and general lab stack maintenance.

A breakdown of tasks associated with these areas is given with their approximate costs below; a more detailed breakdown can be seen in Table 2.

Fundamental to the requirements of the LRP is the addition to the *JOIDES Resolution* of microbiological capabilities. For scientific considerations, the microbiology laboratory needs to be hermetically sealable. The most desirable place to accommodate such a structure would be the top



of the current lab stack. Development here would then logically extend to increasing the size and capabilities of the currently inadequate downhole tools lab. These measures would combine to produce an additional floor atop the current lab stack structure.

As successive legs smash previous core retrieval records, it has become apparent that core storage facilities aboard the vessel are inadequate for high recovery legs. ODP is investigating ways in which to increase core storage capacity. Additional storage and work space to replace that which will inevitably be lost can be generated by building in the space above the gym.

Comments from the scientific community reveal that improved conference and library facilities are sorely needed. One solution would be to add a level on top of the "hotel" extending to, and incorporating, the redundant DP shack. This development would allow the X-ray and thin-section labs to migrate down a floor and occupy the current science lounge, leaving room for the expansion and development of the chemistry and paleontology labs. The paleontology lab would be able to annex the redundant space currently given over to passageway, alleviating the chronic overcrowding predictable on paleoceanographic cruises. The chemistry lab would be allowed to separate into inorganic and organic sections with the former thin-section lab becoming a "clean area" for atomic absorption spectrophotometry (AAS). This is key to reducing the possibility of contaminating samples and increasing the reliability and quality of data produced.

By definition, maintenance procedures for individual laboratories are necessary to maintain current laboratory capabilities at their present levels.

Ship Operations

Ship operation costs are defined in terms of:

- The number of ODP employees attending the drydock and their travel and living expenses (not including salary). The figure quoted for Science Services presumes a full technical crew will attend for the full drydock period. A summary is shown in the table below.

Exp. Cat	Description	ExpFY97	FY98	FY99	Cat Totals
2000	Payroll	0	0	0	0
	Drilling Services	500 hrs	1000 hrs	1920 hrs	3420 hrs
	Science Services	1300 hrs	1500 hrs	6150 hrs	8950 hrs
3500	Travel (DSD)	$ 1,500	$ 5.000	$ 10,000	$ 16,500
3580	Travel-Port Call(DSD)	$ -	$ -	$ 52,000	$ 52,000
	Science Services			$ 401,156	$ 401,156
5550	Professional Services	$ -	$ -	$ 29,000	$ 29,000
5261	Shipping	$ -	$ -	$ 37,000	$ 37,000
5570	Consulting Services(DSD)	$ -	$ 100.000	$ 125,000	$ 225,000
	Totals	$ 1,500	$ 105.000	$ 654,156	$ 760,656

- Ship/ODL costs including fuel, insurance, day rates, port call expenses, and travel/living expenses for ODL personnel. This figure is estimated at $3,030,759, and;
- ODP insurance costs.

Indirect cost savings during the drydock will be realized by ODP. Savings will be seen in the reduced fuel consumption by the ship, approximately $240,000, and a reduction in the ODL day rate to a standby day rate, saving $3,600 a day, which for 60 days would give a total of $216,000.

Funding

Funding for ship operations will be at the expense of ODP. ODL's proposed contribution will cover the cost of the classification process (@$1.5 million). Other modifications will be the fiscal responsibility of ODP. However, negotiations between ODP/TAMU and ODL are under way in an attempt to secure additional funds for the drydock project. Once the final figure has been determined, prioritizing of the work laid out in Tables 1 and 2 can begin in earnest.

NSF has agreed to contribute the $5 million in 1992 dollars that is necessary to extend the current contract with ODL. ODP will seek additional funding from NSF, in line with the proposals outlined in this document, in order to deliver to the scientific community the tools with which to achieve the goals set out in the LRP. NSF has expressed the desire that its funding contribution be split over a two-year period. In line with this desire, a proposed spending profile for the drydock is shown in Table 3.

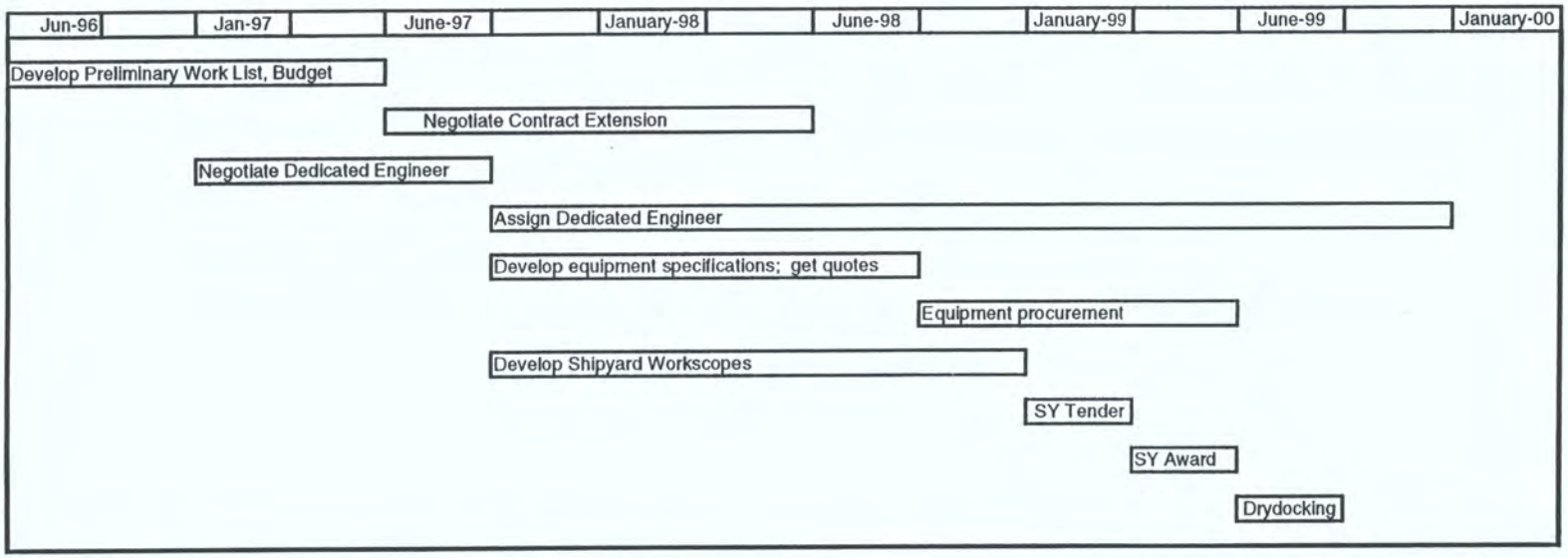
TABLE 1: PRIORITIZED DRYDOCK LIST, DRILLING SERVICES

DESCRIPTION	PRIORITY	YR	ESTIMATED COST	SUBTOTAL	TOTAL
RECERTIFICATION	1	1999			1,515,000
THRUSTERS			20,000		
PROPULSION			108,000		
STEERING			60,000		
MOORING			15,000		
ELECTRICAL/ELECTRONICS			40,000		
Living Quarters			30,000		
HULL			425,000		
TANKS			225,000		
PIPEWORK			140,000		
Shipbd Systems			38,000		
Classification			15,000		
Travel&Living/Shipyard Services			196,500		
Contingency @ 15%			202,500		
				1,515,000	
MARINE SYSTEMS	2	1999			2,758,000
Upgrades					
Station Keeping			1,500,000		
Power Management			625,000		
Maintenance					
Thrusters			550,000		
Propulsion			83,000		
				2,758,000	
DRILLING SYSTEMS	3	1999			1,425,000
Upgrades					
Torque Feedback			100,000		
Brake Controller			125,000		
Driller Instrumentation			450,000		
Maintenance			750,000		
				1,425,000	
SHIPBOARD SYSTEMS	4	1999			945,000
Maintenance					
Hull			125,000		
Tanks			15,000		
Pipework			25,000		
HSE			85,000		
Cranes			325,000		
Upgrades					
F/O Tanks to DW			125,000		
Water Maker/Air Cond/etc			245,000		
				945,000	
LIVING QUARTERS	5	1999		680,000	680,000
Upgrades			680,000		
				SUBTOTAL	5,808,000
PROJECT MANAGEMENT	2 to 5	1999			1,923,950
Travel & Living			292,000		
Engr&Super/Shipyd Services			613,000		
Contingency @ 15%			1,018,950		
				1,923,950	
		1999		TOTAL	7,731,950

TABLE 2: DRYDOCK LIST, SCIENCE SERVICES

DESCRIPTION	YR	ESTIMATED COST	SUBTOTAL
MICROBIOLOGY & DOWNHOLE MEASUREMENTS LABS	1999		
Micribiology Lab (container and outfitting)		315,000	
Enclosing deck and expanding DHM		750,000	
Running elevator to new deck		55,000	
Running utilities to the new deck		5,000	
			1,125,000
STORAGE	1999		
Create storage area above gym		300,000	
Increase Refrigerated Core Storage		50,000	
			350,000
ADDITION TO HOTEL STACK	1999		
Construction of deck		350,000	
Outfitting Conference Room and Library		45,000	
Moving/Upgrading X-ray lab		600,000	
Moving/Upgrading thin-section lab		20,000	
Moving /Expanding Chemistry lab		150,000	
Expanding/Upgrading Paleontology lab		10,000	
			1,175,000
GENERAL MAINTENANCE	1999		
			64,500
CORE LABORATORY	1999		
Running drain pipes to eliminate sediment trap		2,000	
Automatic doors for catwalk entry		20,000	
			22,000
CHEMISTRY/FOCSLE DECK	1999		
Replace chemical hoods		65,000	
Replace chemistry cabinets		40,000	
install second weighing stations if room found		10,000	
			115,000
PHOTO LABORATORY			
maintenance		2,000	
replace rusted decking/equipment foundation		500	
			2,500
ET SHOP			
resurface benches		500	
remove and replace old cabinets		15,000	
			15,500
PALEOMAGNETICS LAB			
Cold Head		15,000	
			15,000
FANTAIL			
Cut loose fantail benches for deck maintenance		1,000	
Refurbish hydraulic reel winches, paint		3,000	
Rebuild Seahorse hydraulic motors		3,500	
			7,500
PROJECT MANAGEMENT			
Science Services T&L		401,156	
15% contingency		432,225	
			833,381
		TOTAL	3,725,381

Table 3 *JOIDES Resolution* Ship Modification, Preliminary Time Line and Spending Profile



Preliminary ODP Spending Profile ($5,000,000 1992 dollars - Forecasted to be $6,000,000 + in 1999 dollars)

	Jun-96		Jan-97		June-97		January-98		June-98		January-99		June-99		Total
ODP spending profile					$50,000	$40,000	$40,000	$40,000	$60,000	$2,500,000	$600,000	$1,500,000	$1,200,000		$6,030,000

SUPPLEMENT TO 1999 DRYDOCK REQUIREMENTS

JOIDES RESOLUTION CONTRACT EXTENSION DRYDOCKING AND UPGRADE

INTRODUCTION

JOIDES Resolution is the ship from which the Ocean Drilling Program's scientists extract and study samples of ancient sediments from beneath the seafloor in order to discover and release the mysteries of our planet Earth's past. From evidence discovered in these prehistoric records of the Earth's life cycle, the scientists hope to better understand the history of our Earth, which will assist them in making predictions of what can be expected in the future. The *JOIDES Resolution* is, and has been, the very heart and the soul of the Ocean Drilling Program for the past decade and has attained a remarkable reputation as the world's most successful ocean research vessel. While many in the scientific community view the *JOIDES Resolution* as belonging to, and an inherent part of, the Ocean Drilling Program, in reality the vessel is contracted from Overseas Drilling Limited (ODL), the company which owns the vessel. ODL is a joint venture company registered in Liberia that is owned in equal parts by the companies Sedco Forex/Schlumberger and Sondenfjeld. Sedco Forex, which mans and operates the *JOIDES Resolution*, is a world class drilling contractor and part of the oil field service giant Schlumberger, and Sondenfjeld is a Norwegian company specializing in owning and operating other dynamically positioned vessels around the world.

CONTRACTUAL TERMS

While the success of the *JOIDES Resolution* is widely recognized in the scientific community, it is equally recognized that the Ocean Drilling Program's future over the next several years is entirely dependent on the *JOIDES Resolution*. It may be less recognized, however, that the contract with the owners of the vessel that provides for continued use of the *JOIDES Resolution* ends on September 30, 1998, and does not provide for use of the vessel beyond this date.

In 1992 TAMU and the NSF recognized the vulnerability of the Program's future with its dependence on the uncertain continued availability of the *JOIDES Resolution*. In conjunction with the vessel's owners, TAMRF signed a Memorandum of Agreement (MOA), which laid the groundwork for extending the contract for an additional 5 years from 1998 until 2003. The MOA was contingent upon several factors, including the provision that TAMU remained the science operator, NSF and JOI endorsement for continued utilization of the *JOIDES Resolution*, and the ODP contribution of up to $5 million in 1992 dollars for capital investment and ship repairs needed by the vessel to continue operation in an efficient manner. Assuming renewal, TAMU will continue the science operatorship for the program until 2003, and it is fully expected that NSF and JOI will endorse the *JOIDES Resolution* for continued use for the Ocean Drilling Program. TAMU is currently discussing with ODL the recommended work to provide for an additional 5 years of efficient ship operation. Based on the current rate of escalation it is anticipated that the contribution expected by the ship's owners will be up to $6.0 million. The owners of the *JOIDES Resolution*, Overseas Drilling Limited, have also indicated a willingness to contribute to the costs associated with the drydock and upgrades related to the contract extension. With present estimates of the drydock and upgrade in the range of $9.3 million this means that the owners may be willing to contribute $3.3 million above the $6.0 million contributed by ODP, naturally subject to final approval of the owner's management.

Review of the current market indicates that, providing final agreements can be developed with the ship's owners, the opportunity to extend the contract for the *JOIDES Resolution* at the present

terms and conditions is of significant benefit to the Ocean Drilling Program. The 1996 competitive market for dynamically positioned drill ships indicates present rates ranging from a low of $60,000 per day to a high of $125,000 per day, while the present rate for the *JOIDES Resolution* is less than $45,000 per day. It is anybody's guess what the market rates will be in 1998. In addition, if the *JOIDES Resolution* were not available, the cost for converting another vessel to suit the program's needs would easily be in excess of $20.0 million, while the continuity and expertise of the *JOIDES Resolution*'s crews would be lost. Replacing the *JOIDES Resolution* with a newly constructed vessel is not a consideration at this juncture due to the extreme costs involved (in excess of $250.0 million). The *JOIDES Resolution* owners are very cooperatively working with TAMU, and it is hopeful that an agreement can be reached to execute the contract extension so that the *JOIDES Resolution* continues to be the scientific platform for the Ocean Drilling Program into the next millennium. To ensure that the *JOIDES Resolution* continues to be available for the Program it is important that TAMU obtain the necessary approvals to execute the contract extension so that the vessel owners can begin planning for the upgrade.

CONSTRUCTION AND DRYDOCK

The *JOIDES Resolution* was constructed in 1978 as the Sedco / BP 471, initially for use as an oil exploration vessel. In 1984, after being awarded a long-term and exclusive contract with the Ocean Drilling Program, the vessel was converted from oil exploration service to function as a scientific research vessel. Since January 1985, the Sedco / BP 471 has been known in the scientific community as the *JOIDES Resolution* and has been the center of the very successful Ocean Drilling Program. During this period the *JOIDES Resolution* has operated extremely efficiently and has attained a reputation as one of, if not the world's most successful ocean research vessels. In the latter part of 1996 the Sedco/BP 471 attained an official name change to the *JOIDES Resolution*.

In 1998 the *JOIDES Resolution* will be 20 years old. While the vessel continues to operate very efficiently and successfully, there are several vital systems aboard that are obsolete by today's technological standards. Many of the system's original manufacturers are no longer in business and spare parts are no longer obtainable. In addition, technological advances have been introduced into the industry that provide for enhanced safety, efficiency and reliability when compared to the older technology now aboard the vessel. Even though the *JOIDES Resolution* is 20 years old, with the proper upgrades in equipment and maintenance, there is no reason to suggest that the vessel cannot continue to operate efficiently and effectively for another 15 to 20 years.

The owners of the vessel have implemented an effective preventative maintenance program. However, the uninterrupted operations over the past 15 years have not allowed for complete strip-down, inspection and repair of several systems. If the Ocean Drilling Program is to continue operating as successfully into the next century as the scientific community has become accustomed to, the opportunity to extend the existing contract for another five years at the existing conditions with the injection of up to $5,000,000 in 1992 dollars is in effect a very attractive consideration when viewing the other options available. After such an upgrade and repair period, the *JOIDES Resolution* can once again embark, with confidence, on a journey to continue unraveling the mysteries of the Earth. This report is intended to summarize the proposals being considered for upgrades and repairs.

CONTRACT EXTENSION DRYDOCK AND UPGRADE

Drydocking typically means taking the vessel completely out of the water so that those sections normally under the water can be inspected and protected. The current plan is to carry out the necessary drydock activities required to meet classification society requirements and the terms of

the contract extension over a two-month period in June / July 1999. This schedule accommodates the *JOIDES Resolution*'s scientific program plan and allows for appropriate management planning, design and equipment procurement activities prior to the drydock.

The vessel has been drydocked two times since the Contract with the Ocean Drilling Program commenced in 1984. Summary of the past and future drydock costs are as follows:

Year	Location	Approximate cost	Purpose	Up-grades
0	Singapore	$1,200,000	Routine - maintain class	None
0	Falmouth	$1,500,000	Routine - maintain class Repaired tank corrosion	None
Planned 1999	Far east Singapore??	Estimated $ 6,000,000 ODP $ 3,300,000 ODL $ 9,300,000 Total	Routine - maintain class Prepare for 5 more years Replace obsolete equip. Service existing equip. Improve quarters Add improvements	See lists

Proposed drydock activities, differentiating between classification requirements and capital investment improvements, are summarized above. Major areas of drydock activity are reviewed later in this document.

INDIRECT COST SAVINGS TO ODP

Although it is anticipated that the Ocean Drilling Program would be expected to contribute up to $6.0 million in 1999 dollars, this cost will be offset to a small degree due to the period of time the vessel is not operating. While the drydock and upgrade are under way, the *JOIDES Resolution* will be using substantially less fuel, and the day rate will be reduced from the operating rate to the standby rate, which could translate into a saving of $3,600 per day in 1996 dollars. The following table indicates magnitudes of savings that may be expected assuming a 60-day upgrade period.

Fuel savings	**16 Tonne/day; 60 days**	**$200/Tonne**	**$192,000**
Day rate savings	**$3600/day**	**60 days**	**$216,000**
ODP staff hotel /food	**25 techs for 60 days**	**$125/day**	**($187,500)**
Possible savings			**$220,500**

This savings could be directed to equipment costs for upgrading the Lab stack.

MAINTAINING CLASS

ABS, or the American Bureau of Shipping, is the classification organization contracted to survey the vessel and ensure that minimum requirements are met and maintained related to the safety and

seaworthiness on behalf of the vessel's owners and the owner's insurance representatives. ABS has very well defined requirements to which the vessel was originally constructed, and to which modifications and upgrades can be made. ABS also has very specific and scheduled inspection requirements over the life of the vessel. As part of the ongoing inspection cycle, ABS calls for a "drydocking" every two years to maintain the vessel in class. Generally ABS will accept an underwater inspection in lieu of drydocking every other drydocking. An underwater inspection in lieu of drydocking is planned for mid 1997, and the next full drydocking is planned for mid 1999 when the vessel is expected to be in the Far East. The drydocking period is the logical time to perform any additional repairs and upgrades that are planned for the vessel.

Station Keeping, Power Generation and Propulsion

Station Keeping: The ASK (Automatic Station Keeping) system is the nerve center of the dynamic positioning system, which gathers signals from various sources and sends orders to the thrusters and propulsion system so the vessel stays on location without being attached to the seabed. Although this system remains functional, it is obsolete by today's standards. The original manufacturer, Honeywell, no longer manufacturers ASK systems, and parts are no longer available on the market. It is becoming more difficult to maintain as components within the system continue to wear out. The existing ASK system is not as responsive as the new generation of ASK systems. As a result, the system is now operated with a positive bias, meaning the vessel is powered upwind or upcurrent from the actual drilling location. This will ensure that an increase in weather-related force driving the vessel off location will not create a drift-off situation during coring because of the slow response time of the existing system. As a result of the positive bias, the existing ASK demands higher fuel consumption, additional diesel generator sets on line, and a lower power factor. The new systems manufactured today will operate much more efficiently and, therefore, save fuel and wear and tear on the vessel equipment. It is very important that the ASK system be replaced to ensure the vessel's continued ability to maintain position dynamically while also saving on fuel consumption.

A new ASK system is a fraction of the size of the existing system and would allow the new system to be located on the bridge. This will free up virtually two complete rooms that now house the ASK equipment. Some of the additional space could then become available for additional accommodation space. As a side benefit, with the new ASK system on the bridge, it could be monitored and handled by the marine crew rather than the very specialized Dynamic Position Operator's position.

Power Generation; Data Management System (DMS): A Data Management System (DMS) is the brain that controls the distribution of power to the vital pieces of equipment on the vessel. The *JOIDES Resolution* is equipped with a DMS system, which is obsolete by today's standards and is not particularly effective. A new state of the art DMS system will pay for itself over the first few years of the project by better management of the power, which will directly translate into better fuel economy. Such a system will help eliminate the need to run extra engines to ensure adequate power availability and will ensure engines are better loaded, all of which will improve the efficiency, fuel consumption, and reliability while also reducing engine operation and maintenance.

Thrusters, propulsion, and steering: These systems are 20 years old and will require a thorough inspection and servicing to ensure their life for another 15-20 years of service. It goes without saying that if the propulsion and thruster systems are no longer functional the vessel loses its ability to stay on location or transit between locations. While these systems are quite old, they continue to be very reliable and it is not planned to replace them with new units. The main propulsion system is subject to ABS inspection as it relates to the seaworthiness of the vessel.

Drilling Systems

Drilling equipment and systems: Drilling systems are not included in any classification society requirements; therefore, their condition is subject to the maintenance standards maintained by the vessel owner. The drilling systems have been the workhorses of the *JOIDES Resolution* since the program began. Normal preventative maintenance has been performed routinely. However, certain systems have not been completely overhauled due to virtually continuous operations. To avoid equipment breakdowns and to ensure a trouble free operational future it is important that all of the drilling systems and equipment be thoroughly inspected, overhauled and upgraded as required. A listing of the main drilling systems and the summary of the work to be performed is defined below.

- Coring Winch: This equipment is a two-drum winch with wireline installed to run and recover the core barrels and the cores. The winch should be torn down so that the internal components (i.e., bearing, gears, electric motors, etc.) can be inspected and refurbished as required.

- Derrick: The derrick is the 147-foot-tall structure rising from the center of the vessel that houses and supports the main drilling equipment. It is bolted together in a latticework. It will be important to inspect the derrick components for damage, corrosion, bolt tightness, etc., to ensure that it can continue to support the heavy loads associated with the drilling function.

- Heave Compensator: The heave compensator is the equipment mounted in the derrick that keeps the drill string on bottom with constant weight by compensating for the up and down motion (heave) of the ship as it rides the ocean waves. The heave compensator on the *JOIDES Resolution* is the only one in existence, and the manufacturer is no longer in business. Although it continues to be functional and reliable, it will be important to inspect the equipment and repair any items as required with custom-made spares that have reasonably long delivery times.

Drilling Hook: The hook is a piece of equipment mounted in the derrick that supports the weight of the top drive drilling unit. It is important to inspect the structural integrity of the unit and inspect for cracks and wear.

Blocks: The crown block and traveling block are the components mounted in the derrick through which wire rope from the drawworks travel in order to develop the mechanical advantage necessary to support, raise and lower the weight of the overhead drilling equipment and drill string. Each block is fitted with several sheaves and bearings. It would be appropriate to strip the equipment, inspect the sheaves and shafts for cracks or wear and replace the bearings.

Top Drive Drilling System: The top drive is the electrical equipment hanging in the derrick that creates and transmits rotation and torque to the drill string. The *JOIDES Resolution* is fitted with one top drive and has a complete backup unit. Because the backup is available it should not be necessary to invest significant money to service the units. However, it will be appropriate to inspect and service the power lines and supports associated with the top drive.

Swivel: The drilling swivel is the piece of equipment supporting the top drive that allows drilling fluid to be pumped down the drill pipe while also allowing rotation. It should be stripped and serviced.

Drawworks: The drawworks is the hoisting mechanism used to raise and lower the drill string in and out of the hole. This piece of equipment is under constant use when coring. It is advisable to strip and inspect the drawworks to ensure that it can continue to operate trouble free.

Drawworks electric brakes: The drawworks on the *JOIDES Resolution* is fitted with two electric brakes. Although the drawworks has a mechanical band brake, to stop the extreme weights carried by the drawworks the electric brakes are a necessity. The brakes act as large electromagnets which are used to slow the descent of the drill string. It is appropriate to inspect the internals of the brakes and their controls to ensure continued functionality.

Rotary table: The rotary table is the unit mounted on the drilling floor that supports the drill string while it is not connected to the blocks. The rotary table can also be used to rotate the drill string while not using a top drive. However, it is not routinely used for this purpose on the *JOIDES Resolution.* It would be appropriate to inspect the rotary table and components for wear.

Iron Roughneck: The iron roughneck is the mechanical "robot" that tightens and untightens pieces of drill string as they are being made up or broken down to run into or pulled out of the hole. The equipment should be inspected and serviced because the iron roughneck in use on the *JOIDES Resolution* is no longer manufactured (newer units won't fit on the *JOIDES Resolution* drilling equipment without significantly modifying the equipment in use).

Pipe rackers: The pipe rackers are the mechanisms that handle, store and transfer the drill string from the hold of the vessel to the drill floor. The manufacturers of the pipe rackers are no longer in business. However, the equipment remains functional and maintainable. The equipment should be inspected and repaired as required.

Mud Pumps: The mud pumps are used to pump drilling fluid down the drill string at pressures up to 4500 psi at high volumes. These pumps should be inspected and serviced.

High pressure piping: This piping and associated valves run from the mud pumps to the drill floor. The system should be inspected for wall thickness to ensure that it can contain anticipated pressures delivered from the mud pumps.

Low pressure piping: This piping connects the mud storage pits to mixing pumps and from the pits to the mud pumps. It should be inspected for integrity and the valves in the system should be repaired or replaced.

DRILLING SYSTEM ADVANCES

There have been technological advances to various components of the drilling systems that will improve the coring capability and enhance the safety aboard as follows:

Drilling instrumentation: The *JOIDES Resolution*'s drilling instrumentation package is technology from the 1970s. The computer age has not missed the drilling instrumentation industry. There are state of the art drilling instrumentation packages that enhance the ability to monitor, record and, therefore, improve control of the drilling and coring parameters. A state of the art drilling instrumentation package will not only provide for increased efficiency in core recovery and improve record keeping, but will also upgrade the image of the drilling function to be in line with the image expected by the scientific community of the 21st century.

Drill String Torque Feed Back: Sedco Forex has developed technology to minimize the drill string torque fluctuations. This technology not only reduces fatigue on the drill string, but also allows for more consistent rotation and torque of the drilling bits. Such technology should provide for improved core recovery.

Brake Controllers: Computer technology has been developed that adds reliability, redundancy and, therefore, safety to the Drawworks electric brakes. Such systems also add the ability to prevent equipment or driller error that could result in the drilling equipment being pulled into the crown or

being allowed to drop onto the drill floor, either of which would result in catastrophe to the equipment and personnel, while completely disrupting the Program.

Living Quarters

Two-month legs aboard the *JOIDES Resolution* put not only a physical strain but also an emotional strain on those aboard. The comfort of the crew and scientists is extremely important to ensure efficiency, while maintaining positive morale. Based on the current configuration of the *JOIDES Resolution*, the ability to make major living quarter improvements without major surgery on the vessel is limited only by the space available. Modifications can be made to improve the utilization of the available space while enhancing the comfort levels in those areas. Such improvements being considered include a general refurbishment and facelift of the quarters, sound reduction, improved entertainment systems, improved ventilation to the living and working areas. Any space freed up in the quarters would allow for increased personnel aboard or preferably be utilized to minimize the number of persons assigned to some of the more crowded rooms.

Lab Stack

The scientific laboratory aboard the *JOIDES Resolution*, commonly referred to as the Lab Stack, is owned and maintained by TAMU. Recommendations for improvements must come from the scientific community and will be managed and funded by ODP. In addition to any upgrades implemented by the scientific community, there are spaces in the lower part of the lab stack that could be modified by removing an unused bridge crane, riser supports and installing another deck to provide for additional offices or storage to better utilize the now-limited space aboard the *JOIDES Resolution*. The offices for the Lab Officer and possibly the library could be moved to these spaces, thus freeing up additional rooms for additional quarters.

Hull, Tanks and Pipework

The hull, associated tanks incorporated into the hull and the pipework allowing for the transfer and flow of the various fluids throughout the vessel are main components of the vessel. The hull of the *JOIDES Resolution* is still in good condition after 20 years of service and, if properly maintained, another 15-20 years life expectancy is not unreasonable. It is inevitable, however, that some corrosion will occur on various sections of the hull, tanks and pipework. Various sections have been repaired as required over the years; however, it will be very important to thoroughly inspect, repair and protect all sections of the vessel exposed to the elements so that further corrosion does not deplete the life of the Vessel. A complete paint job not only protects the vessel from corrosion, but also enhances the appearance, giving the impression of a new vessel rather than a 20-year old one. Such a paint job is above and beyond any classification society requirements. It will also be beneficial to convert the diesel tanks under the quarters back to drill water tanks to support deep water drilling activities.

Shipboard Systems

Various major pieces of equipment aboard the *JOIDES Resolution* necessary to provide vital services to the vessel require inspection and repair or replacement to ensure continued functionality. It would be appropriate to add a 2nd replacement water maker to ensure capability of meeting the constant demand for potable water. Installation of a refrigeration unit to air condition the thyrig room would ensure continued functionality and reduced maintenance of the electrical systems aboard. Sound proofing in some of the work areas is also recommended to ensure acceptable noise levels are not exceeded. The three cranes aboard the unit are 20 years old, and while functional and meeting all classification requirements, should be thoroughly inspected to ensure their continued ability to safely move equipment to, from and around the vessel.

Health, Safety and Environment

To improve the conditions in various working locations aboard the vessel noise reductions are recommended, as is removal of asbestos material located in ceiling tiles and pipe lagging. This asbestos material, which is stenciled "do not disturb," does not cause unsafe conditions provided it is not disturbed. However, it is recommended that the asbestos material be removed from the vessel.

Planning and Preparation

Planning is the key to an efficient and cost effective upgrading of the *JOIDES Resolution*. It will be important to further define the upgrades and repairs required and proposed through the development of equipment and upgrade specifications. To firm up the prices, competitive quotes must be obtained for the equipment before the equipment can be purchased. Detailed workscopes will have to be developed so that competitive shipyard quotations can be obtained. Poorly defined or incomplete workscopes given to a shipyard lead to extensive cost overruns. A shipyard can, and will, charge whatever it wants for projects not previously well defined.

To ensure that the proper planning and project management occurs, Sedco Forex proposes assignment of a dedicated engineer as early as mid 1997 if ODP can commit to reimbursing ODL out of their contribution to the project. The Sedco Forex engineer would function as Project Manager to work on the equipment and shipyard specifications as well as equipment and shipyard costing. In addition, ODP has hired an engineer with electrical and shipyard experience who could function as the Project Engineer working with the Project Manager and would be able to assist with the workscopes and equipment specifications, while ensuring that the ODP money contributed to the upgrades is appropriately used and accounted for.

Beyond 2003

While planning and implementing improvements and upgrades to the *JOIDES Resolution* in 1999 to carry her and the Ocean Drilling Program into the 21st century, we must also look beyond to the period 2003 - 2013. While the majority of the upgrades and repairs conducted in 1999 can contribute directly to the functionality of the JOIDES beyond 2003, <u>all</u> of the upgrades <u>will</u> contribute to the continued success, excellent reputation and perception of the vessel and the Ocean Drilling Program. Any work performed in 1999 to extend the life of the vessel will ensure that the main structure and equipment will continue to be functional beyond 2003. Any of the major upgrades to the major systems (i.e., ASK, DMS and Instrumentation, etc.) will be functional and operational well beyond 2003. Although a major upgrade and lengthening of the *JOIDES Resolution* is anticipated in 2003, the work and money contributed now will not be wasted and will ensure continued excellent results from the Ocean Drilling Program into the next millennium.

OCEAN DRILLING PROGRAM

STRATEGIC IMPLEMENTATION PLAN 1998 TO 2003

EXECUTIVE SUMMARY

This strategic plan for the implementation of the Ocean Drilling Program for the period 1998 to 2003 provides a model for achieving the scientific goals of the ODP Long Range Plan (LRP) over the next five years, and an assessment of the technological and cost implications of carrying out the scientific objectives of the Program. It also investigates the consequences of different budget scenarios for the scientific program that can be carried out during Phase III.

The indicative science plan was developed by combining the FY 98 (and early FY 99) Science Plan with information on active proposals; their global rankings completed by the JOIDES thematic panels; the results of Workshops held in 1996 that recommended drilling strategies and priorities for several major themes of the LRP; and themes that will require the generation of new proposals. Nonetheless, ODP is, and will remain, a proposal-driven program aimed at conducting the highest quality science while remaining accountable to its Long Range Plan. Hence, this is viewed as an evolving document that will change as new scientific ideas and directions are recognized.

Dynamics of Earth's Environment is a major LRP theme. Understanding the climate system, and its response to such factors as global warming from greenhouse gases, is critical to the future of humankind. The longer term factors that influence climate are known, and ODP will now investigate decade-to-century time scale variations by collecting long, extremely high-resolution sedimentary sections. ODP will investigate the relative sensitivity of climate to greenhouse gases and Earth's orbital changes, the role of polar ice sheets in regulating climate change, and the history of Pacific and Atlantic deep waters. By the end of Phase III, ODP will have (i) a first-order global sampling of key climatic systems with resolution of decade-to-century scale variations in climate and its impact on sea-level changes; (ii) calibrated high-resolution, orbitally-tuned geologic time scales, extended to at least 40 Ma bp; and (iii) defined northern and southern hemisphere heat transport.

Sea-level changes occur on time scales of tens to millions of years, as a result of global changes in climate, tectonism, and local changes in subsidence and sediment supply. Future sea-level fluctuations will have large economic and environmental impacts. Therefore, ODP will first determine why, when, and by how much sea level has changed in the past. Firstly, ODP will determine the magnitude, age, and mechanism of past changes, and the complex relationship between planetary climate, Earth orbital dynamics, and thermal convection in the Earth's interior. Secondly, ODP will study the geologic consequences of changing sea level, particularly the link between sea-level change and the stratigraphic record of unconformities and the sediments between them. By the end of Phase III, ODP will have (i) documented the history of ice sheet growth, distribution, and decay for Antarctica; and (ii) established how eustacy affects the age and character of basin-wide unconformities, as well as the distribution and composition of sediments between them.

Sediments, sub-surface fluids and bacteria all act to change Earth's environment. ODP will focus on the carbon cycle by drilling in extreme environments, and explore the distribution, extent and formation of gas hydrates on the outer continental margins. ODP will also explore the interactions of fluids, sediments and bacteria, and the dynamics of deformation and formation of mineral deposits, hydrocarbon reservoirs, and global geochemical cycling. Earth's deep biosphere represents a new and exciting pilot project. Bacteria live in sediments at depths of at least 1000 m below the seafloor, and in volcanic rocks along mid-ocean ridges. ODP will explore the distribution, depth, extent, and genetic range of the deep biosphere, and its biology, ecology, and contribution to the global carbon budget. By the end of Phase III, ODP will have (i) determined the composition, variability and global volume of gas hydrates; (ii) implemented routine fluid sampling and hydrogeological experimentation, and addressed the magnitude of fluid flow in different tectonic settings; and (iii) quantified the deep biosphere in upper crustal rocks and sediments, and evaluated a range of environments for a post-2003 biological observatory.

The second major theme of the LRP is Dynamics of Earth's Interior. ODP will focus on mantle dynamics, the formation and structure of oceanic crust, hydrothermal processes and sulfide mineralization, crustal aging, and recycling of material at subduction zones. Significant progress will be dependent on continued technological development of new drilling techniques for hard rocks, as well as the ability to drill deep holes. By 2003, ODP will have laid the foundations of a global network of seafloor borehole seismic observatories, as part of the International Ocean Network (ION). ODP will also quantify the substantial interior-to-surface energy transfer represented by the emplacement of Large Igneous Provinces. By the end of Phase III, ODP will have defined this different mode of mantle dynamics by drilling one or two Large Igneous Provinces.

A long-standing problem in marine geology is the deep structure and composition of the oceanic crust, the related early rifting history of continents and the deep structure of rifted continental margins. By the end of Phase III, ODP will have (i) compared the structures of fast and slow spreading crust down to depths of about 3 km, and constrained the mass and heat budgets associated with the formation of oceanic crust; and (ii) tested the model of ophiolites as representative of forearc crustal sections.

Hydrothermal circulation and seawater-rock reactions are responsible for exchange of heat and mass between the lithosphere and hydrosphere. Assessing these exchanges requires long-term monitoring of subsurface physical, chemical, and hydrogeological processes within the oceanic crust. The formation of massive sulfide deposits along mid-ocean ridges and in back-arc environments is of intrinsic interest for mineral exploration on land. By the end of Phase III, ODP will have (i) determined the structure of a modern, three-dimensional analog of high grade, volcanogenic massive sulfide deposits formed at a convergent margin; (ii) set up one ridge-axis observatory and produced preliminary data addressing the temporal variability of active processes, in particular fluid circulation.

Subduction at convergent plate margins is the mechanism by which sediment and crustal material is recycled into the mantle. ODP will determine subduction zone fluxes by quantifying both the inputs (oceanic sediment and crust) and the outputs (arc sediments, fluids and magmas). By the end of Phase III, ODP will have produced estimates of subduction fluxes at Pacific convergent margins. Plate collision at continental margins have formed some of the largest mountain ranges. Deformation processes at compressional margins, and the links between deformation, fluid flow

and exhumation during convergence and mountain building will be determined from initial deformation at the toe of the subduction zone to the final stages of collision, as well as the link between climate and tectonics.

Understanding the processes that give rise to the structure and stratigraphy of rifted continental margins, specifically the partitioning of deformation due to strain, is a key objective. ODP aims to investigate the role of low-angle normal faults in the process of continental breakup, and the nature of the ocean-continent transition by direct sampling of the deepest portions of extensional margins (especially pre-rift basement rocks, rift-related volcanics, and the oldest sediments deposited on the margin). By the end of Phase III, ODP will have assessed the role of low angle detachment faults during continental breakup at at least one site.

Understanding the balance between the forces controlling plate movement, and the mechanisms responsible for the initiation and propagation of earthquakes, is critical to the development of predictive capabilities for earthquakes and tsunamis. ODP aims to advance the understanding of earthquake mechanisms by carrying out *in situ* monitoring in boreholes of fluid flow, strain (stress) accumulation/release, and other physical properties involved in faulting. By the end of Phase III, ODP will have developed an understanding of the initiation and propagation of earthquakes at a convergent margin, and the relations between fluid flow and geohazards.

If ODP is to be successful in executing this ambitious scientific plan, some critical technologies and innovations will have to be implemented in the near future. Those developments include: (a) higher resolution logs for higher resolution borehole imaging; (b) riserless-type mud circulation and drilling (including blowout preventer) to improve drilling depth, hole stability and core recovery; (c) microbiological systems for better detection and on-board analysis; (d) improved logging-while-drilling/coring, for more efficient coring and logging and better core-log correlation; (e) advanced borehole observatories, for improved monitoring of active processes in-borehole; and (f) advanced CORKs, for improved retrieval of borehole data.

These special developments are estimated to cost $23 million over 6 years. The ODP five year science plan also requires Program access to additional drilling platforms during Phase III, which, even assuming a significant contribution from other geoscience programs, is estimated to cost an additional $1 million per year. The impact of inflation on basic Program operational costs of $44.4 million per year is assumed to be 2% per year. These costs can be met, if NSF increases its contribution from $28 million in FY 98 to $32.8 million in FY03, and non-US members increase their contributions from $2.95 million in FY 98 to $3.2 million by FY 03. If no such increase is agreed, the Program can continue, but many LRP objectives will be compromised. It is also assumed that associate members will increase in numbers, contributing a net $1 million in FY 98, rising to a full member equivalent of $3.2 million in FY 03.

	Prefered ODP Funding Option					
	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
NSF funding contribution	28.0	29.7	30.0	31.0	31.2	32.8
Non-US Member contrib.	2.95	3.0	3.1	3.1	3.2	3.2

Associate Members	0.98	1.5	2.1	2.6	3.2	3.2

1. INTRODUCTION

Over the past twenty-eight years, scientific ocean drilling has been an integral part of marine geological research. The Ocean Drilling Program (ODP) and its predecessors [the Deep Sea Drilling Project (DSDP) and the International Program of Ocean Drilling (IPOD)] have been pre-eminent in advancing our knowledge and understanding of the history and processes that govern the evolution of planet Earth. In addition, the extraordinary record of ocean drilling's scientific accomplishments is often heralded as the prime example of a large program in which successful international collaboration has been a key factor.

The new ODP Long Range Plan (LRP) was published in March 1996 and identifies the fundamental scientific problems that will be addressed through drilling into the early part of the 21st century. These encompass both scientific objectives that were identified during the Second Conference on Scientific Ocean Drilling (COSOD II) meeting in 1987 and have yet to be accomplished, as well as some exciting new problems that have emerged over the past several years both through drilling and other research activities. In addition, the new Long Range Plan responds to the growing awareness that in order to understand the dynamics of Earth as a system, the complex relationships among the lithosphere, hydrosphere and atmosphere have to be unraveled through an interdisciplinary research approach.

Two overall themes for future scientific ocean drilling have been identified in the LRP. The first of these themes is "Dynamics of Earth's Environment" and it encompasses a range of scientific problems related to understanding how our planet's environment — in particular the atmosphere, hydrosphere and biosphere — changes in response to natural and anthropogenic perturbations. The second theme is "Dynamics of Earth's Interior" and seeks to examine the properties and processes within the lithosphere in order to advance our understanding of the structure of Earth's outer layers, global mass and energy fluxes, mantle dynamics, and deformation processes.

Within these broad themes, several "core" themes, three specific initiatives, and a pilot project are identified which capitalize on new scientific frontiers, greater collaborations with other international geoscience programs, and advancements in drilling technologies:

Dynamics of Earth's Environment

- Understanding Earth's Changing Climate
- Causes and Effects of Sea-Level Change
- Sediments, Fluids and Bacteria as Agents of Change

  Initiative: Understanding Natural Climate Variability and the Causes of Rapid Climate Change

  Pilot Project: Earth's Deep Biosphere

Dynamics of Earth's Interior

- Exploring the Transfer of Heat and Material To and From the Earth's Interior
- Investigating Deformation of the Lithosphere and Earthquake Processes

  Initiatives:
  - In situ *Monitoring of Geological Processes*
  - *Exploring the Deep Structure of Continental Margins and Oceanic Crust*

These themes encompass a wide range of scientific problems that the ODP will address over the next five years, while also providing the flexibility to pursue new, exciting questions as they emerge. The goals are ambitious and will require a strong commitment on the part of the international scientific community, and the development of partnerships with other major global geoscience initiatives. This document provides a scenario as to how the goals of Phase III of the ODP Long Range Plan may be addressed over the next five years, and an assessment of the technological and budgetary implications of accomplishing the scientific objectives of the Program. The indicative science plan presented here was produced using the following sources of information:

- the FY 98 (and early FY 99) Science Plan as determined by PCOM (Dec. 1996) and approved by EXCOM (Feb. 1997)
- active proposals already within the system
- the global rankings of proposals completed by the thematic panels in Spring 1996 based on their high priority scientific objectives
- results of Workshops held in 1996 that recommended drilling strategies and priorities for several major themes of the Long Range Plan
- themes from the Long Range Plan that will require the generation of new proposals.

ODP is, and must remain, a proposal-driven program aimed at conducting the highest quality science while remaining accountable to its Long Range Plan. Hence, this is a evolving document that will change as new scientific ideas and directions are recognized. Although it is difficult to predict how many drilling legs will be devoted to each core theme in a given period of time, it is possible to estimate the number of drilling legs needed to make significant progress towards the accomplishment of specific scientific goals. Consequently, the number of legs listed in the document for the period 1999 to 2003 exceeds the number of standard legs available by 50%. The final sequencing of legs (either single or multiple) outlined in this scenario that address the scientific objectives of each theme will be determined by logistical considerations (e.g., geographic location, weather constraints, etc.) and by the availability, or development of appropriate drilling technologies (some of which, such as riser capability, may not be available for extensive and dedicated drilling at single sites until very late in Phase III, or early Phase IV). This document also discusses the major technological developments required during Phase III, and presents four budget scenarios and their consequences. It is clear that in order to achieve the scientific goals of the Long Range Plan, a modest growth in funding over the next five years is a necessity. If that growth is achieved, then by the end of Phase III, the ODP will have made significant progress towards accomplishing the objectives of several major themes, while for others, the groundwork will have been done in preparation for their accomplishment during Phase IV.

1.1 ALIGNMENT OF THE JOIDES INFRASTRUCTURE TO THE NEEDS OF THE LONG RANGE PLAN

The LRP calls for a three-phased approach that is intended to guide the program into a new phase of scientific drilling in the 21st century. The final year of drilling in

Phase II (which ends in 1998) has just been scheduled, with selection of drilling programs based heavily on the goals of the LRP. Phase III (between 1999 and 2003) is envisaged as a major shift in ODP activities towards closer integration with other international geoscience programs, and a broadening of drilling platform capabilities in these cooperative initiatives. Phase IV (beyond 2003) will add a riser drilling platform to the core of operations with the *JOIDES Resolution* or its successor.

ODP has revised and simplified the science advisory structure, to better deal with the scientific objectives, technological initiatives, and collaboration with other international geoscience programs required by the Long Range Plan. The new JOIDES Science Advisory Structure centers on a Science Committee (SCICOM) that will provide long-term oversight on the direction of the Program, and will be responsible for ensuring that the goals of the Long Range Plan are met. They will receive scientific advice from two Science Steering and Evaluation Panels (SSEPs) that are aligned with the two overall LRP program themes, and a number of short-lived Program Planning Groups (PPGs), set up to promote both active collaboration with other international programs, and the submission of drilling proposals on new initiatives within the LRP. An Operations Committee (OPCOM) will be created as a sub-committee to SCICOM to handle logistical and scheduling issues, and to oversee operational planning, equipment needs, and the short- and long-term technological developments necessary to accomplish the drilling legs. This new structure is being phased in during 1997 and is expected to be fully in place by November 1997.

1.2 THE FY 98 PLAN — THE END OF PHASE II

Selection of drilling programs for the FY 98 schedule (and into the very early part of FY 99) was completed at the December 1996 PCOM meeting, and includes legs that will address objectives that fall within both major themes of the LRP. Within "Dynamics of Earth's Environment," two legs will be devoted to key objectives related to understanding climate. Leg 177 will study the paleoceanographic and climatic history of the southern high latitudes by drilling a latitudinal and depth transect in the Atlantic sector of the Southern Ocean. This will provide the sedimentary sequences needed to expand the biostratigraphic, biogeographic, paleoceanographic, and paleoclimatic history of the Southern Ocean during the Cenozoic — a period marked by major changes in southern hemisphere paleogeography. Leg 181 is another in the series of ODP legs (151, 154 , 162, 172, 177) designed to examine the Global Conveyor Belt Model of ocean circulation in key "gateway" areas. Leg 181 will be a depth and latitudinal transect on the eastern Campbell Plateau and its abyssal margin to reconstruct the stratigraphy, paleohydrography and dynamics of the Deep Western Boundary Current and related water masses since the early Miocene (ca. 20 Ma). The results will provide important information about the development of the Boundary Current, which is fundamental to understanding world oceanic and climate histories.

Important issues related to sea-level change will be addressed during two legs. Leg 178 will be the first in a series of Antarctic drilling legs aimed at understanding the timing, extent, and variability of glaciation of the Antarctic continent in order to better understand its effect on global sea level, and its influence on the surrounding ocean. It will provide an unprecedented high-resolution record of Antarctic continental climate over the past 6-10 Ma and a direct check on the presumed glacio-eustatic origin of global sea-level change over the same period. Leg 182 (in FY 99) will drill an array of

holes across the Cenozoic carbonate shelf in the Great Australian Bight to document the way in which this large, high-to mid-latitude shelf carbonate platform evolved throughout the past 65 Ma. in response to oceanographic and biotic change, and to extract information about global sea-level fluctuations, physical and chemical paleocean dynamics, biotic evolution, hydrology and diagenesis.

Four drilling programs will address objectives within "Dynamics of Earth's Interior." Leg 176 will deepen Hole 735B on a wave cut terrace along the Atlantis II Fracture Zone to investigate the structure of the lower oceanic crust at a slow-spreading ridge. Leg 179 will drill a hole into basement on the Ninety East Ridge in the Indian Ocean for installation of a broadband ocean seismometer and instrument package in support of the International Ocean Network (ION) program. This site will fill a gap in the International Ocean Network that will permit study of the dynamics of the Indian Plate. Leg 180 will be the first in a proposed two-leg program to investigate the role and nature of low-angle faulting in continental breakup, and the evolution of conjugate rifted margins in the western Woodlark Basin, Papua, New Guinea. Drilling will initially characterize, and subsequently monitor, the *in situ* properties (stress, permeability, temperature, physical properties, and fluid pressure) of the active low-angle fault zone, and determine the vertical motion history of both the down-flexed upper plate and the unloaded lower plate, and hence estimate the timing and amount of extension prior to spreading. Leg 183 (in FY 99) will investigate the origin, growth, compositional variation, and subsidence history of the Kerguelen Plateau and Broken Ridge in the southeastern Indian Ocean — one of the largest oceanic Large Igneous Provinces.

2. SCIENCE IMPLEMENTATION PLAN FOR PHASE III (1999-2003)

This section examines in detail the scientific objectives contained within each core theme and sets out an implementation plan and the expected accomplishments for the next five years (1999-2003), together with the required technological developments.

2.1 DYNAMICS OF EARTH'S ENVIRONMENT — UNDERSTANDING EARTH'S CHANGING CLIMATE

Exploring the causes, effects, and interrelations between climate change and oceanic circulation patterns is essential to understanding our climate system and predicting its response to factors such as global warming from greenhouse gases. ODP has already contributed substantially to our knowledge of the longer term factors that influence climate (e.g., Milankovitch cycles, evolution of oceanic gateways) and is now ready to investigate decade-to-century time scale variations by collecting long, extremely high-resolution records from areas of rapid sedimentation rates. Drilling during Phase III will focus on three major objectives.

2.1.1 Understanding Natural Climate Change and the Causes of Rapid Climate Change (ODP Initiative I)

This initiative will take advantage of new, high-resolution analytical techniques to investigate the causes and consequences of natural climate variability over short (tens to thousands of years) time scales. ODP aims to determine:

(a) whether *rapid* climate change is globally distributed and linked to a common driving force, such as solar variability, or whether it reflects local variations in naturally unstable systems, such as shallow oceanic circulation.

(b) whether *rapid* climate change is systematic and predictable, or whether it is random and inherently unpredictable.

To achieve these goals, ODP will constrain the origin and history of glaciation in Antarctica; the stability of Earth's tropical thermostat; and mechanisms of heat transport in boundary currents and deep waters during anomalous warm climate regimes.

Mechanism of Implementation: During Phase III, high-resolution climate studies associated with ODP Initiative I will form parts of approximately six ODP legs. ODP will operate in the Southern Oceans, in marginal basins, on continental margins, in coral sequences, drifts, and fjords. Possible targets include the South China Sea (origin and history of monsoon climates of Asia), the Bering and Okhotsk Seas (examining polar processes, possible deep-water sources and Arctic connections), the Gulf of California (investigating a productive low-latitude system), and the Laurentide region in Canada (monitoring ice sheet stability). In addition, ODP will expand the geographic array of sites that record climate variations on decadal to millennial scales, emphasizing locations that monitor key oceanographic systems and that can be dated with good precision. These may include sites drilled for other scientific purposes or sites that can be drilled on "mini-legs" of short duration between more conventional legs. (This is summarised in Figure 1.)

Expected Outcomes by 2003: ODP will have a first-order global sampling of key climatic systems with resolution of decadal-to-century scale variations. Focused studies will include trade-wind processes in the tropics, productive eastern-boundary current systems in the Northern and Southern Hemisphere, deep-water flows in the Atlantic and Pacific, and polar processes in the northern and southern hemispheres. With these data, ODP will assess global versus local extent and predictability of decadal-millennial scale climate changes.

Projected Significance: The nature and timing of rapid climate fluctuations are extremely relevant to society in terms of understanding the impact of global warming — one of the world's most pressing environmental issues. Rapid climate change, occurring on the order of tens of years, has the capacity to cause major social, economic and human impacts on both third and first world agriculture. Assessment of the Earth's vulnerability to rapid climate change will become an essential component of mitigation, adaptation, and response.

2.1.2 Orbital Scale Climate Dynamics

During 1998-2003, ODP will focus on the Southern Hemisphere in order to determine:

(a) the relative sensitivity of Southern Hemisphere glacial history and global climate to greenhouse gases and Earth's orbital changes.

(b) the history and sensitivity of Pacific and Atlantic deep waters (which are major factors in global heat transport) to climate change.

(c) the role of the polar ice sheets in regulating global climate sensitivity by extending orbital-scale climate studies and time-scales back in time prior to the ice ages.

Mechanism of Implementation: Significant advancement of these objectives will require drilling five legs or their equivalent. Required sites lie mostly in the Southern Hemisphere, and three legs are already scheduled for FY 98: a paleoceanographic transect across the Southern Ocean - Atlantic Sector; the first leg to look at Antarctic ice-sheet history; and a leg to investigate the history and evolution of the Pacific Deep Western Boundary Current. Other possibilities include: additional studies of Antarctic ice-sheet history (ANTOSTRAT proposals) (1-2 legs); studies of the Southern Hemisphere Pacific (W. and E. boundary currents) (2-3 legs); studies of N. Pacific Deep Water sources (1 leg); and investigation of Monsoon and the Indonesian Gateway (1-2 legs). (See Figure 1.)

Expected Outcomes by 2003: ODP will have extended and calibrated high-resolution, orbitally-tuned geologic time scales from their current limit of the past 10 Ma to the past 40 Ma or longer. Major steps will have also been made in establishing a hemisphere-by-hemisphere detailed history of ice sheet growth, distribution and decay.

Projected Significance: An important component of near-term climate prediction is understanding the relative roles of greenhouse gases, whose release is exacerbated by agricultural and industrial activity, versus a natural, orbitally-tuned geological variability. Separating these two signals out of the climatic record will permit the development of the appropriate international government response policies.

2.1.3 Climate Extremes

Understanding processes that create and end intervals of anomalous, extreme climate on Earth is key to testing the sensitivity of existing climate models and to providing parameters for new predictive models for future climate change. ODP aims to determine:

(a) the relative roles of atmospheric CO_2 and warm, deep waters in driving climate change to produce extreme climates on Earth, and the role of atmospheric fallout from explosive volcanism in abruptly ending warm intervals.

(b) the mechanisms of heat transport in boundary currents and deep waters during anomalous warm and cold periods, and the stability of Earth's tropical thermostat.

Mechanism of Implementation: ODP will focus on key warm intervals of the Pliocene (an anomalous warm time with relatively cool deep waters and some polar ice sheets, with CO_2 ranges near those of today), Eocene (a time of extreme warmth, high CO_2, warm deep waters, little polar ice, and low equator-pole thermal gradients), and the Cretaceous (oceanic anoxic events). Drilling will be required to investigate Paleogene equatorial systems (1 leg), latitudinal thermal gradients (e.g. Bering Sea) (1 leg), and the origins of ice in W. and E. Antarctic [ANTOSTRAT Paleogene proposals (2 legs, one already scheduled)]. Approximately two drilling legs will investigate the

interactions between tectonics and climate change and may include Himalayan uplift (1 leg), the history of the Australia-Antarctic Gateway (1-2 legs), the W. Pacific warm pool and Indonesian Gateway (1 leg), and the history of the Drake Passage and Panama Isthmus (1-2 legs). (See Figure 1.)

Expected Outcomes by 2003: ODP will have better constrained northern and southern hemisphere thermal gradients and heat transport in warm climate regimes, and tectonic-climate interactions, including the history of Southern Ocean circumpolar climates, and development of Asian monsoons associated with northward drift of Australia and Himalayan uplift. The history of ice sheet growth and decay will also have been established for Antarctica.

Projected Significance: Understanding long-term global climate change is an important aspect of assessing the evolution, and thus the sustainability, of environments on Earth. Determining the conditions necessary for the establishment of extreme warm intervals is critical to understanding Earth's future "greenhouse" climates.

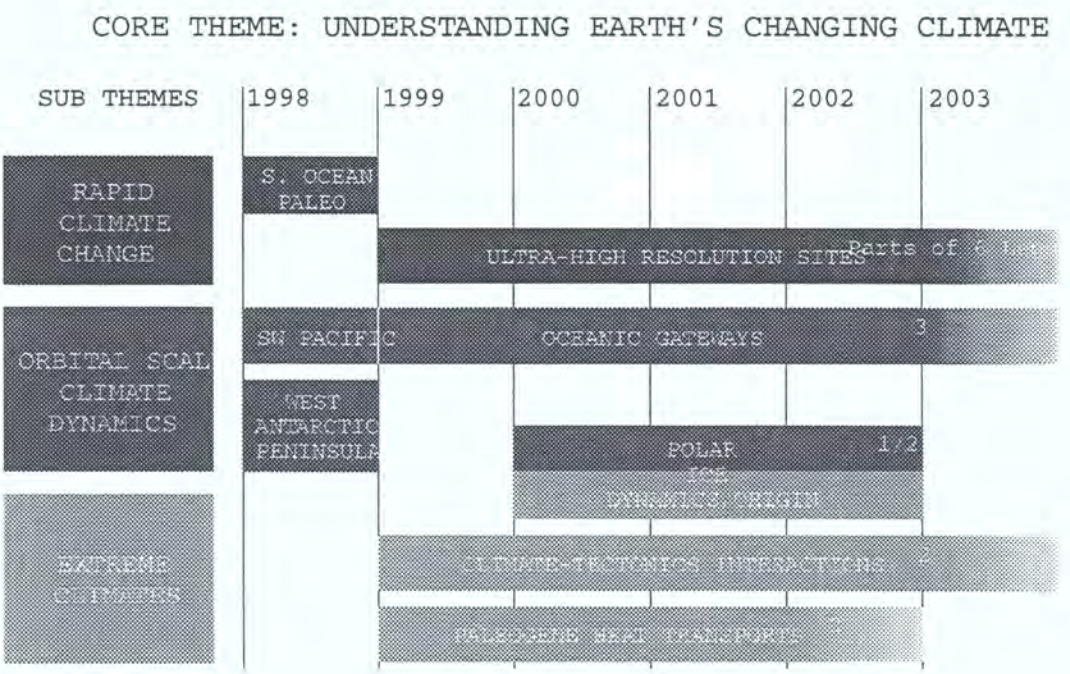


Figure 1

2.1.4 Collaborations with other Global Geoscience Programs

Of particular importance in addressing the issue of rapid climate change is establishing a global array of high-resolution climate records - a goal beyond the capabilities of any one nation or program. Collaboration with other programs such as the Nansen Arctic Drilling (NAD) Program working in the Arctic region, ANTOSTRAT working on the climate history of Antarctica, and IMAGES (International MArine Global

changE Study) which is expanding geographic coverage using conventional piston cores, as well as the use of other drilling platforms, will be required to address this fundamental scientific problem. Other international and national programs addressing issues of Climate Change include GLOCHANT, IGBP/PAGES, CLIVAR, PANASH/PEP.

2.2 DYNAMICS OF EARTH'S ENVIRONMENT — UNDERSTANDING THE HISTORY AND EFFECTS OF SEA-LEVEL CHANGE

The shoreline divides Earth into two realms, but despite this apparent simplicity, a complex array of processes control the position of where the ocean meets the land. Sea-level changes occur on a wide range of time scales (from tens of years to tens of millions of years) as a result of global changes in climate (particularly ice volume), tectonism (particularly changes in seafloor spreading), and local changes in subsidence and sediment supply. Recognizing that sea-level fluctuations have large economic and environmental impact, ODP has begun to study them using two approaches. These strategies are closely related and are designed to understand why, when, and by how much sea level has changed in the past.

2.2.1 Testing Models of Global Sea-Level (Eustatic) Change

The first approach tests models of sea-level change on a global scale and aims to determine:

(a) the magnitude, age, and mechanism of past sea-level changes on vertical scales that range from meters to hundreds of meters, and on time scales from hundreds to millions of years.

(b) the complex relationship between planetary climate, Earth orbital dynamics, and thermal convection deep within the Earth's interior.

Mechanism of Implementation: Testing models of global sea-level (eustatic) change requires highly precise geologic correlations. Thus, well-dated records are needed from a variety of geological settings. Because changes in global ice volume are known agents of sea-level change, both direct and proxy indicators of continental ice growth/decay are needed. These will be collected in high-latitude drill sites along the Antarctic margin, as well as in high-resolution oxygen isotopic records from the open ocean. Drilling into atolls and guyots, the nearest structures we have to sea-level "dip-sticks," will provide additional direct measures of eustatic change. Although eustatic records within passive margins are overprinted by local sea-level change, they contain an embedded global signal that through ODP drilling can be linked to these other indicators. (See Figure 2.)

2.2.2 Testing Sequence Stratigraphic Models

The second approach tests models of the geologic consequences of changing sea level. The geologic column is replete with stratal successions that appear to share basic patterns from one sedimentary basin to the next. ODP has the unique ability to examine these widespread natural archives for the common imprint of eustatic change, and provide a unifying key to understanding their history. ODP aims to determine:

a) the link between sea-level change and the stratigraphic record of unconformities and the sediments between them.

Mechanism of Implementation: Testing stratigraphic models of sea-level impact will require transects of drill sites across continental margins and carbonate platforms of various ages and tectonic settings. The range of factors contributing to the stratigraphic expression of sea-level change is large and complex, and sampling must concentrate on carefully chosen locations. Records from areas of contrasting rifting age must be compared before it can be assumed that all factors have been isolated. Furthermore, sampling will not be restricted to regions now covered by water; many valuable records of the effects of sea-level change are found beneath dry land and require that we continue drillsite transects landward of the shoreline. (See Figure 2.)

Expected Outcomes of Both Programs by 2003: ODP drilling will have produced a global time scale at the precision of orbital forcing (~20 Ka) back through the middle Eocene, and perhaps well into the Paleocene. This will enable the history and impact of sea-level changes to be compared between times when ice was known to cover Antarctica (the Neogene-Oligocene) to when it was not (Paleocene-early Eocene). Detailed records back to the mid-Cretaceous warm interval will have begun, but may not be at the same level of documentation as those of younger time periods. Margin transects from both hemispheres and in end-member depositional settings will show how eustacy affects the age and character of basin-wide unconformities, as well as the distribution and composition of sediments between them. Both approaches — testing eustatic models and testing the stratigraphic expression of eustatic change — will have provided baseline information on how this planetary dividing line has changed in the past, and what factors will control it in the future.

Projected Significance: Sea level is known to have *risen* 130 meters between approximately 12,000 and 5,000 years ago, and to have *fallen* a few meters in the last few thousand years, both as a result of *natural* causes. Those changes have profoundly shaped human history. Ongoing change, whether natural or driven by extreme human industrial and agricultural activity over the last century, has the capacity to continue to shape both our coastlines and the future of human activity. Separation of natural from "greenhouse" effects is critical to prediction and essential to planned strategies for mitigation.

Significant sea-level change is not just a recent event; it has been occurring for hundreds of millions of years and has shaped the deposition of sediments in basins globally. Ancient sediment "packages", separated by unconformities, characterize these basins, and the types of sediments ("facies") within these packages are becoming more and more predictable, relative to an emerging pattern of global sea level history. Facies prediction is the key to much needed improvements in petroleum exploration strategies, as future oil resources become increasingly more difficult to find.

2.2.3 Collaborations with Other Global Geoscience Programs

The goals of this scientific theme are directly linked to many of the same programs as the Rapid Climate Change theme, including IMAGES, ANTOSTRAT, MARGINS, NAD, and ICDP.

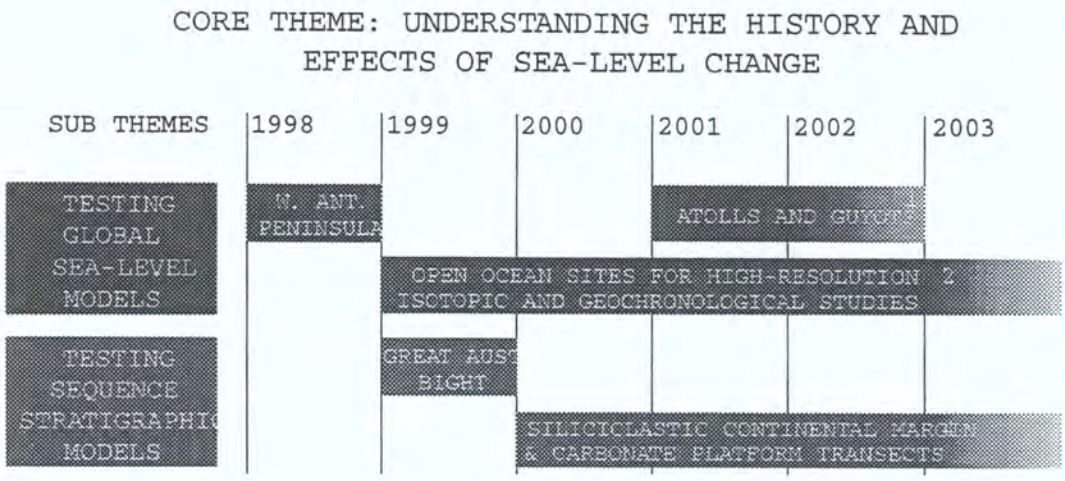


Figure 2

2.3 DYNAMICS OF EARTH'S ENVIRONMENT - SEDIMENTS, FLUIDS AND BACTERIA AS AGENTS OF CHANGE

Marine sediments contain a record of how the global biogeosphere operates and changes over time. ODP has been studying the sedimentary record of these processes to understand how Earth's environment is changing and what role human activity may be playing in perturbing the natural cycles. Drilling for the next five years will focus on three major topics — one of which, the Earth's deep biosphere — represents a new and exciting pilot project for ODP.

2.3.1 The Carbon Cycle

Marine sediments play an integral role in the carbon cycle by mediating long-term changes in atmospheric carbon dioxide levels, and by the preservation of organic carbon by burial. However, the pathways and rates of exchange of carbon are not well understood. A new investigative approach will be to drill in environments that result in strong, local perturbations. In addition, ODP will continue to explore the distribution and extent of gas hydrates and their mechanism of formation on the outer continental margins. Specifically, ODP aims to determine:

(a) the relative importance of destruction, preservation and burial processes in flux of organic carbon in extreme environments;

(a) the global distribution and composition of gas hydrates on the outer continental margins, the dynamics of their formation and destruction, and their role in the global carbon cycle; and

(c) the significance of gas hydrates in terms of representing an unquantified reservoir in the global carbon system, and in terms of energy resources.

Mechanism of Implementation: Two to three legs of drilling are planned for transects of holes in sedimentary environments that may represent extreme cases in the carbon cycle. These may include restricted anoxic basins or very high productivity environments. In addition, the accretion and subduction of sediments containing organics at convergent margins leads to a linkage between global carbon fluxes, gas hydrate distribution, and the interaction of tectonic hydrogeologic processes in these systems. Opportunities are potentially available within the framework of other drilling programs located on convergent margins in the Pacific Ocean. (See Figure 3.)

Expected Outcomes by 2003: Drilling will have provided examples of how the carbon cycle is affected by extreme environments, thereby allowing the response of the carbon cycle to such conditions to be modeled. The gas hydrate drilling program will have placed better constraints on the global volume of gas trapped in hydrated sediments, its composition, and lateral variability. Analyses of recovered gas hydrates will have (1) determined their source and, coupled with regional geophysical studies, their migration paths (if they are produced locally); and (2) ascertained whether gas hydrates stimulate or modify fluid flow on continental margins.

Projected Significance: Carbon dioxide and methane are undoubtedly the two most important "greenhouse" gases. Methane is also the most significant component of natural gas - a major international energy source. Very large amounts of methane may be stored as frozen gas hydrates beneath continental slopes, where they represent *both* a significant potential energy source, *and* an as yet unquantified reservoir of potential "greenhouse" gas within the global carbon system. Sustainable, low environmental impact development of these gas hydrates as a future energy resource will depend on understanding their distribution and role in the dynamic, natural carbon system.

2.3.2 Fluid Flow in Sediments and Rocks

ODP has demonstrated that fluids flow through crustal rocks and sediments in a range of tectonic settings and interact both physically and chemically with the substrate and bacteria living within it. These processes play crucial roles in the dynamics of deformation and in formation of mineral deposits, hydrocarbon reservoirs, and global geochemical cycling. There is intrinsically a strong cross disciplinary coupling in many processes involving fluid flow. For example, in the saturated and brittle portion of the crust, the hydrogeologic system, state of stress, and resulting fault movements are coupled and interact through the fluid pressure and permeability regime. Investigating fluid generation mechanisms and the processes that control the distribution fluid flow and the accompanying chemical fluxes will require innovative downhole sampling techniques and borehole monitoring experiments.

ODP is on the threshold of developing an integrated strategy for the study of sub-seafloor fluid flow processes for promoting an understanding of the impact of subsurface hydrogeologic and geochemical systems on the Earth's exterior and subsurface biosphere, mass flux balances, and the dynamics of actively deforming systems. ODP will determine:

(a) the coupling of subsurface fluid and chemical regimes and deformation in active tectonic environments, including spreading and subduction zone environments (i.e., including fault dynamics and earthquake processes);

(b) the coupling between fluid flow and geochemical processes, including the formation of gas hydrates and the cycling of carbon and greenhouse gases; and

(c) the impact of the hydrogeologic and physical environment on nutrient fluxes and the subsurface bioecology.

Mechanism of Implementation: Fluid-related implementation strategies will be included as a normal part of each relevant ODP leg. Certain specific legs will, however, have a greater focus on fluid-related processes with the associated significant requirement for complex fluid sampling strategies, hydrogeologic monitoring experiments, and physical property studies (examples include Nankai and perhaps the Mariana system). Continued technological developments within the 1999-2003 time-frame will be key to successful progress in elucidating processes of fluid flow and their consequences within sediments and crust. (See Figure 3.)

Expected Outcomes by 2003: Fluid sampling and hydrogeological experimentation will be firmly in place as a routine part of each interdisciplinary ODP drilling program. First-order questions related to the magnitude of fluid flow in different tectonic settings, and the chemical reactions that take place between fluids and the host material, will have been answered, thereby allowing more focused studies at specific sites in future years.

Projected Significance: Development of an integrated model of the subsurface fluid flow affecting the Earth's upper lithosphere, and the resultant physical, chemical and biological interactions, is crucial to assessing the role of fluids in the dynamics of deformation (often producing earthquakes), in the formation of mineral deposits and hydrocarbon reserves, and in global geochemical cycling. A quantitative understanding of the strong interactive coupling of these processes is critical to such broad-ranging issues as sustainable groundwater management, environmentally sound petroleum and mineral exploration, earthquake prediction, and mitigation of offshore geological hazards, such as submarine landslides.

2.3.3 Earth's Deep Biosphere (ODP Pilot Project)

The recent discovery that bacteria live in sediments at depths of at least 1000 m below the seafloor, as well as in volcanic rocks along mid-ocean ridges, has raised many questions concerning the extent of the subsurface biosphere, as well as its role in global biogeochemical cycles. ODP aims to explore:

(a) the distribution, depth extent, and genetic range of the subseafloor biosphere living in upper crustal rocks and marine sediments.

(b) its biology, ecology, and contribution to the global carbon budget.

Mechanism of Implementation: There are three logical stages to the development of this new project that ODP will implement in the next five years: (See Figure 3.)

(a) establishment of facilities onboard the *JOIDES Resolution* for sampling and analysis of microbial communities, including the development of techniques for

drilling and core handling that will provide a "clean" environment from which bacterial samples can be obtained;

(b) formal and informal interaction between advocates/experts on the subsurface biosphere and proponents of drilling proposals that have other scientific objectives as the primary goals in order to utilize some of these sites for preliminary investigations of the distribution of microbial organisms, and to gain some experience in sample handling and the diversity of the microbial communities and environments; and

(c) completion of two transects to examine the variability of microbial processes deep within the sedimentary column. One transect will likely be in sediments on either an active or passive margin (likely to be biologically very different), and the other in upper oceanic crust on the flanks (1-20 Ma) of a spreading center.

Expected Outcomes by 2003: A fundamental test of the hypothesis of the presence of a deep biosphere in upper crustal rocks and sediments will have been completed. In addition, the range of environments linked with this biological activity will have been evaluated, the nature of the interaction of microbial activity (including avenues of output and input) with the oceanic and continental carbon reservoirs will have been determined, and the most appropriate environment for a (post-2003) drill hole to serve as a biological observatory for long-term time-series measurements will have been identified.

Projected Significance: Previous assumptions about the extent of the Earth's biosphere have now been challenged by the discovery of microbial activity within the Earth's lithosphere. Understanding the extent and ecology of the subsurface biosphere will certainly provide a new dimension to our concept of life on Earth, and may provide new clues to the origin of life on Earth. In addition, enzymes of thermophilic bacteria from mid-ocean ridges have already been employed commercially in the biochemical industry, and further studies of subsurface microbes may yield a new genetic and biochemical resource of potentially functional and economic value.

2.3.4 Collaboration with Other Global Geoscience Programs

The carbon cycling aspects of Sediments, Fluids and Bacteria as Agents of Change, and in particular, the interest in gas hydrates, are closely linked with scientific objectives of MARGINS. Completion of studies of fluid flow and microbial processes deep within the sediments and crust will require collaboration with InterRidge (a program with strong interests in monitoring processes within the oceanic crust), and scientists who participated in the Subsurface Science Program of the U.S. Department of Energy.

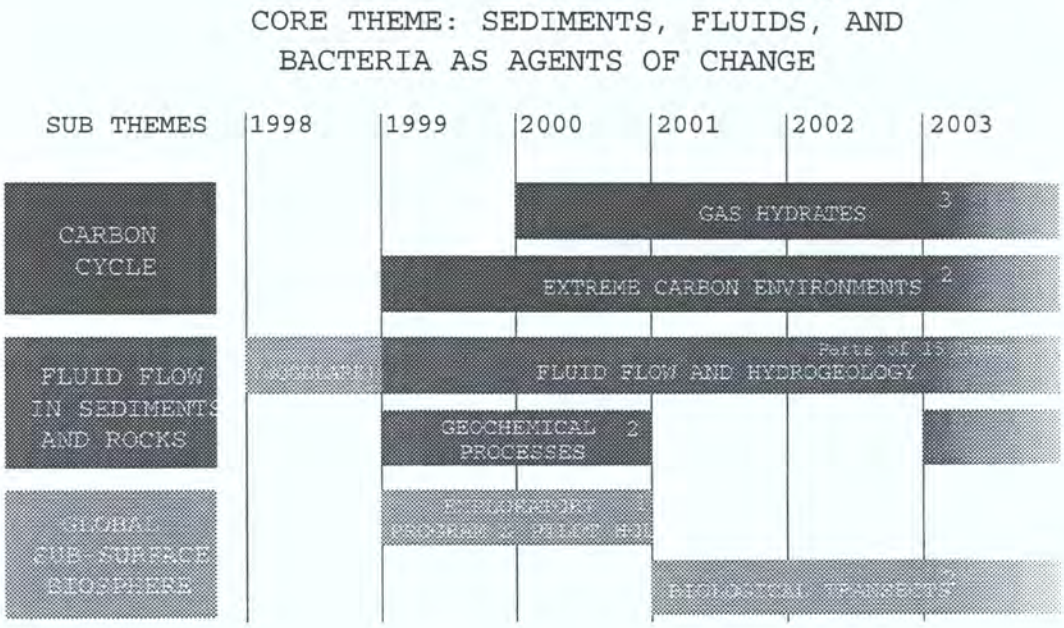


Figure 3

3.1 DYNAMICS OF EARTH'S INTERIOR — EXPLORING THE TRANSFER OF HEAT AND MATERIALS TO AND FROM THE EARTH'S INTERIOR

Quantifying and modeling the physical and chemical processes involved in the solid Earth geochemical system requires a knowledge of mantle dynamics, the formation and structure of oceanic crust, hydrothermal processes and sulfide mineralization, crustal aging, and recycling of material at subduction zones. Although some of these studies are currently limited by the need for continued technological development of new drilling techniques for hard rocks, as well as the ability to drill deep holes, considerable progress will be made during the next five years (1999-2003) focused on four scientific problems.

3.1.1 Dynamics of Mantle Reservoirs (part of ODP Initiative II)

Investigation of mantle dynamics will require collection of mantle tomographic images by the establishment of seafloor borehole observatories for continuous recording of broadband seismic data. This would significantly improve the coverage of global seismic stations, and allow better resolution of mantle features, as well as decreasing the threshold at which earthquakes can be detected in many areas. Another important aspect of mantle dynamics is the substantial energy transfer from the Earth's interior to the surface represented by the emplacement of Large Igneous Provinces (LIPs) in the Cretaceous, but not in the Cenozoic, suggesting a radically different mode of mantle dynamics. ODP aims to:

(a) provide sites in oceanic crust for the emplacement of broadband seismometers. These sites will become part of the International Ocean Network (ION); and

(b) define the mode of mantle dynamics that led to emplacement of Large Igneous Provinces during the Cretaceous, but not in the Cenozoic, and assess the impact of LIP formation on the energy transfer from the Earth's interior to the surface.

Mechanism of Implementation: By 2003, ODP expects to drill three holes that are left in a condition suitable for emplacement of broadband seismometers — one is already scheduled for 1998. These holes may be drilled to meet other scientific objectives but, if suitably located, could become seafloor borehole observatories. An exploratory phase of LIP drilling is envisaged over the next five years in which transects of shallow holes across LIPs will be used to determine ages and geochemical trends. A total of two or three Cretaceous LIPs in the Indian and Pacific Oceans (2-3 legs) are targeted as existing data suggest that they may have different origins. These transects would then allow selection of sites for deeper penetration. Drilling deeply into oceanic plateaus and volcanic margins is required to examine the chronology and geochemistry of several LIPs in order to estimate magma volumes, and timing and mechanisms of emplacement. If a hole stabilization method (such as riserless drilling) becomes available in Phase III, then an initial attempt could be made to drill one hole to 1500-2500 meters. However, it is anticipated that the major scientific goals that require deep drilling will be accomplished post-2003. (See Figure 4.)

Expected Outcomes by 2003: At least three holes will have been drilled for seismometer emplacement, instrumented and operational as part of the International Ocean Network. Drilling of two large LIPs will have determined (a) the period of time taken to form individual LIPs; (b) whether or not LIP formation was episodic; (c) the relative importance of upper and lower mantle as sources of LIPs; and (d) whether mantle circulation, as expressed by LIP formation, has changed through time.

Projected Significance: Active thermal processes that create oceanic crust, cause major oceanic volcanism, and drive the current deformation of the Earth's surface, have their origins deep within the Earth's mantle. Understanding the link between mantle dynamics and volcanism is also fundamental in predicting the effects of extensive volcanism, including its impact on climate, and the wider impact on society.

3.1.2 Characterization of the Oceanic Crust (ODP Initiative III)

A long-standing goal of the marine scientific community has been to address a number of important questions related to the structure and composition of the oceanic crust. Such questions include the early rifting history of continents and the deep structure of rifted continental margins, and the process of formation and deep structure of the oceanic crust. ODP will determine:

(a) the rifting history of continents, and the processes affecting continental margins that lead to the formation of new ocean basins; and

(b) the magmatic, hydrothermal, tectonic, and biological processes involved in the formation and structuring of oceanic crust, including a test of the "ophiolite" model of oceanic crust.

Mechanism of Implementation: Drilling in the next five years will aim to improve our understanding of the interrelationships of magmatic, hydrothermal, tectonic and biological processes that lead to the generation of oceanic crust at the mid-ocean ridges. A series of experiments will provide information about the architecture of the oceanic crust at both fast- and slow-spreading ridges. For the fast-spreading crustal section, ODP will assign one leg of preliminary drilling of several holes in Pacific crust (away from the axis) to characterize lithologic variability in the upper crust, followed by two legs to deepen one of these holes to 3 km to include the depth at which melt lenses have been imaged beneath the spreading axis. For the slow-spreading crustal section, the ODP strategy will be to devote two legs to drilling two holes (at the center and the end of a segment) to investigate crustal heterogeneity and its relation to magma production. Finally, one leg will be devoted to drilling a forearc section that will represent a reference to test the model of ophiolites being analogs for crustal sections in these environments. (See Figure 4.)

Expected Outcomes by 2003: The structures of fast and slow spreading crust down to depths of about 3 km will have been compared, and an evaluation made of the mass and heat budgets associated with the formation of oceanic crust. In addition, the model of ophiolites as representative of forearc crustal sections will have been tested.

Projected Significance: Formation of new crust on the Earth occurs principally along the mid-ocean ridge system. Most of our knowledge of the structure of oceanic crust is derived from remote geophysical techniques, and yet the formation of new crust is *fundamental* to plate tectonics and continental drift that shape the surface of the Earth. A better model of the structure and composition of the oceanic crust will provide a better understanding of crustal accretion processes that form the crust that covers two-thirds of the Earth's surface. In addition, processes affecting continental margin formation are critical to characterising the formation and accumulation of oil and gas in these basin areas. An understanding of structural evolution, thermal history and sediment deposition of deeper water basins on continental margins will support the new thrust of exploration for the world's remaining large undiscovered petroleum resources. ODP deepwater technology will also be important in determining seabed conditions relevant to deepwater resource production.

3.1.3 Hydrothermal Processes and Formation of Massive Sulfide Deposits

Hydrothermal circulation and seawater-rock reactions are responsible for exchange of heat and mass between the lithosphere and hydrosphere, although their role in global thermal and geochemical budgets is not well understood. Assessing these exchanges requires long-term monitoring of the spatial and temporal variability of the subsurface physical, chemical, and hydrogeological processes within the oceanic crust. Although hydrothermal circulation results in the formation of massive sulfide deposits along mid-ocean ridges, many of the more economically important sulfide deposits likely formed in a back-arc environment. Hence, there is intrinsic interest related to mineral exploration in drilling into an actively-forming hydrothermal deposit linked to felsic magmatism at a convergent margin. ODP aims to:

c) establish a ridge-axis observatory to provide long-term temperature and pressure measurements, and properties of hydrothermal fluids over several years;

(b) determine geochemical fluxes associated with hydrothermal circulation, and relate to the extent of the biomass associated with such deep hydrothermal circulation;

(c) determine the internal structure, and lateral and vertical heterogeneity, of a large, actively forming sulfide deposit in a back-arc basin environment, and assess the importance of such processes as metal remobilization and zone refinement in concentrating metals at the seafloor and in the stockwork zone.

Mechanism of Implementation: The borehole long-term instrumentation effort will be developed in conjunction with seafloor instrumentation in the context of a ridge observatory (through InterRidge). A series of CORKed boreholes will be strategically located within the observatory site and instrumented for long-term monitoring (1 leg). Subsequently, one of the holes may be un-CORKed, drilled to about 2 km, and re-CORKed with the objective of evaluating chemical processes occurring within the "reaction zone" of the deposit.

One additional leg will be devoted to drilling a large, actively forming hydrothermal deposit in a convergent margin setting. It will consist of a series of short holes, to determine the extent of the deposits, and one deep hole (~ 2-3 km) to penetrate the deposit, its stockwork zone, and its underlying "reaction zone." The likely target is one of the many deposits now identified within the Western Pacific arc-basin system. (See Figure 4.)

Expected Outcomes by 2003: ODP/InterRidge will have set up a ridge-axis observatory and produced preliminary data addressing the temporal variability of active processes, in particular fluid circulation. In addition, the structure of a modern, three-dimensional analog of high grade, volcanogenic massive sulfide deposits formed at a convergent margin will have been determined.

Projected Significance: Base metals sulfide deposits are actively forming as a direct result of hydrothermal circulation of seawater through the oceanic crust. In some places, oceanic crust is exposed on land as a result of plate collision processes. Rich copper, iron and zinc deposits are currently mined in such locations. Determination of the structure and geochemical character of an actively forming, large deposit in a back-arc setting, will provide a three-dimensional analog and exploration model of high grade, volcanogenic massive sulfide deposits formed at convergent margins. A better model of oceanic crustal composition, structure and formation will provide much better global resource estimates and improve exploration methods for these minerals.

3.1.4 Mass Balance Experiments at Convergent Margins

Convergent margins are an important component of the Earth's geochemical cycle. Subduction at these margins provides the mechanism by which sediment and crustal material is recycled into the mantle. Hence, an important objective of ODP is to:

(a) determine subduction zone fluxes by quantifying both the inputs (the sediment and crust of a subducting oceanic plate) and the outputs (sediments, fluids and magmas from the associated arc-back-arc basin systems).

Mechanism of Implementation: Mass flux determinations will first be attempted in the Western Pacific by focusing at least two drilling legs most likely on the relatively simple Mariana-Izu non-accretionary convergent margin: one leg on the subducting Pacific Plate and one on the adjacent forearc. To obtain the input fluxes, at least one of the sites on the Pacific Plate will penetrate through the sediments and into a significant thickness of oceanic crust. To obtain the output flux, a likely target is a fluid release site such as a serpentinite seamount. Other studies will be required to investigate the relative roles of accretion vs. subduction near the toe of the slope at a sedimented margin. Flux determinations at accretionary convergent margins can be carried out using legs drilled for other purposes. (See Figure 4.)

Expected Outcomes by 2003: An estimation of subduction fluxes at Pacific convergent margins will have been obtained, including: (a) the relative importance of sediments and crust to the input flux; (b) the spatial variability in source and composition of subduction-derived fluids; and (c) the net crustal flux recycled into the mantle.

Projected Significance: Convergent margins and related volcanism are important components of Earth's geochemical cycle. Much of this margin volcanism is highly explosive due to high volatile contents, such as Tambura, Krakatoa and Mt. Pelée. Consequently, better understanding of geochemical fluid cycling at subduction zones will contribute to defining the risks associated with volcanic eruptions, as well as providing a general geochemical characterization of Pacific convergent margins.

CORE THEME: TRANSFER OF HEAT AND MATERIALS
TO AND FROM EARTH'S INTERIOR

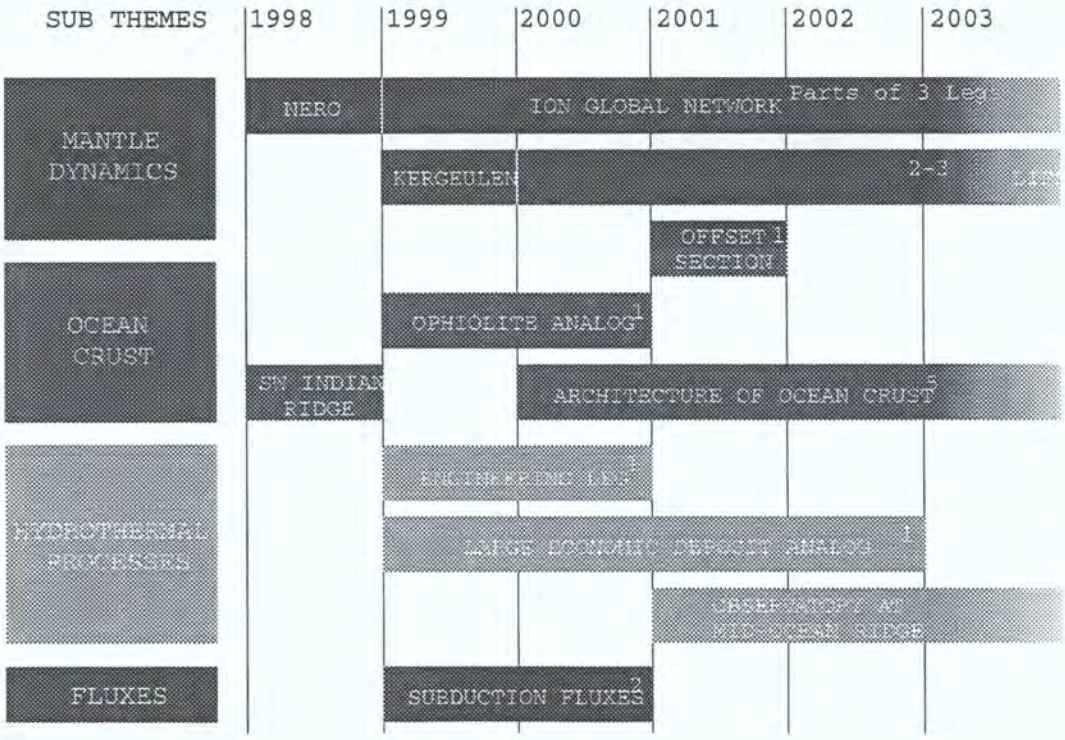


Figure 4

3.1.5 Collaboration with Other Global Geoscience Programs

ODP drilling and instrumented boreholes will provide an integral component of *in situ* long-term monitoring strategies to study the formation of oceanic crust which have been developed by InterRidge. Drilling in oceanic crust and the development of observatories has links to InterRidge, ION and BOREHOLE, and is the bridge to riser drilling of the deep ocean crust during Phase IV. Selection of the site for the ridge-axis seafloor observatory and the crustal studies will be part of a joint ODP-InterRIDGE initiative. Objectives of the drilling of LIPs is closely linked with goals of IAVCEI/LIPS. Convergent margin studies are of interest to both MARGINS and InterRidge.

3.2 DYNAMICS OF EARTH'S INTERIOR — DEFORMATION OF THE LITHOSPHERE AND EARTHQUAKE PROCESSES

3.2.1 Extensional Boundaries

The structure and stratigraphy of passive continental margins provide information about the deformation of continental lithosphere, the nature of the continent-ocean crust transition, and the early stages of ocean basin formation. Understanding the processes that give rise to the structures of margins, specifically the partitioning of deformation due to strain, is a key objective of ODP. The Program will investigate:

(a) the role of low-angle normal faults in the process of continental breakup.

(b) the processes that control rifting.

(c) the nature of the ocean-continent transition by direct sampling of the deepest portions of extensional margins (especially pre-rift basement rocks, rift-related volcanics, and the oldest sediments deposited on the margin).

Mechanism of Implementation: Drilling a series of shallow holes in an area of active rifting, such as the Woodlark Basin, is a high-priority, and a first leg is scheduled for FY 98. Direct imaging via borehole logging and geophysical studies will reveal the structural details from which major extension processes can be inferred. Some of the key objectives require deep drilling and hole stabilization. At least one pilot deep hole will be drilled during Phase III to test the limits of the *JOIDES Resolution's* drilling capabilities. If hole stabilization methods become available during this phase, then it may be possible to drill one deep (1.5-2 km) hole (2 legs) in preparation for more extensive deep drilling during Phase IV. (See Figure 5.)

Expected Outcomes by 2003: At least one low-angle detachment fault will have been drilled and assessment made of their role in continental breakup. In addition, some advances in refining the nature of the transition from continental to oceanic crust will have been made, although accomplishment of this objective will require further deep drilling.

Projected Significance: Documenting the structure and stratigraphy of passive continental margins is a key step towards understanding the processes of deformation of continental lithosphere and the early stages of ocean basin formation.

Understanding deep continental margin structure and evolution is also of major economic importance. Oil production from continental slope settings (>200 meters) is expected to increase five-fold over the next eight years, and so determination of deep crustal structure, rifting dynamics, thermal history and fluid flow in the crust and slope basins are key in quantifying exploration risk and success.

3.2.2 Convergent Boundaries

Collisional processes at continental margins have formed some of the largest mountain ranges. However, the mechanisms of deformational processes at compressional margins, and the links between deformation, fluid flow and exhumation during convergence, are not well understood. Addressing this scientific problems is linked with ODP Initiative III. ODP aims to:

(a) characterize the history and style of deformation associated with mountain building from initial deformation at the toe of the subduction zone to the final stages of collision.

(b) determine the mechanisms of active deformation, and develop models of décollement formation, fluid flow, and chemical fluxes in accretionary wedges.

(c) determine the link between climate and tectonics.

Mechanism of Implementation: Objectives linked to orogeny will be addressed by drilling an accretionary prism as well as an arc-continental collision boundary, possibly the Taiwan margin, to study deformation (1 leg). Links between Himalayan evolution and monsoons will be examined by drilling, most likely in the basins of the South China Sea (1-2 legs). Deep drilling (2-4 km) above the seismogenic zone of a convergent margin will reveal the accumulated effects of earthquake faulting, tsunami generation, or slope failures (2 legs). (See Figure 5.)

Expected Outcomes by 2003: Preliminary information on the mechanisms of deformation at convergent boundaries will have been obtained, and a model for the links between climate and tectonics will be developed. In addition, a first-order understanding of the relations between fluid flow and geohazards will have been established.

Projected Significance: Arc-continent and continent-continent collisions have formed some of the largest mountain ranges. Modeling the mechanisms of deformational processes at these compressional margins, and the links between deformation, fluid flow and exhumation during convergence and collision, will improve quantitative geological descriptions of fold mountain belts, related resource assessments, and provide better pointers to petroleum and mineral potential.

3.2.3 Earthquake Mechanisms (part of ODP Initiative II)

Understanding the balance between the forces controlling plate movement, and the mechanisms responsible for the initiation and propagation of earthquakes, is critical to the development of predictive capabilities for earthquakes and tsunamis. ODP aims to:

(a) advance the understanding of earthquake mechanisms by carrying out *in situ* monitoring in boreholes of fluid flow, strain (stress) accumulation/release, and other physical properties involved in faulting.

Mechanism of Implementation: Drilling will investigate deformational processes and earthquake mechanisms at different types of plate boundaries by deep drilling, coring, logging with an advance generation of LWD tools, and *in situ* experimentation. Some of these sites will also be used for *in situ* monitoring of important physical and chemical properties required to understand earthquake mechanisms. In addition, a few of these sites will be selected for the establishment of these ODP boreholes as long-term seafloor observatories as part of the International Ocean Network. The drillholes will also provide natural laboratories for monitoring changes in the stress field, thermal conditions, fluid pressures, and other parameters that are likely to influence activity along these plate boundaries. (See Figure 5.)

Expected Outcomes by 2003: A first-order understanding of the initiation and propagation of earthquakes at a convergent margin will have been developed. The establishment of a seafloor observatory at a convergent margin will have laid the foundations of a global network of borehole observatories to be constructed in different tectonic environments.

Projected Significance: Improved understanding of earthquake processes will lead to better constraints on location, depth, magnitude and expected time of particular events, which will allow for improved earthquake and tsunami mitigation procedures.

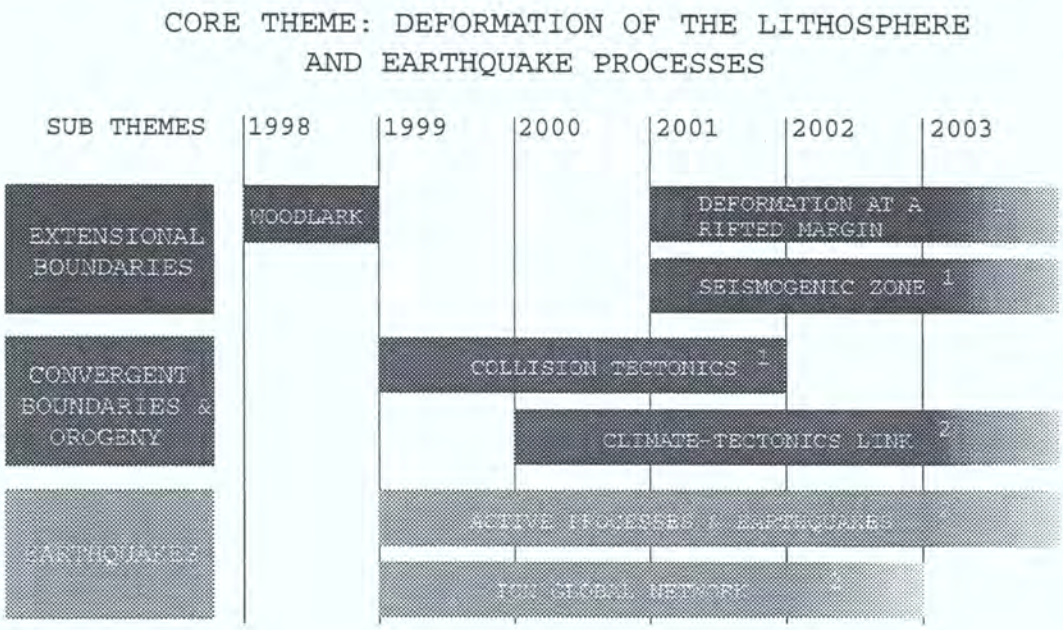


Figure 5

3.2.4 Links to Other Global Geoscience Programs

These scientific objectives have strong ties with ION, BOREHOLE, SEIZE/ILP, and FDSN. Processes associated with convergent and extensional boundaries are also tied to objectives of MARGINS, and links with continental drilling [e.g., through the International Continental Scientific Drilling Program (ICDP)] may be possible with the planned ODP drilling at extensional boundaries.

3.3 SUMMARY OF PHASE III — AND INTO PHASE IV

By the end of Phase III, the ODP will have made significant progress towards accomplishing the objectives of several major themes:

For **Dynamics of Earth's Environment**, the ODP will have:

- a first-order global sampling of key climatic systems with resolution of decadal-to-century scale variations in climate and its impact on sea-level changes;
- calibrated high-resolution, orbitally-tuned geologic time scales and extended them to the past 40 Ma or longer;
- constrained controls on northern and southern hemisphere thermal gradients and heat transport;
- documented the history of ice-sheet growth, distribution, and decay for Antarctica;
- established how eustacy affects the age and character of basin-wide unconformities, and the distribution and composition of sediments between them;
- constrained global volumes of gas trapped in hydrated sediments, its composition, lateral variability and, coupled with geophysical studies, its migration paths;
- implemented fluid sampling and hydrogeological experimentation as routine parts of each interdisciplinary ODP drilling program, and answered first-order questions related to the magnitude of fluid flow in different tectonic settings; and
- tested the hypothesis that a deep biosphere exists in upper crustal rocks and sediments, and evaluated a range of environments that may be appropriate for a post-2003 biological observatory for long-term time-series measurements.

For **Dynamics of Earth's Interior**, the ODP will have:

- compared the structures of fast and slow spreading crust down to depths of about 3 km, and constrained mass and heat budgets associated with ocean crust formation;
- tested the model of ophiolites as representative of forearc crustal sections;
- determined the structure of a modern, three-dimensional analog of high grade, volcanogenic massive sulfide deposits formed at a convergent margin;
- set up one ridge-axis observatory and produced preliminary data addressing the temporal variability of active processes, in particular fluid circulation;
- produced preliminary estimates of subduction fluxes at Pacific convergent margins;
- assessed the role of low angle detachment faults during continental breakup at least one site;
- developed an understanding of the initiation and propagation of earthquakes at a convergent margin, and the relations between fluid flow and geohazards; and
- laid the foundations of a global network of seafloor borehole observatories for installation of broadband seismometers.

For other scientific themes, the groundwork will have been done in preparation for their accomplishment during Phase IV. At least one pilot deep hole (>2 km) will have been drilled during Phase III to test the limits of the *JOIDES Resolution's* drilling capabilities. In addition, technological developments during Phase III, such as the diamond coring system (DCS) and hammer drill-in casing, will have improved our ability to drill into, and recover samples from, fractured formations. With the scientific advances made during Phase III, and the enhanced drilling capabilities available during Phase IV (including riser drilling), the Ocean Drilling Program will be well-poised to build on its scientific accomplishments and pursue new and challenging frontiers in the 21st century.

4. TECHNOLOGY AND SUPPORTING REQUIREMENTS

4.1 UNDERSTANDING EARTH'S CHANGING CLIMATE

- **Coring/Drilling**
  (a) Longer, more continuous, and less disturbed APC cores are needed to aid high-resolution sampling;
  (b) orbital scale studies need improved recovery through XCB and RCB coring;
  (c) Antarctic/Arctic regional drilling will require improved coarse sediment recovery; and
  (d) hole stabilization, possibly using a form of the "riserless mud circulation" technology currently under concept development, may be needed to allow shallow to intermediate depth drilling in high deposition rate sedimentary basins, where there is a possible hydrocarbon risk.
- **Logging**
  (a) Enhanced high-resolution core logs; data handling and database capabilities;
  (b) high-resolution downhole logging.
- **Operational Strategy**
  Achievement of rapid climate change objectives typically involve short, but geographically-widespread, drilling operations, which must be packaged with legs examining longer-term climate variations, or other regional studies.
- **Ancillary Platforms**
  (a) Ice support vessels are required on projected Antarctic legs; and
  (b) Access to ice-strengthened drilling platforms will be required if cooperative drilling projects can be arranged with the Nansen Arctic Drilling Program.

4.2 UNDERSTANDING THE HISTORY AND EFFECTS OF SEA-LEVEL CHANGE

- **Coring/Drilling**
  (a) Long, less-disturbed cores that ensure complete and continuous recovery are needed for precise time scales; and
  (b) high core recoveries and good hole conditions to ensure excellent log quality in challenging lithologies.

- **Logging**
  (a) High-resolution tools for analyzing sediment properties, both in the borehole and the laboratory, to improve correlations among drill holes and between down-hole logs and sediment cores; and
  (b) tools for logging the shallowest part of the sediment column.
- **Sampling**
  Overlapping and precise measures of stratigraphic position (bio-, chemo-, magneto-stratigraphy) are needed to construct accurate geochronologies.
- **Ancillary Platforms**
  Access to a commercial shallow water drilling rig, with diamond-coring capabilities that can recover long sequences of shallow-water shelf sediments and coral reef deposits, is required to provide for transects across a continuum of depositional environments and subsidence histories.

4.3 SEDIMENTS, FLUIDS AND BACTERIA AS AGENTS OF CHANGE

- **Coring/Drilling**
  Drilling technology is needed to provide "clean" samples for testing of the subsurface biosphere.
- **In-Hole Measurements**
  (a) Further technological development of downhole equipment for routine recovery, preservation and extraction of gas-bearing sediments in undisturbed condition (Pressure Core Sampler) is necessary to permit sub-sampling of fluids and gases;
  (b) Development of observatory-based methods for long-term monitoring and sampling of fluids and aqueous chemistry at multiple levels within a drillhole;
  (c) Development of hydrogeological experimental equipment, including packers and pumping equipment, required to address objectives related to fluid flow; and
  (d) Subsurface biosphere studies require detailed knowledge of the chemistry, temperature, and hydrodynamics of circulating fluids. This will require the isolation (via packers) of stratigraphic sections and fluid sampling from specific permeable sections, and the tight CORKing of holes in sediment and igneous basement, with resampling of fluids subsequent years via wireline reentry.
- **Laboratory Facilities**
  Special on-board facilities for appropriate microbiological analyses of cores will be essential for testing of the subsurface biosphere.

4.4 EXPLORING THE TRANSFER OF HEAT AND MATERIALS TO AND FROM THE EARTH'S INTERIOR

- **Coring/Drilling**
  (a) High speed diamond coring for high core recovery in fractured and brittle rock, and for penetration of an active seafloor hydrothermal system;
  (b) Bare rock spud-in and casing set;
  (c) Hole stabilization, possibly using a form of the "riserless mud circulation" technology currently under concept development, to allow intermediate depth drilling at an older oceanic crust site in the 2000 to 3000 metre sub-seabed

range, and/or intermediate depth drilling on a Large Igneous Province in the 1500 to 2500 m sub-seabed range

4.5 DEFORMATION OF THE LITHOSPHERE AND EARTHQUAKE PROCESSES

- **Coring/Drilling**
  (a) High speed diamond coring for high core recovery in fractured and brittle rock, and for penetration of an active seafloor hydrothermal system;
  (b) bare rock spud-in and casing set; and
  (c) hole stabilization, possibly using a form of the "riserless mud circulation" technology currently under concept development, to allow intermediate depth drilling at a passive continental margin site in the 1500 to 2500 m sub-seabed range.
- **In-Hole Measurements**
  (a) Improved downhole instrumentation is required for monitoring parameters such as seismic strain, pressure, and temperature in a seafloor borehole observatory; and
  (b) development of tools, or remote techniques for collecting *in situ* data from seafloor observatories, and data collection not requiring the use of a drillship.

4.6 STATUS OF CURRENT TECHNOLOGY DEVELOPMENTS AND SUPER TECHNOLOGY AND INNOVATION REQUIREMENTS

A particularly important technology development that is critical to the achievement of ODP Phase III science objectives, and actually underway in FY 97/98, is the replacement of the current *passive* primary heave compensator on the drillship, with an *active* primary heave compensator. This development has the potential to overtake the need to develop a new "diamond coring" system, which was previously seen as the appropriate technology to achieve improved core recovery in brittle and fractured rock, and in sections with alternating hard and soft layers. Following implementation, diamond coring could be accomplished through a further development of the motor driven core barrel (or similar system).

A second key technology, currently under development, but not yet implemented, is the hammer drill-in casing. This ODP application of a commercial mining technology will allow for bare rock spud in and casing set, which is critically important to the successful achievement of certain initiatives under the Earth's Interior theme.

Some of the technology requirements outlined above can be accommodated by an extension of current, or on-going engineering development projects. Standard technology development projects, requiring funding at a relatively modest level, have been included in ODP Program Plans for FY 97, FY 98, and beyond. However to achieve the more scientifically challenging Phase III science objectives detailed above, and to set the stage for scientific ocean drilling beyond 2003, a *new* approach to, and level of Program "technology and innovation", over and above current and future engineering development projects, is proposed, requiring a level of resources above that presently committed to technology development. The following "super technologies and innovations" were identified after consideration of the Science Plan needs, and consultation with Science and Wireline Services Operators:

- New technology development, focusing on deeper and improved core recovery, and higher resolution logging
  - *Higher resolution logs:* improved, higher resolution borehole imaging;
  - *Riserless-type mud circulation and drilling:* drilling mud circulation system will improve drilling depth (LRP initiative), hole stability and core recovery;
  - *Blowout preventer:* required with drilling operations involving mud recirculation.

- New Program "innovations," aimed at better measurements on core, core-log integration, and in-hole measurements
  - *Microbiological systems:* required for better detection and on-board analysis - needs identified in ODP pilot project;
  - *Improved logging-while-drilling/coring:* including resistivity-at-bit as an initial step, this will improve definition of the sub-surface that is required for more efficient coring and logging, improved safety and better core-log correlation;
  - *Advanced borehole observatories:* improved borehole conditions and establishment of "legacy" holes that will allow improved monitoring of active processes in-borehole, as identified in LRP initiative;
  - *Advanced CORKS:* improved borehole data retrieval, identified in LRP initiative

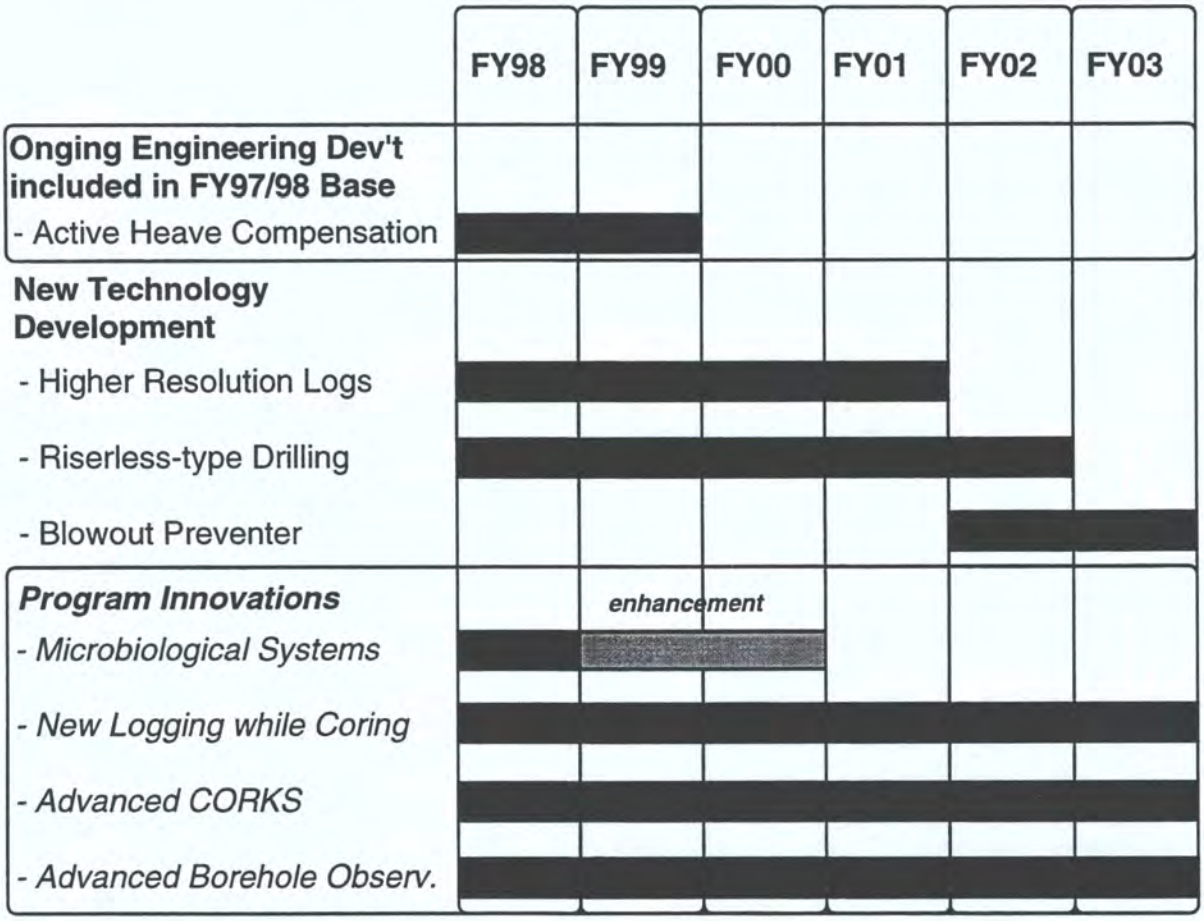


Fig.6 - "Super Technology and Innovation" Development Plan

A *Proposed Super Technology Development Plan,* involving these indicative technology, engineering developments and innovations, covering the period FY 98 through FY 03, is shown in outline in Fig. 6. This summary includes the project for the active primary heave compensator system, which is actually included in the base operating budget for FY 97 and will be included in the base budget for FY 98.

4.7 ADDITIONAL PLATFORM REQUIREMENTS

Another key factor in the achievement of new LRP themes and initiatives is the use of additional drilling platforms. Specialized drilling platforms are critical to the achievement of science goals in shallow water and in Arctic environments, where *JOIDES Resolution* cannot operate. Options for charter of platforms that *can* work in such environments include commercial "jack-up" or other style of conventional oil exploration drilling platform; Russian ice-breaking drilling platforms capable of operating in shallow Arctic Seas (potential Nansen Arctic Drilling Program/ODP cooperative program); and commercial geotechnical vessels equipped with ODP's Hydraulic Piston Corer.

4.8 SUMMARY — SUPER TECHNOLOGY AND ADDITIONAL PLATFORMS

"Super technology and innovation" proposals and additional platforms, considered essential to the successful implementation of the Long Range Plan and are linked to the component parts of the Five-Year Science Plan in Table 1.

Table 1

"Super Tech. Projects"	*Earth's Environment*	*Earth's Interior*
Riserless-type mud circulation & drilling system; plus blowout preventer	Sequence stratigraphic models *(in some places)*	Mantle dynamics Ocean crust & Rifted margins
Higher resolution logs	Rapid climate & Sea-level change; Orbital dynamics	
Microbiological systems	ODP pilot project	
Logging-while -drilling/coring	Carbon cycle & Hydrothermal processes Fluid flow	Sequence stratigraphic models
Advanced borehole observatories	Fluid flow	Mantle dynamics Earthquakes
Advanced CORKs	Fluid flow	Mantle dynamics Earthquakes
Shallow water platforms	Sea-level change	
Ice-breaking platforms	Extreme climates	

5. ODP PHASE III BUDGET OPTIONS

5.1 SUMMARY OF BASE PROGRAM COSTS

Following the restructuring of the Science Operator in late 1996 and the implementation of project management across the Program, the FY 98 budget of $44.4 million represents a new "base budget." This figure is based on funding contributions from NSF and 5 2/3 non-US members, as of the start of FY 97. The new "base budget" includes a development project ("X-base") budget of $3.75 million per year. Whilst down from the original 1996 BCOM recommended target of $5.0 million for FY 98, this is considered a balanced outcome as a result of TAMU's running costs ("A-base") being simultaneously reduced, as a result of the restructuring, and expanded as a result of FY 98 operations in the Southern Ocean (the additional cost of "distant ocean" operation is estimated to be about $1 million in FY 98). The resultant draft allocations for FY 98 are shown in Table 2.

Table 2

(a) Summary

	FY 96	FY 97	FY 98
TAMU	37 717 503	37 578 636	37 840 000
LDEO	4 810 444	4 953 364	4 650 000
JOI/JOIDES/DB	1 872 053	1 868 000	1 910 000

(b) Draft FY 98 Breakdown

	Fixed Costs	A-Base	X-Base
TAMU	21 640 000	12 900 000	3 300 000
LDEO	2 190 000	2 060 000	400 000
JOI/JOIDES/DB	0	1 860 000	50 000
Total	23 830 000	16 820 000	3 750 000
		TOTAL	44 400 000

This base budget includes sufficient funds for:

- six drilling legs per year, with provision for operations in "distant oceans";
- electronic publication of Program results and database management;
- a moderate to limited level of "leg enhancements" (such as CORKs, reentry cones, ice support and/or specialty logging; about $1.9 million); and
- a modest level of technology and systems development (about $1.6 million).

This base budget does *not* make provision for:

- inflation beyond FY 98;
- significant upgrading of the capabilities of the existing drilling platform;
- operation of alternative drilling platforms;
- a high level of "leg enhancements"; or
- an advanced level of technology development.

5.2 PROPOSED TECHNOLOGY DEVELOPMENT COSTS

The cost of the key technology development and innovation plan outlined in Section 4.6 (above) has been estimated for current budgeting purposes. Except as noted, funds indicated in Table 3 are in addition to those already included in the indicative base budgets of both operators for technology development.

Table 3

	Technology Developments and Innovations							
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Active Primary Heave Compensation System	0.55	0.55	0.49	0.50				
TOTAL - incl. in base budget	0.55	0.55	0.49	0.50	0.00	0.00	0.00	0.00
Improved Adv. Piston Corer								
High Resolution Logs		*0.50*	1.00	1.00	1.00	1.00		
Blowout Preventer							1.50	2.90
Riser/Riserless Drilling		*0.20*	0.20	0.40	0.70	1.10	1.00	
TOTAL - new technology dev't	0.00	*0.70*	1.20	1.40	1.70	2.10	2.50	2.90
Microbiology Laboratory		*0.50*	0.10	0.10	0.10			
Improved Logging while Drlg.			0.50	0.70	0.80	1.00	1.30	1.60
Advanced CORKS			0.20	0.20	0.40	0.50	0.50	0.50
Advanced Borehole Systems			0.20	0.40	0.40	0.60	0.70	0.80
TOTAL - innovations	0.00	*0.50*	1.00	1.40	1.70	2.10	2.50	2.90
TOTAL	0.55	1.75	2.69	3.30	3.40	4.20	5.00	5.80

The figures in italics in the FY 97 column are not currently included in the approved FY 97 Program Plan.

5.3 COST OF THE USE OF ADDITIONAL PLATFORMS

The Long Range Plan identified a number of potential alternative platforms that might be used, or indeed are needed to achieve science goals beyond the capabilities of *JOIDES Resolution*. These charter options included:

- Commercial jack-up or other style of conventional or oil exploration drilling platform to tackle scientific objectives in shallow water (less than 75 m);
- Russian ice-breaking drilling platforms capable of operating in shallow Arctic Seas;
- other commercial vessels, equipped for operations using the ODP's Hydraulic Piston Corer (HPC).

The suggested approach to use additional platforms involves identifying other national or international geoscience programs, or projects, that have scientific objectives that are compatible with those already identified in the Long Range Plan (in general) and in the this document (in particular). The funding strategy presented here involves ODP sharing costs of charter, fit-out and operation of such vessels with the relevant national or international geoscience program. It is assumed that the cooperating program is capable of funding its share from sources not already funding ODP.

(a) Oil Exploration Platform: The Science Operator has costed the charter, fit-out and operation of a commercial jack-up oil exploration drilling platform at approximately $6 to $6.5 million for a 60-day operation, inclusive of the costs of project management, mobilization, fit-out and demobilization.

(b) Ice Breaking Platform: In October, 1996, a "task force" from the Nansen Arctic Drilling Program met to prepare an implementation strategy. That group identified the cost of charter of Russian Arctic drilling platforms at approximately $2.5 to $3 million for a 60-day operation, inclusive of the costs of project management, mobilization, fit-out and demobilization.

(c) Geotechnical Drilling Platform: The Science Operator has costed the charter, fit-out and operation of the geotechnical drilling platform, *Bucentaur*, at approximately $4.5 to $5 million for a 60-day operation, inclusive of the costs of project management, mobilization, fit-out and demobilization.

For budget purposes, the total cost of operating additional scientific ocean drilling platforms during ODP Phase III has been estimated at $4 million per year in FY 99, rising to $8 million per year in FY 03 (Table 2). It is further assumed that, if the cooperating external program, or project (such as Nansen Arctic Drilling Program) can raise significant additional funds, and if an appropriately selected drilling leg or project is ranked sufficiently highly by both programs, then ODP would contribute resources (i.e., comingled funds) to that joint operation. Specifically, it is anticipated that ODP would fund at least the cost of installing ODP coring and possibly logging facilities on the ancillary platform, providing technical staffing for the operation and managing logging, core acquisition, sampling and archiving. In the Long Range Plan budget strategy, the ODP contribution was assumed to be $1 million per year throughout Phase III, as illustrated in Table 4 (also *Option 1*; below).

Table 4

	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Additional Platform Costs		4.0	5.0	6.0	7.0	8.0
ODP Contribution		1.0	1.0	1.0	1.0	1.0
External Contrib.		3.0	4.0	5.0	6.0	7.0

The success of this strategy depends on the expected "stimulus" that will result from the contribution provided by ODP to other geoscience programs to achieve common scientific goals through a cooperative venture. Primary responsibility for raising that expected external contribution lies with the cooperating international geoscience program. There is no implication that the operation of any additional platform under this scheme is necessarily the prerogative of the current ODP Science Operator at Texas A&M University.

5.4 BUDGET OPTIONS - SUMMARY

In the light of the broad Program requirements indicated above, plus the likely or anticipated sources of Program funding, four budget options are considered and are summarized in Figure 7.

- ***Option 1***: This is the "Long Range Plan Option." It is designed to achieve most remaining Phase II and Phase III science objectives, with only a modest level of risk. It involves modest Program growth over the next 6 years, and involves an average increase of only 2% per year in member contributions.

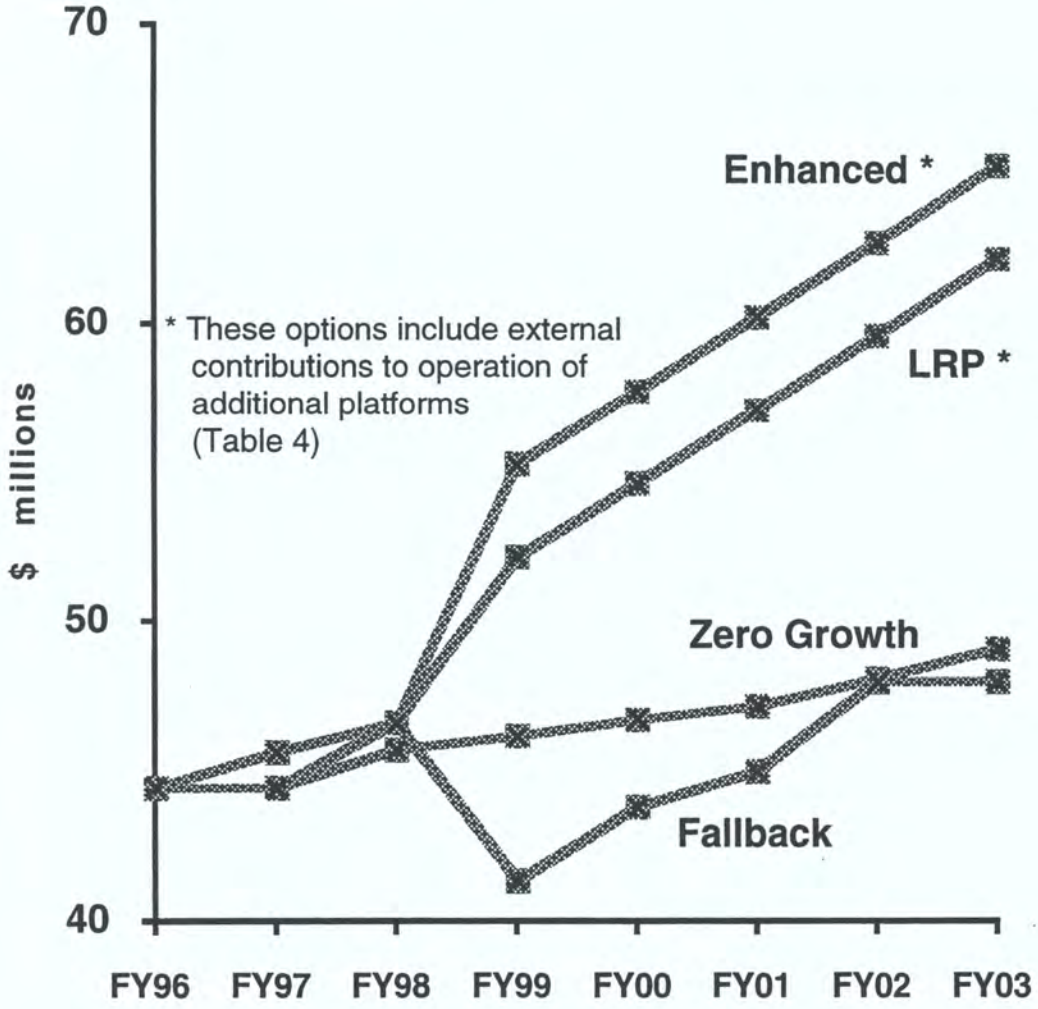
- ***Option 2***: This is the "Zero Growth Option." It is designed to achieve simpler, lower risk Phase II and Phase III science objectives, but this funding level compromises use of additional platforms, innovation and significant technology development. Program growth is only through participation of new members, with no increase in existing member contributions (NSF excluded).

- ***Option 3***: This is the "Fall-back Option." It assumes the loss of one of the existing non-US full members, and is designed to achieve as many Phase II and Phase III science objectives as possible, in the context of no use of additional platforms, possibly reduced leg enhancements and no technology development. It relies on new member participation and increased contributions from remaining Program participants to sustain the Program. The NSF contribution is capped at 60% of the total Program budget.

- ***Option 4***: This is the "Enhanced Program Option." and the one most likely to achieve all remaining Phase II and Phase III science objectives, while establishing a firm base for the implementation of Phase IV beyond 2003. It involves significant

Program growth over the next 6 years, and requires an average increase of 3% per year in member contributions over 7 years.

Figure 7: Budget Options - Summary



5.5 BUDGET CONSIDERATIONS - THE "LONG RANGE PLAN OPTION"

The ODP Long Range Plan includes a general budget strategy for the period 1996 through 2008. This is ***Option 1***, as described above. It is based on $44.4 million in FY 97, representing contributions from NSF and 5 full non-US members, plus the Australia/Canada Consortium contributing at the 2/3 level. The "Long Range Plan Option" also included the expected contributions from Korea, Chinese Taipei and China in FY 97, plus other new associate member contributions thereafter. The LRP "target budget" strategy for FY 97 through FY 03 is illustrated in Figure 2. The "target budget", as shown, does *not* include provision of $6 million for the major refit that is due sometime in 1999.

These options include the external contributions envisioned as part of the use of ancillary platforms (Table 3). The initial breakdown of the LRP "target budget" was presented to EXCOM and ODP Council in February, 1997. It is shown in Table 5, and is based on the following assumptions:

Table 5 - "Long Range Plan Option"

(a) ODP Funding Requirements Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Base Prog.Cost	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
Net Inflation				1.0	1.9	2.8	3.7	4.7
Innovations			1.0	1.4	1.7	2.1	2.5	2.9
Add'l Tech. Dev't			1.2	1.4	1.6	1.8	2.0	2.2
Add'l Platform				4.0	5.0	6.0	7.0	8.0
TOTAL	44.4	44.4	46.6	52.2	54.6	57.1	59.6	62.2

(b) ODP Funding Contributions Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
NSF funding	27.7	27.0	28.0	29.7	30.0	31.0	31.2	32.8
5 non-US Memb.	14.7	14.7	14.7	15.0	15.5	15.5	16.0	16.0
ACCTK Consort.	2.0	2.7	2.95	3.0	3.1	3.1	3.2	3.2
Assoc. Members			1.0	1.5	2.0	2.5	3.2	3.2
Add'l Platform				3.0	4.0	5.0	6.0	7.0
TOTAL	44.4	44.4	46.6	52.2	54.6	57.1	59.6	62.2

- base program funding is $44.4 million, based on existing contributions from NSF and 5 2/3 non-US members, as indicated above;
- average provision for inflation, from FY 98 through FY 03, is 2% compound on the base budget;
- provision for "innovation" starts at 2% in FY 98, rising to 6% of base plus inflation through FY 03. The allocation of 2% in FY 98 is predicated on use of new non-US Program contributions; and
- provision for additional technology development, over that included in the FY 97 budget, starts at 2.7% in FY 98, rising to 4.5% of base plus inflation through FY 03.

The allocation of 2.7% in FY 97 is also predicated on use of new non-US Program contributions.

- Provision is also made for a contribution from ODP funds to the charter and operation of additional drilling platforms, as discussed above. The total project cost is indicated in "funding requirements" (Table 4a). Total expected external contribution is shown in "contributions" (Table 4b). The net contribution from ODP funds is therefore the difference between these amounts (also shown in Table 3).
- The NSF contribution is assumed to grow from FY 98 through FY 03 at an average rate of just over 3% compound.
- The current non-US full member contribution is assumed to grow from FY 98 through FY 03 at an average rate of just over 1.5% compound (1% from FY 96 to FY 03).
- The total non-US contribution (current plus new members) is assumed to grow from FY 97 through FY 03 at an average rate of about 4% compound.
- The percentage NSF contribution is consequently assumed to fall from 62% in FY 96 to 60% or less from FY 98, not counting effective contributions from undefined sources for additional platforms.

5.6 BUDGET CONSIDERATIONS — THE "ZERO GROWTH OPTION"

The "Long Range Plan Option" assumes modest growth in NSF and non-US member contributions for the period 1998 through 2008. The "Zero Growth Option" assumes no such increase, with the only growth in overall Program funds coming from final completion of the AusCan Consortium by FY 98, new associate member contributions, and some additional NSF funding to meet the unavoidable impact of inflation from FY 01. This is shown in Table 6.

The impact of the "Zero Growth Option" on Program delivery, relative to the "Long Range Plan Option," is as follows:

- The "incentive" effect intended to influence the charter and operation of additional platforms, in cooperation with other international geoscience initiatives during ODP Phase III, is eliminated. Any operation of additional platforms would be solely dependent on new funds raised for the purpose.
- Innovation and additional technology development is drastically impacted
  - development of high resolution logs and new logging-while-drilling/coring innovation is not started;
  - progress on riser/riserless drilling on *JOIDES Resolution* stops in FY 98;
  - all new technology development stops in FY 99; and
  - all innovation stops in FY 01.
- The increase in the number of non-US members in the Program, concomitant with no access to additional platforms being available through the Program, would mean that the number of shipboard berths on *JOIDES Resolution* available to non-US participants would fall by about 15% by FY 02.

Table 6 - "Zero Growth Option"

(a) ODP Funding Requirements Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Base Prog. Cost	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
Net Inflation				1.0	1.9	2.8	3.7	4.7
Innovations			0.8	0.8	0.4			
Add'l Tech. Dev't			0.5					
Add'l Platform								
TOTAL	44.4	44.4	45.7	46.2	46.7	47.2	48.1	49.1

(b) ODP Funding Contributions Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
NSF funding	27.7	27.0	27.0	27.0	27.0	27.0	27.4	28.4
5 non-US Memb.	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
ACCTK Consort.	2.0	2.7	3.0	3.0	3.0	3.0	3.0	3.0
Assoc. Members			1.0	1.5	2.0	2.5	3.0	3.0
Add'l Platform								
TOTAL	44.4	44.4	45.7	46.2	46.7	47.2	48.1	49.1

5.7 BUDGET CONSIDERATIONS — THE "FALL-BACK OPTION"

An alternative low budget scenario that JOI was requested to examine, is the case where one current full non-US member drops out of the Program after FY 98. The resultant "Fall-Back Option" assumes the same growth in remaining non-US member contributions through FY 98, plus completion of the AusCan Consortium and involvement of new associate members, as in the "Long Range Plan Option". However, from FY 99 through FY 03, this option is developed on the assumption that NSF's contribution are fixed to a maximum of 60% of the total Program budget (or, $1^1/_2$ times the total non-US contribution).

The impact of the "Fall-Back Option" is shown in Table 7. It has a much more severe outcome than the "Zero Growth Option." Major impacts are as follows:

- No additional technology development, Program "innovations," or access to additional platforms can be achieved during ODP Phase III. Any operation of additional platforms would be dependent solely on new funds raised for the purpose.
- Underfunding means that standard Program leg enhancements and/or base level engineering developments would be affected drastically in FY 99 through FY 01.
- Overall risk to Program operations is substantial.

Table 7 - "Fall-Back Option"

(a) ODP Funding Requirements Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Base Prog. Cost	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
Net Inflation				1.0	1.9	2.8	3.7	4.7
Innovations			1.0					
Add'l Tech. Dev't			1.2					
Add'l Platform								
TOTAL	44.4	44.4	46.5	45.4	46.3	47.2	48.1	49.1

(b) ODP Funding Contributions Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
NSF funding	27.7	27.0	28.0	24.8	26.3	27.0	28.8	28.8
5 non-US Members to FY 98; then 4	14.7	14.7	14.7	12.0	12.4	12.4	12.8	12.8
ACCTK Consort.	2.0	2.7	2.9	3.0	3.1	3.1	3.2	3.2
Assoc. Members			1.0	1.5	2.0	2.5	3.2	3.2
Add'l Platform								
TOTAL	44.4	44.4	46.6	41.3	43.8	45.0	48.0	48.0

5.8 BUDGET CONSIDERATIONS - THE "ENHANCED PROGRAM OPTION"

JOI has also examined the implications of *increasing* the overall Program funding by the equivalent of one full non-US member ($3.0 to $3.2 million per year) from FY 99 through FY 03. Table 8 shows how these additional funds could be applied to the achievement of enhanced Long Range Plan goals and objectives ("funding

requirements" Table8a). Table 8(b) shows how the increases in external contributions might be partitioned between all Program contributors.

It is suggested that the most effective use of such additional Program funds might be increasing the ODP contribution to the charter of additional drilling platforms, required to accelerate the achievement of the widest range of Long Range Plan goals. The effective increase in the "incentive" would clearly encourage more effective collaboration with other international geoscience programs. The additional $3.0 to $3.2 million per year would guarantee an additional drilling leg per year in shallow water (<75 m), or in the Arctic. This would also increase the scientific participation in the Program. Again, there is no implication that the operation of any additional platform under this scheme is necessarily the prerogative of the current ODP Science Operator at ODP/TAMU.

Table 8 - "Enhanced Program Option"

(a) ODP Funding Requirements Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Base Prog. Cost	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
Net Inflation				1.0	1.9	2.8	3.7	4.7
Innovations		0.5	1.0	1.4	1.7	2.1	2.5	2.9
Add'l Tech. Dev't		0.7	1.2	1.4	1.6	1.8	2.0	2.2
Add'l Platform				7.0	8.1	9.1	10.2	11.2
TOTAL	44.4	45.6	46.6	55.2	57.7	60.2	62.8	65.4

(b) ODP Funding Contributions Projection								
	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
NSF funding	27.7	27.7	27.6	31.4	32.4	32.7	33.7	34.6
5 non-US Members	14.7	14.7	15.0	16.0	16.0	16.5	16.5	17.0
ACCTK Consort.	2.0	2.7	3.0	3.2	3.2	3.3	3.3	3.4
Assoc. Members		0.5	1.0	1.6	2.1	2.7	3.3	3.4
Add'l Platform				3.0	4.0	5.0	6.0	7.0
TOTAL	44.4	45.6	46.6	55.2	57.7	60.2	62.8	65.4

The additional funding could be achieved by increasing the US contribution by an average of 4.6% per year between FY 98 and FY 03, and individual non-US member contribution levels by an average of 3% per year. Overall non-US contribution levels would rise by an average of 4.6% per year between FY 98 and FY 03.

5.9 BUDGET CONSIDERATIONS — SUMMARY OF IMPACTS

A summary of the different budget options on the implementation of the base Program, additional technology development, Program "innovation", and access to additional platforms is shown in Table 9. Clearly, anything less than the "Long Range Plan" option could be seen as "more of the same" and well short of the science outlined in the Long Range Plan and detailed above.

Table 9 - Budget Options - Summary Impacts

Option	Base Program	Additional Platform	New Technology	Program "Innovation"
"Long Range Plan"	*yes (some risk)*	*part*	*yes*	*yes*
"Zero Growth"	*yes (high risk)*	*no*	*no*	*no*
"Fall-back"	*reduced program*	*no*	*no*	*no*
"Enhanced Program"	*yes*	*yes*	*yes*	*yes*

The specific impacts on the science initiatives presented in this document are shown in Table 10, which considers each of the accomplishments that ODP expects to achieve by the end of Phase III, as listed in Section 3.3. The major impact on understanding both rapid and orbital time scale climate changes would be the lack of high-resolution downhole logs. Although multiple coring at a single site can ensure the recovery of a continuous sedimentary record, the lack of high-resolution logs would severely limit the ability to make the core-to-core correlations necessary to create a complete composite section. Heat transport studies, which could be addressed mostly through the "gateway" studies approach that ODP currently employs, would be possible under all the budget scenarios, although improving the resolution of these studies would again be limited by the lack of high-resolution downhole logging. However, in the Fall-back budget option, such studies would also be limited to areas not requiring ice-support vessels. Understanding ice sheet history and sea-level change would be constrained in any but the LRP and Enhanced Program scenarios, not only because of the lack of high-resolution downhole logging tools to determine and correlate physical properties, but more importantly, because of the need for ancillary platforms for both Arctic and shallow water drilling, which would not be available under the Zero Growth and Fall-back budget options.

Table 10 - Impact of Budget Options on Projected Scientific Accomplishments

Accomplishment	LRP	Zero Growth	Fall-back	Enhanced Program
Climate Variations	*yes*	*no high resolution logs*		*yes*
Orbital Time Scales	*yes*	*no high resolution logs*		*yes*
Heat Transport	*yes*	*yes*	*maybe*	*yes*
Ice Sheet History	*mostly (risk)*	*Antartica only*	*no*	*yes*
Sea-Level Change	*mostly (risk)*	*not shallow*	*no*	*yes*
Gas Hydrates	*yes*	*yes*	*maybe*	*yes*
Fluid Flow	*yes*	*no*	*no*	*yes*
Biosphere	*yes*	*yes*	*no*	*yes*
Ocean Crust Struct.	*yes*	*shallow*	*no*	*yes*
Ophiolite Model	*yes*	*shallow*	*no*	*yes*
Hydrothermal Processes	*yes*	*shallow*	*no*	*yes*
Ridge Axis Observ.	*yes*	*no*	*no*	*yes*
Subduction Fluxes	*yes*	*shallow*	*shallow*	*yes*
Continent Breakup	*yes*	*shallow*	*no*	*yes*
Earthquake Processes	*yes*	*no*	*no*	*yes*
Borehole Observatories	*yes*	*yes*	*standard*	*yes*

Objectives related to sediments and fluids would be significantly impacted by Zero Growth in the budget because considerable technological development of hydrogeological experimental equipment (e.g., packers, pumping equipment, etc.) is needed before fluid flow issues can be addressed well. ODP has already completed one leg that drilled gas hydrates, and so their continued study would be possible under most of the budget scenarios. However, a reliable and routine method of collecting pressurized cores and then extracting sub-samples of fluids and gases for analyses is desperately required; this development would be unlikely in the Fall-back scenario. Since the current state of knowledge about the subsurface biosphere is so meager, significant progress can be made on this new direction for ODP with the addition of microbiological lab facilities to the drilling vessel. However, more detailed experimental work on the interactions of microbes with fluids will require the use of packers and more advanced CORKs, the development of which would be limited in the Fall-back budget option.

Assuming that the current engineering implementation plan for active primary heave compensation will lead the way to implementation of diamond coring, the major

impact of budgetary limitations on objectives under the "Dynamics of Earth's Interior" will result from the lack of progress towards development of (i) a mud circulation system to improve depth of penetration, deeper drilling in hydrocarbon risk areas, and borehole stability and conditions, (ii) logging-while-drilling/coring to enable unstable formations, such as hydrothermal deposits, to be logged, and (iii) improved downhole instrumentation and data retrieval methods for use in holes designated as observatories. Under the Zero Growth option, drilling would be limited to shallow depths and logging to stable formations, and the implementation of any observatory program would be curtailed. Under the Fall-back option, the lack of any technological innovation, and particularly the possible decrease in base level engineering development, would limit significant progress under this theme to initial shallow studies of subduction fluxes, and drilling observatory holes only for installation of seismometers.

This analysis demonstrates that, even in a Zero Growth budget, the scientific objectives that can be accomplished are considerably less than outlined in the ODP Long Range Plan. If ODP is going to go beyond "business as usual" and pursue new and exciting directions in Phase III, it is absolutely critical that there is modest growth in the budget over the next five years.

PROGRAM	**THE MESOZOIC SOMALI BASIN**
Proposal	**079-Rev2**
Title	**The Mesozoic Somali Basin: Tethys and the Birth of the Indian Ocean**
Proponents	**M.F. Coffin, A. Bosellini, J.E.T. Channell, W.W. Hay, H. Jenkyns, J.G. Ogg and P. Blum**

BRIEF DESCRIPTION

We propose to drill deeply (~3000 m) into sediment and oceanic basement of the Western Somali Basin in order to obtain Mesozoic sediment and basalt associated with the waning Tethyan Ocean and the nascent Indian Ocean. Our site, WSB-1, addresses: 1) Mesozoic global change, including paleoceanography and paleoclimate; 2) geochemistry, petrology, and hydrothermal alteration of Jurassic oceanic crust; 3) Gondwanan plate kinematics; 4) Mesozoic bio-magnetostratigraphy and chemostratigraphy; 5) sedimentary mass balance; and 6) state of stress of the Somalian plate.

For the preparation and identification of a potential deep-penetration ODP site and alternates, a marine geophysical survey in the Western Somali Basin has been proposed (079-Add).

We want to aquire a data set in this region comparable to our data set collected at the conjugate Antarctic continental margin for the following reasons:

- determination of timing and nature of break-up;
- comparison of the seismic crustal structure and of the magnetic anomaly characteristics of the Mesozoic-aged oceanic crust in the Somali Basin and in the Lazarev Sea, Riiser-Larsen Sea;
- study of similarities and differences of the seismostratigraphic characteristics of Mesozoic ocean circulation accounted for by the tectonic processes taking place at convergent margins.

PROPOSAL HISTORY					
NUMBER	**REVIEW**	**RANKING**			
		LITHP	OHP	SGPP	TECP
079 Rev2	SPRING 1995		11		
079-Rev2	FALL 1995				
079-Rev2	SPRING 1996*				
	FALL 1996			11	11

*Proposal 079-Rev2 was not ranked in SPRING 1996 as it was inadvertently omitted from the Active Proposal List.

REVIEWS

LITHOSPHERE PANEL

FALL 1996

This proposal has been poorly ranked by the panel in the past. The proponents have not included LithP objectives in the proposal. Why was this site chosen as a selected deep hole despite being poorly ranked by the Thematic Panels in the past?

SEDIMENTARY AND GEOCHEMICAL PROCESSES PANEL

FALL 1996

Rankings: A3, B1.3, B2.1, C3/C4, D2, E0, F4/F5

This addendum provides a summary for a proposed site survey of the Somali Basin. Because it is written in German, it is somewhat difficult to evaluate. However, based on the English summary, it appears as though no significant changes on scientific objectives have been made since proposal 079-Rev2 was submitted in 1993.

SGPP has never considered this proposal to be of high thematic priority. SGPP has never included the proposal in any of its global rankings. In the years since 079-Rev2 was submitted, SGPP rewrote its White Paper, and JOI/ODP formulated a new Five-Year Plan. Unfortunately, nothing has been added to clarify or improve the aspects of interest to SGPP. The thematic goal of "sedimentary mass balance" dates back to an earlier SGPP White Paper. The proponents fail to provide the details necessary for us to give this vague objective a fair evaluation, but even if they had, the theme is no longer of high priority to SGPP. The role of eustatic sea-level is mentioned briefly, as a potential control on rates and processes of sediment accumulation. This potential exists within virtually every sedimentary succession. Why should ODP focus its efforts on the Somali Basin example? Evidently, the proponents merely hope to match non-eustatic pulses in turbidite deposition with phases of local tectonic activity. SGPP remains quite interested in the effects of sea-level fluctuations (in general), but to be meaningful and definitive, studies of this type need to follow the guidelines of the Sea-Level Working Group. The drilling sites must be located along transects that are tied closely to changes in seismic-reflection geometry. Drilling a single very deep hole through flat-lying reflectors will tell us very little (nothing?) about how sea-level affects three-dimensional facies architecture.

Presumably, the proponents plan to hang their borehole stratigraphy on the eustatic template of Haq and others. They fail to provide convincing justification, however, as to why this should be done in the Somali Basin as opposed to any other continental margin. The real purposes of this study are: (1) to determine the timing and nature of continental break-up; (2) to study magnetic anomaly characteristics of Mesozoic-aged oceanic crust, and (3) to compare the stratigraphic characteristics of Mesozoic sequences to both sides of the SW Indian Ridge. As such, the study remains marginally relevant to SGPP

objectives, at best. There is little chance of success with respect to SGPP thematic priorities, and the proposal is unlikely to become a high priority.

TECTONICS PANEL

FALL 1994

Tectonic objectives need to be placed into the proper scientific framework. Currently there is insufficient seismic data coverage over the proposed drilling region and the drilling sites remain undefined. It is unconvincing that only one hole can uniquely constrain the proposed kinematic models. Clarification is needed as to why stress measurements in addition to those available on land are needed and wheher it is essential to drill into oceanic crust in order to obtain reliable values of stress. If the kinematic history is solved with new magnetic, gravity and seismic data collected by a pre-site survey then the need to drill to basement for the purpose of discerning between existing kinematic models can be removed. **Ratings: A6, B1.2, B2.1, C3, D2, E2, E3, E6, E8, F4**

SITE SURVEY PANEL NOVEMBER 1996

No remarks.

LOGGING PROSPECTUS NOVEMBER 1996

This proposal will core a single deep site in the Somali Basin, into some of the world's oldest oceanic crust. A single hole is planned to 3000 m depth, coring 2500 m of sediment and 500 m of basement. The scientific aims of the leg are to obtain Mesozoic sediment and basalt associated with the waning Tethyan Ocean and the nascent Indian Ocean, specifically: 1) Mesozoic global change, including paleoceanography and paleoclimate; 2) geochemistry, petrology, and hydrothermal alteration of Jurassic oceanic crust; 3) Gondwanan plate kinematics; 4) Mesozoic bio-magnetostratigraphy and chemostratigraphy; 5) sedimentary mass balance; and 6) state of stress of the Somalian plate.

Downhole logging will be critical to these scientific objectives, providing continuous measurements where core recovery is (inevitably, in a single hole) incomplete, and complementary to in-situ measurements where recovery is good.

For paleoceanography, the geophysical tools will be able to detect cycles and long term changes in the sediment properties. Natural gamma measurements and GLT (geochemical) logging will be able to distinguish between claystones, siltstones, and calcareous and organic-rich sediment. The susceptibility measurement of the GHMT tool should be useful as a tracer for detrital sediment input. FMS will record sub-cm-scale changes in porosity and grain-size, and provide detailed images of fractures, turbidites and other sedimentological features, from which dip and strike directions can be determined.

In the basaltic basement, the logs are especially important, as core recovery is often more difficult than in sediments. The FMS will give detailed images of pillow lavas, sheeted dikes, breccias, and also the distribution of vesicles and direction of veins and fractures. The geophysical and geochemical logs will also distinguish different basalt types, useful in determining the true proportions and distribution where core recovery may be biased to one type or the other. The GLT will give major-element abundances.

For magnetostratigraphy, the GHMT should give an essential continuous magnetic reversal record through the sediment column. The GHMT is unlikely to provide directional information that is useful to plate kinematics, as the sensor measures only scalar intensity of the magnetic field in the borehole.

The BHTV could be used to determine the in-situ stress in the hole, if break-outs of the borehole wall occur; these breakouts will be aligned according to the present stress field.

A VSP would help correlate depth to lithological horizons with seismic reflectors, and hence aid seismic stratigraphic interpretations, and also sedimentary mass balance calculations.

The proposed hole would be the deepest yet drilled by the ODP, and therefore there are large uncertainties surrounding the drilling time, and consequently the hole conditions. The drilling strategy will hinge on how many sections of the hole will be logged separately. Leaving all logging until hole completion is not possible, as borehole deterioration for such a deep hole will be severe. Logging is recommended to be carried out in two sections in the sediment (at bit changes), and once in the basement.

Site	**Water depth**	**Penetration**		**Logging Operations**
		sediment	**basement**	
WSB-1	4000	2500	500	Triple, FMS-Sonic, GHMT, GLT, BHTV, VSP

PROGRAM	THE MESOZOIC SOMALI BASIN
Proposal	079-Rev2
Title	The Mesozoic Somali Basin: Tethys and the Birth of the Indian Ocean
Proponents	M.F. Coffin, A. Bosellini, J.E.T. Channell, W.W. Hay, H. Jenkyns, J.G. Ogg and P. Blum

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We want to aquire a data set in this region comparable to our data set collected at the conjugate Antarctic continental margin for the following reasons:

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- comparison of the seismic crustal structure and of the magnetic anomaly characteristics of the Mesozoic-aged oceanic crust in the Somali Basin and in the Lazarev Sea, Riiser-Larsen Sea;

- study of similarities and differences of the seismostratigraphic characteristics of Mesozoic ocean circulation accounted for by the tectonic processes taking place at convergent margins.

PROPOSAL HISTORY					
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079-Rev2	FALL 1995				
079-Rev2	SPRING 1996*				

*Proposal 079-Rev2 was not ranked in 1996 as it was inadvertently omitted from the Active Proposal List.

REVIEWS

LITHOSPHERE PANEL

FALL 1993

This proposal meets major LITHP objectives. The panel recognizes that this is a mature proposal but there are still a few deficiencies. There is a need for more detailed survey data; the panel encourages the proponents to proceed with their efforts to collect this data. Much of the LITHP support for this effort is based on the potential for comparisons with Site 801. A key element in such comparisons, missing from this proposal, is the physical characterization of the crustal section. The proponents should contact Leg 129 scientists involved in such studies. The proponents should also understand, however, that should they put this additional work into the proposal there is still another factor that might influence the degree to which LITHP can support the proposal. As it stands now, it is not clear that LITHP objectives can be met with a single leg of drilling. Time estimates for the proposed site are on the order of 80 days. The proponents should consider this issue in an exact site location based on new site survey data.

OCEAN HISTORY PANEL

FALL 1993

There are strong OHP interests in this proposal as discussed in our review of 079-Rev1 (Spring 1993). We continue to endorse these earlier comments about the scientific merits and strengths of this revision. However, in subsequent documents, we ask that the proponents explain how many of the objectives and ideas can be addressed adequately through the acquisition of only one site. Some of the claims seem to be overstated, particularly in the paleoclimate section. We ask that more specifics be provided concerning how

spatially-dependent phenomena will be addressed. OHP also requests clarification of the drilling time estimates, as we were informed by the TAMU representative at our meeting that this one borehole will require more than one leg, rather than the 45-50 days indicated by the proponents. At the moment, it is unknown if OHP could or would strongly support two full legs for this project. We note that the basement objectives are not of OHP interest. Finally, we ask the proponents to determine if the DCS is needed to meet the scientific objectives of this proposal, and what the alternatives would be in the absence of the DCS system.

We note that site survey data are incomplete and that a drilling site has not been chosen. We have given a panel interest value of 4 (addresses high-priority objectives, but with deficiencies), rather than the 5 (addresses high-priority objectives) previously given. This change, based on the lack of site survey data, is solely to make OHP's assignments of panel interest consistent, and in no way indicates any reduction of OHP's scientific interests in this very interesting and well-presented document.

SEDIMENTARY AND GEOCHEMICAL PROCESSES PANEL

FALL 1993

Through the drilling of a single hole to a depth of about 3000 m (est. drilling time = 45-50 days), this proposal aims to accomplish a wide variety of objectives that deal with the Mesozoic history of Tethys and the Indian Ocean, including hydrothermal alteration of crust, mass balance, black shales, global stratigraphy, sea level, and old sediments. The proponents have nicely incorporated a large amount of information from previous marine surveys and drilling sites as well as integrated substantial geological information from nearby continental areas. The geological setting of the probable drill site is therefore well established, providing ample documentation that the proponents have probably selected the most suitable location to achieve their objectives. Since this would be a deep hole to basement, one probable problem will be the penetration of likely chert-chalk sequences. Overall, however, this is a well- formulated proposal with worthy objectives.

The main objectives, however, lie mostly in the purview of TECP and OHP. With regard to SGPP objectives, the sea level and sequence aspects of this area cannot be addressed by drilling one hole in the basin. Flat lying reflections suggest that most sequence boundaries will be conformable in the basin area. A transect to the continental margin is necessary, as well as comparative holes on other margins. Biostratigraphic dating may not have high enough resolution to date sea level events. Other salient SGPP objectives are the determination of a general sedimentary mass balance for this region and the origin of black shales. But, again, a transect approach would be necessary to understand sediment flux, and it is difficult to see how one hole in the basin will answer questions of black shale origin. Although a single hole can

establish the age and lithologies at this one site, one might question how applicable this would be to a regional calculation (though careful correlation of seismic records could be valuable in this regard). SGPP would also certainly have an interest in the proposal to study alteration of the Jurassic oceanic crust in this region as a means to understand the global geochemical budget.

This proposal was originally revived when SGPP was requested by PCOM to suggest a possible deep drilling site, but has never really been ranked highly by the panel. The proposal will likely remain categorized as a 3 because of its secondary themes related to SGPP objectives. But, because of the limited scope of what can be achieved with a single hole, it will probably never be of high priority to SGPP.

TECTONICS PANEL

FALL 1993

This a technically challenging site at 4000 m. water depth, involving penetration of 2500 m of sediments and 500 m of basalt. The location is indeed critical to an understanding of the Mesozoic evolution of Tethys from the Atlantic to the northern Australian areas, which have been the target of previous DSDP and ODP drilling. Most of the objectives are essentially paleoceanographic and thus outside TECP's mandate. The main questions of tectonic interest are the nature and alteration of Jurassic marginal oceanic crust, regional plate reconstructions, and in situ stress measurement. None of these topics, however, are of sufficient importance to TECP to justify drilling based on tectonics objectives alone. TECP would, however, have a lively interest if the proposal emerges as a high priority for another panel. TECP encourages the proponents to obtain the necessary additional site survey data to allow specific site locations.

TECP emphasizes also its desire for three-dimensional characterization of the proposed drill sites wherever possible. Detailed structural maps and accurate true-scale cross-sections (balanced to the extent possible) need to be presented to provide better constraints and justifications for the drillsites. The specific objectives and hypothesis-testing questions for each drill site should be clearly stated.

ODP Proposal Log Sheet **079-Rev2**

Proposal received: Jun 28, 1993
Proposal reviewed: Fall 1993

☐ *New proposal* ☒ **Revised proposal** ☐ *Addendum to proposal* ☐ *Other*

The Mesozoic Somali Basin: Tethys and the Birth of the Indian Ocean

M.F. Coffin, A. Bosellini, J.E.T. Channell, W.W. Hay, H. Jenkyns, J.G. Ogg and P. Blum

Abbrev. Title: Tethys and the birth of the Indian Ocean	Key: Tethys/Indian Ocean	Area: Ind

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Objectives:

1. Mesozoic global change including paleoceanography and paleoclimate.
2. Geochemistry, petrology, and hydrothermal alteration of Jurassic ocean crust.
3. Gondwanna plate kinematics.
4. Mesozoic bio-magnetostratigraphy chemostratigraphy.
5. Sedimentary mass balance.
6. State of stress of the Somali Plate.

Specific area: Western Somali Basin

Proposed Sites: As on site summary form of this proposal

Site Name	Position	Water depth	Penetration Sed	Bsmt	Total	Brief site-specific objectives
WSB-1	3°0'S; 45°0'E	4000	2500	500	3000	Mesozoic global change, bio-magnetic & chemostrat.

Proposal acknowledged by JOIDES Office:	Jul 21, 1993	to:	Coffin, M.F.
Proposal forwarded for review:	Jul 16, 1993	to:	LITHP, OHP, SGPP, TECP
Proposal copies:	Jul 16, 1993	to:	JOI Inc., SO (ODP/TAMU), SSDB
Proposal forwarded to DPG:	00/00/00	to:	

ODP Proposal Log Sheet 079-Rev2

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Brief Description:

We propose to drill deeply (~3000 m) into sediment and oceanic basement of the Western Somali Basin in order to obtain Mesozoic sediment and basalt associated with the waning Tethyan Ocean and the nascent Indian Ocean. Our site, WSB-1, addresses:1) Mesozoic global change, including paleoceanography and paleoclimate;2) geochemistry, petrology, and hydrothermal alteration of Jurassic oceanic crust;3) Gondwanan plate kinematics;4) Mesozoic bio-magnetostratigraphy and chemostratigraphy;5) sedimentary mass balance; and6) state of stress of the Somalian plate.

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079-Rev2

THE MESOZOIC SOMALI BASIN: TETHYS AND THE BIRTH OF THE INDIAN OCEAN

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25 June 1993

Abstract

We propose to drill deeply (~3000 m) into sediment and oceanic basement of the Western Somali Basin in order to obtain Mesozoic sediment and basalt associated with the waning Tethyan Ocean and the nascent Indian Ocean. Our site, WSB-1, addresses: 1) Mesozoic global change, including paleoceanography and paleoclimate; 2) geochemistry, petrology, and hydrothermal alteration of Jurassic oceanic crust; 3) Gondwanan plate kinematics; 4) Mesozoic bio-magnetostratigraphy and chemostratigraphy; 5) sedimentary mass balance; and 6) state of stress of the Somalian plate.

1.0 Introduction

The Somali Basin in the western Indian Ocean (Fig. 1) is one of the oldest ocean basins in the world (Ségoufin and Patriat, 1980; Rabinowitz et al., 1983; Coffin and Rabinowitz, 1987; Cochran, 1988), its western portion having begun opening in Early to Middle Jurassic time following prolonged, episodic rifting (Coffin and Rabinowitz, 1988, 1992). A Mesozoic age is also implied for the northern part of the basin, although no marine magnetic anomalies have been identified there to date. Much of the deep sea record adjacent to the southern margin of the Tethys has been destroyed by the rifting and northward drift of terranes that split off the Gondwanan margin and subsequently collided with Asia (Fig. 2; e.g., Wilson et al., 1989). The Somali Basin probably contains the only *in situ*, untectonized sedimentary record of Mesozoic Tethys between the North Atlantic and the Argo Abyssal Plain off northwest Australia.

Sediment and igneous crust of the Somali Basin offer unique opportunities for new research in Mesozoic global change, Jurassic oceanic crust, plate kinematics, bio-magnetostratigraphic and chemostratigraphic correlation, and sedimentary mass balance. Furthermore, investigation of the state of stress in the igneous crust may shed light on heretofore inconsistent results concerning the existence and tectonic regime of an independent Somalian plate.

We propose that the Ocean Drilling Program (ODP) investigate the Mesozoic history and current stress regime of the Western Somali Basin by drilling a single deep hole. This proposal exploits engineering and technological research, now a

major part of the ODP budget, and will hopefully stimulate accelerated improvement in deep drilling capability and development of the diamond coring system for improved recovery of limestone/chert sequences.

1.1 Tectonic Framework

The Somali Basin and its conterminous conjugate continental margins were formed by the initial breakup between East and West Gondwana which resulted in contraction of Tethys and expansion of the Indian Ocean. Prior to and coeval with sea floor spreading in the basin, Paleotethys was superseded by Neotethys during Triassic and Jurassic time, and Neotethys was replaced by the Indian Ocean during the Cretaceous and Cenozoic (Fig. 2).

Both the Western and Northern Somali basins are distinctive sub-basins in the Western Indian Ocean bordered by continental margins and fracture zones (Figs. 1, 3). Their deeper (>4000 m) portions are generally characterized by low relief, and igneous basement commonly lies 6-8 km below sea level (Fig. 4). No Deep Sea Drilling Project (DSDP) site in either basin (Fig. 1), 234 and 235 in the north (Fisher, Bunce, et al., 1974), and 240 and 241 in the west (Simpson, Schlich, et al., 1974), have penetrated igneous basement.

Although three differing interpretations of Mesozoic magnetic anomalies in the Western Somali Basin have been proposed (Fig. 3), the ~10 m.y. age differences do not affect the overall tectonic framework (Fig. 2, 5). The oldest identifiable magnetic anomaly in the Western Somali Basin is Late Jurassic in age, being either M22 (Ségoufin and Patriat, 1980; Cochran, 1988) or M25 (Rabinowitz et al., 1983; Coffin and Rabinowitz, 1987). Between the coast of East Africa and these anomalies, however, lies a zone of crust interpreted as oceanic in origin (Coffin et al., 1986; Coffin and Rabinowitz, 1987) which is characterized by low-amplitude magnetic anomalies. By extrapolating spreading rates determined from identified magnetic anomalies in the Western Somali Basin to the crust between the oldest anomalies and the interpreted continent-ocean transition, the age of onset of sea floor spreading has been estimated at ~165 Ma, or Callovian (Rabinowitz et al., 1983; Coffin and Rabinowitz, 1987). Spreading half-rates estimates in the Western Somali Basin range from 1.3 to 1.8 cm/yr (Ségoufin and Patriat, 1980; Rabinowitz et al., 1983;

Cochran, 1988). No marine magnetic anomalies are yet recognized in the Northern Somali Basin.

1.2 Oceanic Basement

Igneous basement of the Western Somali Basin is seismically oceanic, based on numerous sonobuoy experiments (Fig. 6). It may be characterized either in terms of a layered model - layers 2B (5.42±0.19 km/s), layers 2C (6.23±0.22 km/s), 3 (7.03±0.25 km/s), and mantle (7.85±0.32 km/s) have been identified - or a gradient model, in which layer 2 is marked by a steeper velocity gradient than underlying layer 3 (Coffin et al., 1986). Integrated igneous crustal thicknesses (1.62±0.22 s, or 5.22±0.64 km; Fig. 7) are significantly thinner than the global average of 7.1±0.8 km (White et al., 1992). No coherent reflections are observed from within the igneous crust on MCS data; this may be due in part to the relatively small energy source (1000 in^3) employed (Coffin and Rabinowitz, 1988).

1.3 Stratigraphy

The Mesozoic geological development of the Western Somali Basin and its conterminous continental margins has been addressed most recently by Coffin and Rabinowitz (1988, 1992) and Bosellini (1986, 1989, 1992).

1.3.1 Continental Margins

Karoo sediment records a ~150 m.y. history of rifting, subsidence, and uplift accompanied by crustal extension and thinning in East Africa and Madagascar (Fig. 8). Sedimentary basins began forming in Late Paleozoic time, and intermittent rifting along consistent fault trends continued until initiation of sea floor spreading between Madagascar and Africa in Middle Jurassic time. Although predominantly continental, Karoo sediment contains many marine intervals. These include salt layers in Tanzania (Permian through Bajocian) and in the conjugate rift basins of Somalia and northern Madagascar, and Middle Permian through earliest Triassic marine strata in northeast Madagascar. Between the Early and Middle Jurassic, both the East African and Madagascan margin sediment changed from dominantly continental to overwhelmingly marine (Figs. 9, 10). Igneous rocks of those ages were extruded along the margins of Somalia and northwestern Madagascar, and all

of the basins experienced widespread faulting. All onshore basins contain Late Jurassic through Early Cretaceous mixed marine and continental facies rocks, and Upper Cretaceous volcanic rocks have been encountered in every basin except the Lamu Embayment in Kenya.

1.3.2 Deep Western Somali Basin

Four major reflecting horizons, *blue, red, purple,* and *green,* from bottom to top, are traceable throughout most of the Western Somali Basin (Figs. 11, 12); isopach maps show thicknesses of the intervening sequences (Figs. 13-16). The top of oceanic basement is the *blue* horizon; the age of the horizon coincides with the interval of sea floor spreading in the Basin, or Middle Jurassic through Early Cretaceous, and is thus time-transgressive. The *red* reflection immediately overlies oceanic basement, and is confined to the older parts of the Western Somali Basin. Consequently it is believed to be of Middle to Late Jurassic age. This reflection is prominent and high-amplitude, and commonly fills basement troughs. At the *red* reflection, p-wave velocity increases markedly to 4.6 km/s from lower velocities in overlying sediment (Coffin et al., 1986). Offshore the only well relevant to the Mesozoic evolution of the Somali Basin is DSDP Site 241 (Fig. 11, 12), which was drilled in a water depth of 4,054 m, penetrated 1,174 m subbottom into Turonian-Santonian claystone, and recovered 137 m of sediment (Simpson, Schlich, et al., 1974). The entire Upper Cretaceous section chiefly comprises claystone, locally nannofossil-rich, but spot-coring produced only a fragmentary record. Site 241 probably did not penetrate the prominent *purple* horizon observed at 1.0 to 1.1 s sub-bottom. By employing a velocity of 2.2 km/s derived from multichannel seismic (MCS) velocity analysis and sonobuoy measurements, and by extrapolating sedimentation rates, we estimate the age of the *purple* horizon to be mid-Cretaceous (Cenomanian-Albian). The *green* reflection, observed as a strong reflection ~0.5 s subbottom, correlates with a middle Eocene through late Oligocene hiatus at ~470 mbsf. Thus two entirely and one partly Mesozoic seismic sequences are observed in the Western Somali Basin.

The *red* reflection is observed proximal to the East African margin, and lies so deeply buried that it is only discernible on MCS data. It is commonly flat-lying, although faulted in places (Fig. 17). The reflection is conformable with sediment below and above in some places; in other places it truncates underlying reflections.

It correlates with the top of a high-velocity (4.6 $\pm$ 0.3 km/s) layer overlying acoustic basement (Coffin et al., 1986). Because this reflection has not been drilled, because the high velocity is not diagnostic of any particular rock type, and because the reflection cannot be traced to onshore outcrop, its geology can only be surmised. However a massive Middle to Upper Jurassic limestone both crops out and has been drilled onshore in both East Africa (Kent et al., 1971; Beltrandi and Pyre, 1973; Walters and Linton, 1973; Kent, 1982; Bosellini, 1989, 1992) and Madagascar (Besairie and Collignon, 1971; Boast and Nairn, 1982). The *red-blue* section may be the offshore equivalent of this unit (Coffin and Rabinowitz, 1988, 1992). The sequence consists of a regular series of low-frequency, parallel reflections, and thins from >1,000 m beneath the continental rise to zero in the deepest portions of the Western Somali Basin. It fills basement troughs and its narrow, linear distribution may result from basement-controlled, margin-parallel sedimentation processes during the early phases of continental separation.

The *purple-red* interval, assumed to range in age from Jurassic through mid-Cretaceous, is observed mainly on the rifted portion of the East African margin. Commonly the unit thickens landward, although there are indications of a fan deposit and a margin-parallel sedimentary ridge (Coffin and Rabinowitz, 1988, 1992). The reflection character of *purple* varies widely offshore East Africa, lending complexity to interpretations of its regional significance. In the vicinity of DSDP Site 241 (Fig. 12), the character of the reflection changes. To the southeast, the reflection is an angular unconformity with overlying sedimentary onlap. To the northwest, the horizon is conformable with the sedimentary section, although sequences above and below have distinctive reflection characters. The nature of the *purple-red* sequence in the vicinity of Site 241 is not known; the reflection character is disrupted with a few intermittent reflections. In places (Fig. 18), the *purple* reflection is a hummocky horizon that locally has hyperbolic reflections. It is probably an unconformity. In places, the reflection is obviously an erosional unconformity, as a small channel with onlap fill at ~6.5 s two-way travel time demonstrates (Fig. 19). Just beneath 7 s two-way travel time in the *purple-blue* sequence (Fig. 19) is a lenticular reflection configuration, likely marking a time of vigorous bottom circulation. Farther to the south the horizon cannot be interpreted be identified as an unconformity (Fig. 20); south of ~6.5°S it ceases to be identifiable as a unique horizon. In general the reflection separates overlying sediment displaying parallel, closely-spaced, fairly continuous, regular reflections from

underlying sediment showing a lower-frequency, parallel, and fairly discontinuous reflection character (Figs. 11, 18-20). The typical reflection-free character, especially in the south, of the *purple-red* (or *purple- blue*) section indicates little variation in acoustic impedance throughout the interval, perhaps the result of uniform pelagic sedimentation. The interpreted fan and sedimentary ridge both trend northeasterly toward the major ocean basin of the time, Tethys (Fig. 2), and thus may provide information on paleocirculation patterns. Ocean circulation probably intensified towards Tethys, perhaps explaining the conformity of the *purple* reflection with underlying sediment in the south, and its more unconformable nature with sediment beneath it in the north.

The mid-Cretaceous (*purple*) to Oligocene (*green*) sequence interpreted on MCS data generally thickens toward the margin, reaching a maximum of >2,000 m offshore from the Kenya-Somalia border. In contrast to the underlying *purple-red* sequence, this sequence shows a reflection character indicating an energetic sedimentation regime. The *purple* reflection becomes unconformable with overlying sediment towards the north (Fig. 21). Parallel reflections (perhaps turbidites) onlap the *purple* horizon southeast of DSDP Site 241 (Fig. 21). The *green-purple* interval consists of parallel reflections. At continental rise depths, the *green-purple* interval has a reflection character indicating high-energy sedimentary processes (Fig. 22); contorted, chaotic, hummocky, wavy, and shingled clinoforms are apparent. At greater water depths, similar reflection configurations are observed (Fig. 22), again indicating an energetic bottom environment.

2.0 Scientific Themes

Recovering Mesozoic sediment and igneous rock by drilling in the Somali Basin will allow us to address fundamental global questions involving 1) Mesozoic global change, 2) the nature and evolution of old oceanic crust, 3) bio-magnetostratigraphy and chemostratigraphy, 4) sedimentary mass balance, 5) plate kinematics, and 6) state of stress in the Somalian plate. Furthermore, it should lead to a better understanding of the Mesozoic geology of the surrounding region, including Somalia, Kenya, Madagascar, Yemen, Oman, and India.

2.1 Mesozoic global change: paleoceanography and paleoclimate

2.1.1 Paleoceanography

Since the drilling of DSDP sites 100 and 105, it has been realized that Alpine-Mediterranean Tethyan Mesozoic sediment is extremely similar to that in the Atlantic: red Upper Jurassic limestone, white Lower Cretaceous limestone, black mid-Cretaceous shale, and Upper Cretaceous vari-colored claystone are facies common to both (e.g., Bernoulli, 1972; Lancelot et al., 1972; Hollister, Ewing, et al., 1972). Because of their pelagic nature, these Tethyan facies are amenable to paleoceanographic study. In contrast, mega-Pacific (Lancelot, Larson, et al., 1990) and eastern Tethys (Veevers, Heirtzler, et al., 1974; Gradstein, Ludden, et al., 1990) Mesozoic facies are less well-known, mainly clayey radiolarites. Sections through the Mesozoic stratigraphy of the Somali Basin therefore should offer a wealth of stratigraphic, sedimentary, and paleoceanographic information from Tethyan margins situated in a possible transition zone between western and eastern Tethys. The Somali Basin lies well away from the much studied and possibly atypical Alpine-Mediterranean region, which, during its Middle Jurassic through Cretaceous history, was represented by a narrow and possibly restricted ocean (Fig. 2). We should be able to address how and when this branch of Tethys developed, when the connection to the south (i.e., with the South Atlantic) was established, when the gateway through the western Tethys (Mediterranean area) to the North Atlantic was established, and how the Mesozoic sequence relates to the land record exposed in the Mediterranean and Himalayan areas.

A major transgression occurred over most of East Africa during late Callovian-Oxfordian time; black shale and dark marlstone (Uarandab formation) overlie Liassic shallow water carbonate (Hamanlei formation) (Bosellini, 1989, 1992). As the same (eustatic, tectonic, anoxic?) event is reported both on the northwest Australian margin (Ogg et al., 1992) and in the northern continental margin of India (Gaetani and Garzanti, 1991; Gradstein and von Rad, 1991), a causal link probably exists. Moreover, Oxfordian black shales ("terres noires") are well known in many European countries, and we expect important new paleoceanographic information from Somali Basin drilling.

"Oceanic anoxic events" or black shale events include those at the Cenomanian-Turonian boundary (Fig. 23) and the more complex series of events in the Barremian-Aptian-Albian interval (Fig. 24) that are now being resolved into a series of sub-events, some of which appear local, others of which appear more regional (e.g., Arthur et al., 1990). The challenge now is to map the global distribution of these black-shale intervals, at the highest level of stratigraphic precision, and to investigate their sedimentology, geochemistry, and paleoenvironmental significance. Despite a decade or more of intensive research on regionally extensive Cretaceous black shales, their causality remains an enigma. These intervals are well represented in the Alpine-Mediterranean domain and in the Atlantic. However, the Barremian-Aptian-Albian events are observed neither in eastern Tethys (Gradstein, Ludden, et al., 1990) nor in the deep Pacific, although minor (relative to Atlantic sections) organic shales are preserved on the Magellan Rise (Winterer, Ewing, et al., 1973) and the Mid-Pacific Mountains (Thiede, Vallier, et al., 1981). The Somali Basin thus represents an interesting transition between low-O_2 Atlantic and oxidized Pacific waters.

Mesozoic Somali Basin sediment will also permit examination of relationships among pelagic facies of similar age from equatorial-tropical eastern Tethys: Callovian through Hauterivian clayey radiolarite facies in the tropical Pacific (Lancelot, Larson, et al., 1990); Tithonian through Albian subtropical facies claystones off NW Australia (Gradstein, Ludden, et al., 1990; Ogg et al, 1992); and Jurassic-Cretaceous ribbon radiolarites that characterize obducted slices and continental margin facies of Eastern Tethys (Jurassic-Cretaceous). Questions such as how the CCD changes with time; whether the CCD dropped to ridge depths in the Berriasian-Barremian and then rose again, as in the Pacific, or remained deep in Tithonian-Barremian time, as in the Atlantic; what the relative importance of radiolarian (Pacific-type) versus nannofossil (Atlantic-type) productivity is; what bottom circulation in the restricted basin was; and whether there are faunal indications of fertility, will all be addressed. A continuous logging signature of the cycles should be obtained and tied to bio-magnetostratigraphy in order to deduce relative importance of orbital parameters - obliquity, precession, and eccentricity - and to compare to coeval cycle character in the Pacific and in the western Tethys-Atlantic domain (Robertson and Bliefnick, 1983; Cotillon and Rio, 1984; Ogg et al., 1987).

In the western Tethys/Atlantic region, the Cretaceous "Age of Chalk" is marked by an explosion in nannofossil productivity, a feature that has been greatly debated because of the virtual absence of Lower Cretaceous deep-water chalk in the Pacific and within the sedimentary cover of obducted Eastern Tethys ophiolites. The Somali Basin should contain a record of the southern Tethyan "Age of Chalk" for comparison with other areas.

At present, it is impossible to ascertain whether the Mesozoic Somali Basin was more influenced by the Pacific or western Tethys. With Mesozoic sediment from the Somali Basin, we should be able to determine whether distinctive radiolarian species off Northwest Australia indicate a cool-water influence during the Early Cretaceous or if they merely represent a regional faunal realm and do not indicate widespread paleoceanographic change (Ogg et al., 1992). Similarly, we will determine if *Inoceramus* and calcispheres display abundances that have been interpreted off Northwest Australia to represent "environmentally stressful" conditions. Other topics which may be addressed include the presence of nannofossil markers considered characteristic of high-fertility conditions in the Cretaceous strata, and the presence (western Tethys and Atlantic) or absence (Pacific) of calpionellids, a tropical fauna, in the late Tithonian-Berriasian-early Valanginian. Lastly, we will examine whether dinoflagellates are more similar to the Australian or to the western Tethys realm. Examination of such Mesozoic facies, faunas, and floras from the Somali Basin is fundamental to our understanding of the real nature and significance of Tethys.

2.1.2 Paleoclimate

Prior to the opening of the Somali Basin in the Jurassic, Gondwana lacked major embayments that would allow ocean waters to penetrate to its interior (Fig. 2). Recent climate models of Triassic Pangean geographies using the GENESIS model developed at the National Center for Atmospheric Research (S. Thompson and D. Pollard, pers. comm., 1992) suggest that Triassic and Jurassic continental configurations produced strong monsoonal circulation. In particular, the models suggest that the Gondwanan margin had seasonally reversing winds, blowing from west to east during the southern summer and reversing during the southern winter. This would result in upwelling along the margin during the southern summer and stratification during the southern winter. Opening of the Somali

Basin, coupled with rifting between Antarctica-India-Madagascar-Australia and South America-Africa, introduced ocean waters far into the interior of the formerly continuous landmass (Figs. 2, 8, 9). This would have altered climatic conditions and ultimately destroyed monsoonal circulation. Using either the hot spot or paleomagnetic reference frames of Livermore and Smith (1985), or of Müller et al. (1993), the Somali Basin was at about 30°S when it began to open (Fig. 2). [The paleolatitude of Gondwana during the Jurassic-Cretaceous, however, is not well known; the estimate of 30° might be off by 10°-15°, another reason for drilling igneous basement of the Somali Basin. See section 2.3.] The Somali Basin must have been situated very close to the mean position of southern subtropical highs at the time and should thus provide a record of paleoceanographic conditions in southern hemisphere subtropics. During the Cretaceous, the Somali Basin migrated from 30°S to 20°S and the biogeography of Tethys became decidedly asymmetrical, with higher diversities of species and the development of reef complexes on the northern margin and lower diversity and less frequent occurrence of reef-forming species on the southern margin. The southern margin of western Tethys (North Africa) also became the site of periodic deposition of phosphorites. This suggests that the southern margin of western Tethys was a site of upwelling and the Ekman transport of water beneath the northeasterly trade winds was to the northwest. However, western Tethys was north of the equator, and the Somali Basin, lying south of the equator, may have been characterized by a different pattern of winds and water motions. Recovery of sediment from the Western Somali Basin will allow us to test various Mesozoic paleoclimate models.

The paleogeographic/paleolithologic maps of Ronov et al. (1989) show asymmetrical distribution of climate-indicator sediment on palinspastic paleogeographic maps for the Late Triassic, Jurassic, and Cretaceous. The maps suggest that the Intertropical Convergence Zone (ITCZ) and the belts of subtropical highs were all displaced northward. If this is correct, then the Somali Basin should have lain beneath the mean position of the southern subtropical highs during the entire Mesozoic, and this should be reflected in its sediment fill. If there was monsoonal circulation, movements of the ITCZ and subtropical highs and reversals of the winds should have resulted in higher than average productivity. If there was no appreciable monsoonal circulation and relative stability of the ITCZ and subtropical highs, then the Somali Basin should have had generally low productivity. In either case, it is likely to have been a region prone to warm saline

bottom waters and black shales, although the Argo Basin off Australia was semi-restricted in a similar paleolatitude and lacks such features (Gradstein, Ludden, et al., 1990). The Somali Basin offers a unique possibility to provide a paleoclimatic /paleogeographic reference point for the southern hemisphere subtropics. The following topics will be addressed: character of cyclic sedimentation, evidence for changing land climates of India and of Africa, accumulation rates of eolian input, and age, timing, and character of clastic/carbonate turbidites and relation to eustatic sea level changes and paleoclimate. Possible non-eustatic pulses of turbidites may be a proxy for the tectonic activity associated with the Early Cretaceous breakup of India.

2.2 Formation and Alteration of Jurassic Indian Ocean Crust

Seafloor spreading in the Western Somali Basin began in Early to Middle Jurassic time after protracted episodic rifting (Coffin and Rabinowitz, 1988). Once established, the full spreading rate for the Western Somali Basin ranged between 2.6 to 3.6 cm/yr (Ségoufin and Patriat, 1980; Rabinowitz et al., 1983; Cochran, 1988). The proposed hole WSB-1 in the Western Somali Basin would thus sample Jurassic mid-ocean ridge basalt (MORB) that formed at a slow spreading ridge close to the presumed non-volcanic rifted African and Madagascan margins.

A general feature of oceanic crust that has formed adjacent to non-volcanic continental margins as well as at very slow-spreading ridges is that it is anomalously thin (Fig. 25). It has been argued that this is a consequence of conductive heat loss from upwelling mantle during a long period of pre-breakup lithospheric stretching and thinning of the continent (White et al., 1992). Seafloor spreading over the region of cooled mantle would result in production of smaller melt volumes and thinner crust. The top of igneous crust in the Western Somali Basin displays a mean velocity of 5.40±0.37 km/s from 48 sonobuoy experiments, and seismic layer 2A is not present. Both the high velocity for the uppermost portion of oceanic crust and the corresponding absence of layer 2A are cosmopolitan characteristics of old, in this case Jurassic and Cretaceous, oceanic crust. The average igneous crustal thickness determined from these experiments is 5.2±0.6 km, compared to the global average of 7.1±0.8 km (White et al., 1992). The thin igneous crust is significant for at least two reasons: 1) the data set, consisting of 16 sonobuoy experiments all displaying strong mantle headwaves, constitutes a large number of determinations

of integrated oceanic crustal thickness from a limited geographical area, and 2) the experiments were performed on the oldest identified oceanic crust in the Indian Ocean, and among the oldest world-wide. A key objective, therefore, will be to use petrological methods (e.g., Klein and Langmuir, 1987; McKenzie and O'Nions, 1991) to estimate the temperature and melt volumes for the Western Somali Basin mantle source and account for why the old oceanic crust here is some 25% thinner than the global mean.

There appears to be a fundamental difference in the style of mantle flow between fast and slow spreading ridges (Parmentier and Morgan, 1990). Where the full spreading rate is greater than about 6 cm/yr, mantle upwelling is dominated by two-dimensional sheet flow. In contrast, there is good evidence that at slow-spreading ridges mantle flow is in the form of upwelling diapirs (Niu and Batiza, 1993). Geochemical studies on basalt samples from the Western Somali Basin will allow investigation into the nature of mantle upwelling beneath a slow-spreading ridge shortly after continental breakup.

Drilling Jurassic basement of the Western Somali Basin will also provide the opportunity to study how the composition of Indian Ocean MORB-source mantle has varied over time. Indian Ocean MORBs are isotopically distinct from Pacific and Atlantic counterparts (Fig. 26); they are characterized (on average) by higher $^{87}Sr/^{86}Sr$, $^{208}Pb/^{206}Pb$, and $^{207}Pb/^{206}$ ratios (e.g., Dupré and Allègre, 1983; Ito et al., 1987; Mahoney et al., 1992), forming part of the so-called Dupal anomaly (Hart, 1984). The origin of the Indian Ocean MORB mantle domain is not fully understood. It is not clear, for example, if these distinct compositional features resulted from mixing of deep-seated mantle plumes with the Indian Ocean asthenosphere (e.g., Storey et al., 1989), or whether they were acquired through interaction of the MORB reservoir with continental lithosphere that had been in convective isolation for several billion years. A pertinent question in this regard is for how long has the Indian Ocean ridge system been erupting MORB with Dupal-type geochemical characteristics? Has this been a compositional feature of Indian Ocean MORB since seafloor spreading began in Jurassic time, or is it a more recent feature related to plume-lithosphere-asthenosphere interactions in Cretaceous time (Storey et al., 1989; Mahoney et al., 1992)? Trace element and isotopic geochemistry of Jurassic basement of the Western Somali Basin should help to answer some of these

questions, and will provide important new constraints on the evolution of the Indian Ocean MORB-source mantle.

Mineralogical and geochemical changes that occur to mid-ocean ridge basalts by seawater alteration are of prime importance in understanding the global geochemical budget. Questions of major interest are whether Jurassic oceanic crust of the Western Somali Basin has undergone "aging" in the form of progressive alteration reactions, and how the alteration processes compare with those seen at present day mid-ocean ridges. Most secondary mineral formation appears to cease within 10 to 20 m.y. of crustal formation (Staudigel et al., 1981; Staudigel and Hart, 1985), although there is some evidence for progressive aging reactions from Cretaceous Atlantic Ocean basement Staudigel et al. (1981). If such reactions occur between seawater and oceanic crust, what are the main processes? Does aging occur through chemical exchange between basaltic crust and sediment pore waters (e.g., Lawrence and Gieskes, 1981), or is it through continued fluid flow along permeable zones in the basement (Muehlenbachs, 1980; Lawrence and Gieskes, 1981)? Understanding the alteration history of the core samples will usefully complement similar studies carried out on Jurassic oceanic basalts from Site 801 in the western Pacific (Alt et al., 1992).

2.3 Magnetic Stratigraphy

2.3.1 Plate Kinematics

Magnetic stratigraphy in cores from the Western Somali Basin will enable assessment of paleolatitudes through time, constraining the Mesozoic path of Gondwana and providing a key test of existing plate reconstructions (e.g., Tauxe et al., 1984; Klootwijk et al., 1991). Absolute dating of Mesozoic magnetic anomalies in the Western Somali Basin is necessary to resolve differences among the three existing interpretations (Fig. 3), and will impact ideas on the timing of global plate reorganizations. Paleolatitudes predicted from magnetic anomaly skewness can be compared with sediment and basalt paleomagnetic data, as well as with predictions from Gondwana polar wander path. A subtopic would be testing theories of "inclination error" in sediment - a topic important to models of Pacific plate motion and the North American-European polar wander curves.

2.3.2 Bio-magnetostratigraphic Correlations

Mesozoic magnetic stratigraphy and its correlation to biozones are another important objective. We now know enough about Cretaceous bio-magnetostratigraphic correlations for magnetic stratigraphy to be useful in monitoring faunal/floral migration. For the Jurassic, the Somali Basin sedimentary record may supply a much-needed means of improving bio-magnetostratigraphic correlation, which still leaves a lot to be desired due partly to lack of suitable facies in Jurassic sections exposed on land in the Mediterranean. Middle Jurassic sediment there is either too siliceous (chert) or, if calcareous, is usually very condensed. Lower Jurassic sediment is usually shallow-water facies.

Use of magnetic stratigraphy will also allow testing of the synchroneity of biostratigraphic "datums" between Atlantic-western Tethys and eastern Tethys-Pacific super-ocean sections. Some data suggest that Pacific vs. Atlantic first/last occurrences of some key nannofossils and forams are not synchronous, hence correlation of events between these ocean basins is uncertain. Tying such events of the Somali Basin into magnetic stratigraphy, which has been done for Atlantic-Tethys but has not yet been possible for the Pacific, may aid in detecting time-transgressive "markers" and migration directions. Also, in the Pacific mid-Cretaceous, foraminifera and nannofossil ages may differ by a half-stage. In addition, calibration of radiolarian to nannofossil-foraminiferal events is hampered by lack of both siliceous and calcareous fauna preserved in the strata, which may or may not be the case in the tropical eastern Tethys. This calibration is important to Late Jurassic-Early Cretaceous correlation of Pacific and Atlantic -Tethys events (Baumgartner, 1987). Currently, Kimmeridgian or other stages may be mis-correlated by a half-stage or more between Tethys and the Pacific, which is important for the timing (all done with radiolarians) of terrane accretion and pre-M25 Jurassic magnetic anomalies.

Bathonian-Callovian magnetostratigraphic studies (e.g., Channell et al., 1990; Ogg et al., 1991; Steiner et al., 1985, 1987) indicate that the Jurassic "quiet zone" in the oceans does not represent an interval of prolonged normal polarity, as had been previously suggested (e.g., Channell et al., 1984). In younger Jurassic and Lower Cretaceous *in situ* ocean basin sediment, magnetostratigraphic correlations have only been made in the North Atlantic. Chron M0r has been recognized and

correlated to foraminiferal and nannofossil stratigraphies at two DSDP sites (Tarduno et al., 1989) and at ODP Site 641 (Ogg, 1988). These results are consistent with those from Italian and Spanish land sections which provide the basis for correlation of magnetic stratigraphy to calpionellid and nannofossil zonations (e.g., Ogg et al., 1984; Channell and Grandesso, 1987; Channell and Erba, 1992). A short reversed chron younger than M0 in the late Aptian (*Globigerinelloides algerianus* Zone) at DSDP Site 463 (Tarduno et al., 1989) correlates to similar events observed in Alpine sections (VandenBerg et al, 1978) and possibly in Atlantic sections (Keating and Helsley, 1979). The Somali Basin offers a superb opportunity to further constrain the Mesozoic magnetic polarity time scale by recovering basalt from an identified magnetic anomaly.

2.4 Chemostratigraphic Correlations

An additional means of correlation between Cretaceous sediment of the Somali Basin and that of western Tethys and northern Europe may lie in carbon isotope stratigraphy. Pilot studies of the Albian-Campanian interval in both the English Chalk and in pelagic sediment of the western Tethys (Gabbio section, Italian Apennines) show that such chemostratigraphy is not only a correlative tool but also aids in recognition of matching and mismatching faunal zones and stages from different provinces. Recovery of a continuous or semi-continuous section containing sufficient planktonic carbonate for isotopic analysis will enable cross-correlation of the Somali Basin section with those of western Tethys and northern Europe and offer an independent parameter, together with magnetostratigraphy, against which to calibrate faunal and floral datums.

2.5 Sedimentary Mass Balance

Total sediment thickness in the Somali Basin is variable, but averages about 1 km in the central part of the basin and increases toward the African and Madagascan margins. With an area of ~2×10^6 km^2, we estimate that the minimum volume of sediment in the Somali Basin is on the order of 5×10^6 km^3. Although some of the section near the continent-ocean transition may be salt and limestone, it is likely that most of the basinal sediment is detrital. If entirely detrital, it would be equivalent to a layer ~250 m thick removed from all of Africa north of the equator. The younger series (Miocene-Recent) consists of pelagic calcareous sediment and

clay about 500 m thick in the vicinity of DSDP Site 241 (Fig. 1, 12). At Site 241, Miocene sediment rests unconformably on Eocene and Upper Cretaceous claystone. The nature and source of the older sediment are not known. During the earlier phases of its development, prior to separation of India and Madagascar, the Somali Basin may have served as a major catchment for a large part of interior Africa and India-Madagascar, similar to how the Gulf of California receives an inordinately large share of the sediment budget eroded from southwestern North America. Beyond a general regional mass balance that can be established by knowing the age and lithologies of the rocks in the Somali Basin, Africa, India, and Madagascar all have potential source areas with distinctive mineralogies that may permit determination of sediment sources.

2.6 Dynamics of Oceanic Crust - State of Stress

Africa is treated as a single plate in the most recent, current global plate motion model, NUVEL-1 (Demets et al., 1990). The general extensional stress state of most of the African plate is inconsistent with the compressional midplate stress field predicted solely from plate boundary forces (ridge push from ridges on three sides of the plate and continental collision along the northern boundary) (Fig. 27; Zoback, Zoback, et al., 1989; Zoback, 1992). Current data do not predict consistent motion between the Nubian (West African) and Somalian (East African) plates, but evidence from the East African rift strongly suggests extension (e.g., Rosendahl, 1987; Bosworth et al., 1992) as well as stress related to buoyancy associated with mantle upwelling and lithospheric thinning. Most of the continental portion of the Somalian plate is now experiencing extension and associated volcanism, and therefore onshore stress determinations are strongly influenced by local tectonics (Fig. 28). The oceanic portion of the plate, unaffected by Cenozoic tectonism, would appear to offer the best opportunity for characterization of plate-wide stress, but not a single *in situ* stress measurement has been made there (Zoback, 1992; Bosworth et al., 1992) despite this region's critical role in global plate motion modeling. Stress measurements are vital to understanding the distribution and relative magnitude of the forces that drive (and inhibit) plate motion; the physical, thermal, and mechanical constraints on lithospheric structure; and coupling between lithospheric and asthenospheric processes.

3.0 Somali Basin Drilling Objectives

We propose to drill a single, deep (~3000 m) hole in the Western Somali Basin (WSB-1 in Fig. 1, Appendix 1). The objectives are to investigate: 1) Mesozoic global change, including paleoceanography and paleoclimate; 2) the nature and evolution of Mesozoic oceanic crust; 3) Mesozoic plate kinematics; 4) Mesozoic bio-magnetostratigraphy and chemostratigraphy; 5) sedimentary mass balance; and 6) state of stress of the Somalian plate.

3.1 Predicted Lithologies

DSDP Site 241 (Simpson, Schlich, et al., 1974), drilled in 1972 in a water depth of 4054 m, was a single-bit hole on the East African continental rise that penetrated 1174 m into Turonian-Santonian claystone (Figs. 1, 12). The entire cored section is of deep-sea origin, consisting of biogenic ooze, hemipelagic sediment, and turbidites. We estimate that an additional ~3000 m of sediment lies between the bottom of the hole and the top of oceanic basement, using an average velocity-depth profile determined for the Western Somali Basin (Coffin et al., 1986) (Figs. 29, 30).

Based on sediment recovered at DSDP Site 241, correlation with onshore drilling results and outcrops, seismic facies, and geographical distribution, we suggest that the four sequences mapped in the Western Somali Basin (Figs. 31-34) consist of the following lithologies:

red-blue: deep-sea carbonates with a significant terrigenous component;
purple-red: reworked hemipelagic sediment, biogenic oozes, and terrigenous clastics in fan deposits and sediment ridges;
green-purple: clay-claystone; minor nanno-rich claystone, silty claystone, and calcareous sandstone; commonly in turbidites or slump deposits;
seafloor-*green*: clay-rich and clayey nanno ooze of dominantly pelagic origin; nanno-rich clay and nanno clay of dominantly terrigenous origin.

3.2 Site Selection Strategy

Site WSB-1 would ideally lie in a water depth of ~4000 m, and the section would consist of ~2500 m of primarily Jurassic and Lower Cretaceous sediment and ~500 m of basalt. The map of total sediment thickness (Fig. 30) highlights the area under consideration for site selection, and figures 31 through 34 depict thicknesses of the various sequences. For the primarily Mesozoic objectives of this proposal, we recommend drilling where thicknesses of the *red-blue* and *purple-red* sequences (Jurassic to mid-Cretaceous) are at maxima, and where the two post-mid-Cretaceous sequences are thinner. Furthermore, we recommend five hundred meters of basalt penetration for Somali plate stress determinations, magnetostratigraphic, petrological, and geochemical purposes. We would expect that the most favorable sections exist northeast of DSDP Site 241 along the lower continental rise of Somalia (Figs. 1, 30-34).

Because such a deep hole has never been drilled by DSDP or ODP, it is speculative to estimate the amount of time that will be required to penetrate ~3000 m into Western Somali Basin sediment and igneous rock. However, conditions, at least in the upper ~1200 m of sediment, appear quite favorable for deep penetration. DSDP Site 241, a single bit hole, penetrated 1174 m during a total of 4 days and 20 hours on site (Simpson, Schlich, et al., 1974). The average drilling rate was 27 m/hr, and the average coring rate 14.4 m/hr. Rates decreased abruptly below ~850 m, and were 15 and 4 m/hr, respectively, at ~1150 mbsf. Assuming similar drilling and coring rates for the upper 1200 m at Site WSB-1, and 4 m/hr in sediment from ~1200 to ~2500 mbsf, total drilling and coring time in the sedimentary section (excluding re-entry cone emplacement, casing, bit changes, etc.) would be 18.5 days. The best estimates for drilling 500 m of basalt come from Site 504B, where during DSDP legs 69 and 70, 561.5 m of basement was penetrated (and logged) in 26.1 days on site (Cann et al., 1983). Combining the results from sites 241 and 504B, one could predict that Site WSB-1, in deeper water than 504B, could be drilled in approximately 45-50 days, excluding logging and *in situ* stress experiments.

3.3 Site Survey Requirements

The JOIDES Site Survey Panel guidelines require that deep drillsites must be documented by a grid of intersecting MCS lines as well as by comprehensive velocity

determinations. Existing MCS and single-channel seismic data (Figs. 11, 30-34) in the Western Somali Basin are not adequate to precisely locate WSB-1. Additional high-quality MCS data are required for locating this site, and an MCS site survey cruise focusing on the polygon in Figure 1 is planned for submission to the U.S. National Science Foundation for the 1 November 1993 deadline.

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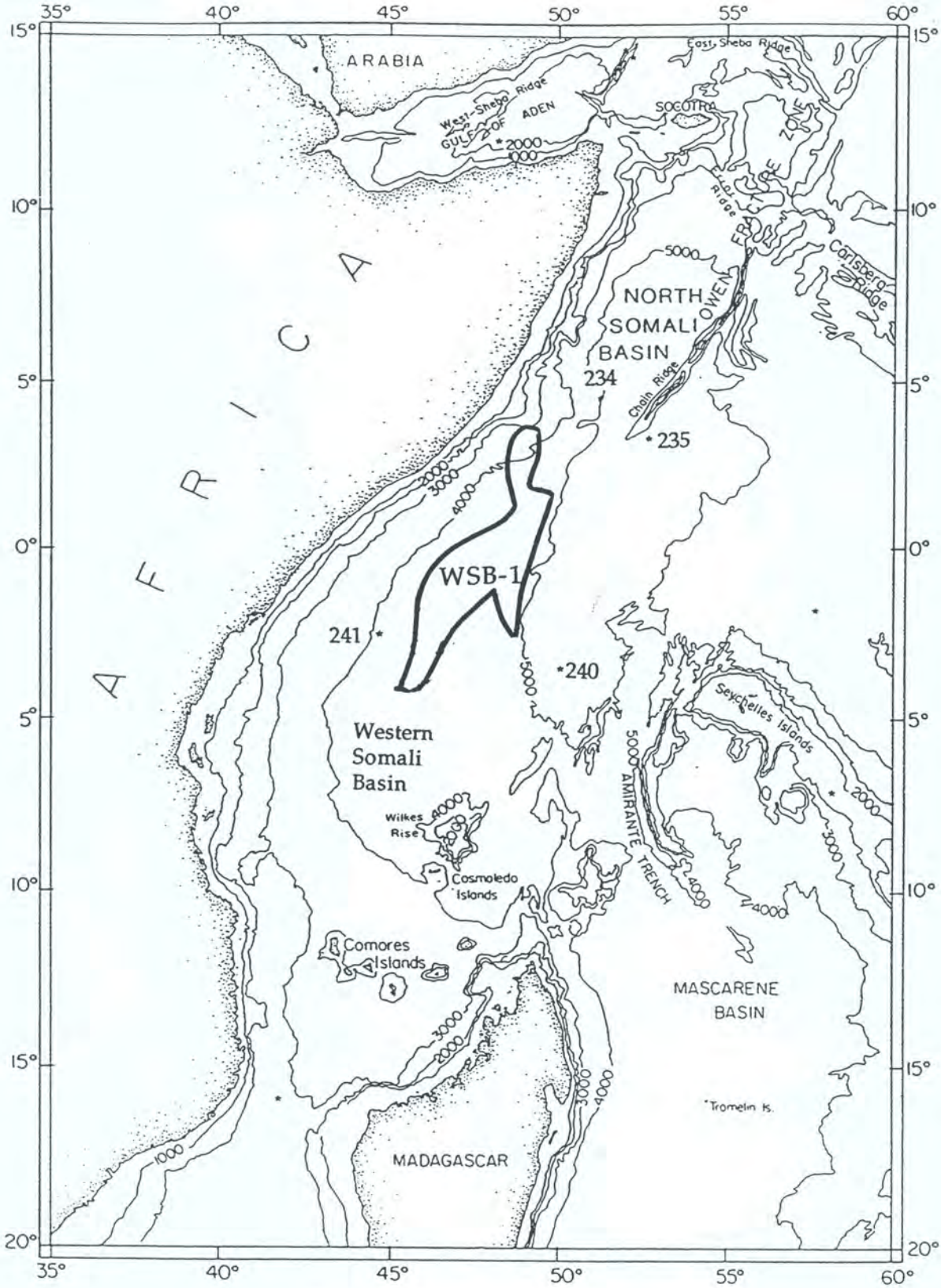


Figure 1. Bathymetric map of the western Indian Ocean. Bold polygon indicates recommended area for site WSB-1 (see Figs. 30-34), and relevant DSDP sites are indicated by stars. Bathymetry is simplified from GEBCO charts (after Cochran, 1988).

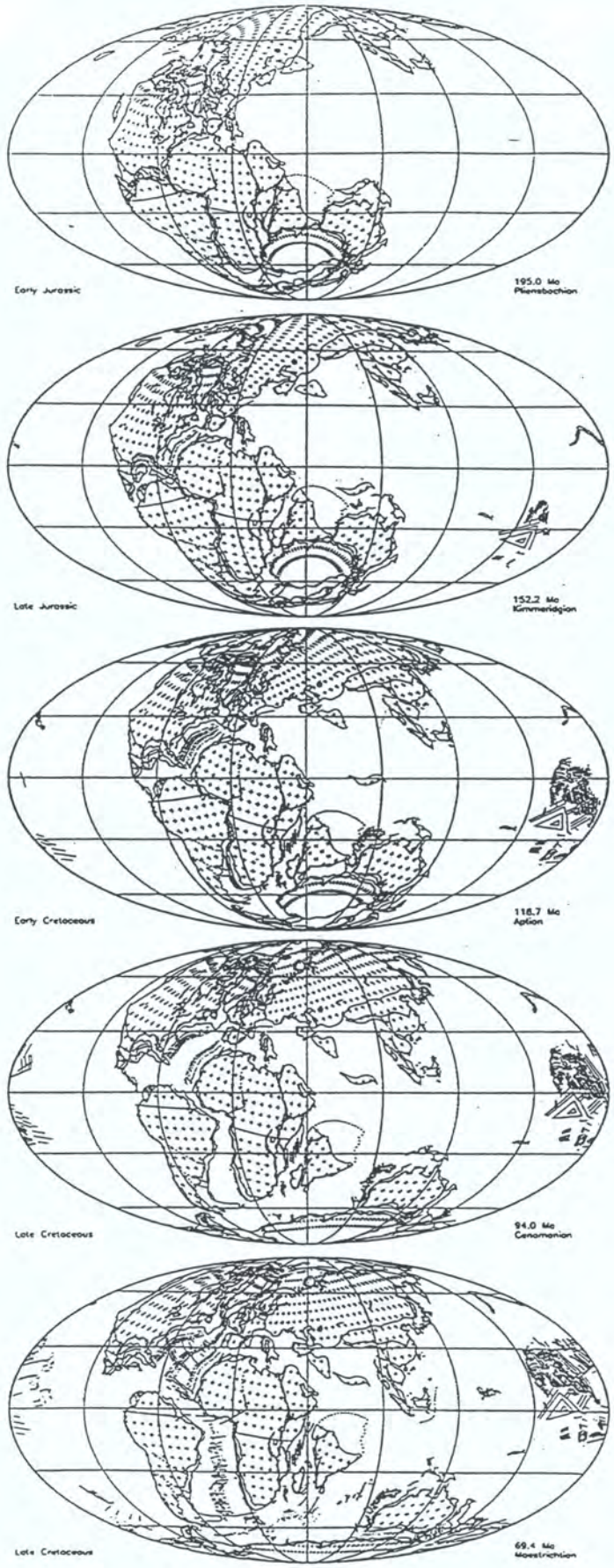
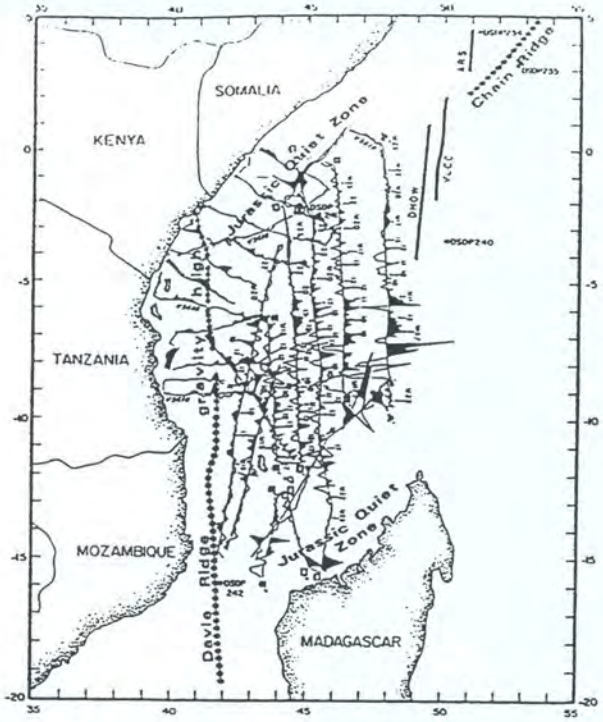
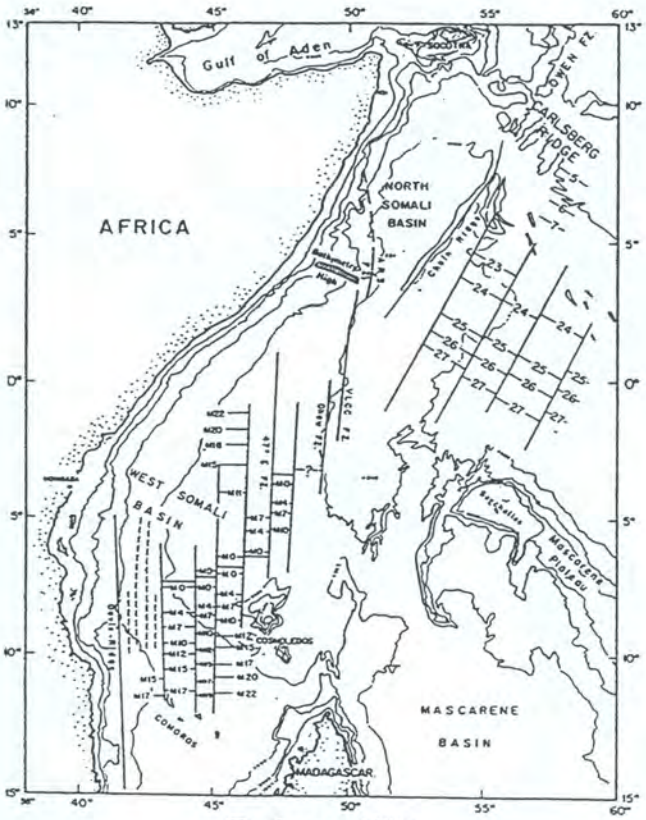


Figure 2. Plate reconstructions from Early Jurassic through Late Cretaceous time showing the gradual closing of Tethys and opening of the Indian Ocean. The Western Somali Basin is bordered by Africa, India, and Madagascar. Paleolatitudes are derived from the hot spot reference frame of Müller et al. (1993); reconstructions are from the PLATES project, University of Texas at Austin Institute for Geophysics.

Ségoufin & Patriat, 1980



Rabinowitz et al., 1983; Coffin & Rabinowitz, 1987



Cochran, 1988

Figure 3. Three different magnetic anomaly identifications in the Western Somali Basin plotted at the same scale. Ségoufin and Patriat (1980) interpreted anomalies M0 (118.7 Ma, Aptian) - M21 (149.9 Ma, Tithonian); Rabinowitz et al. (1983) and Coffin and Rabinowitz (1987) M10 (130.2 Ma, Hauterivian) - M25 156.6 Ma, Oxfordian); and Cochran M0 (118.7 Ma, Aptian) - M22 (152.5 Ma, Kimmeridgian). Time scale used is Kent and Gradstein, 1985.

Figure 4. Depth (from sea level) to basement in the Western Somali Basin compiled and contoured from MCS data (after Coffin et al., 1986). See Figure 29 for velocity data used to calculate sediment thicknesses.

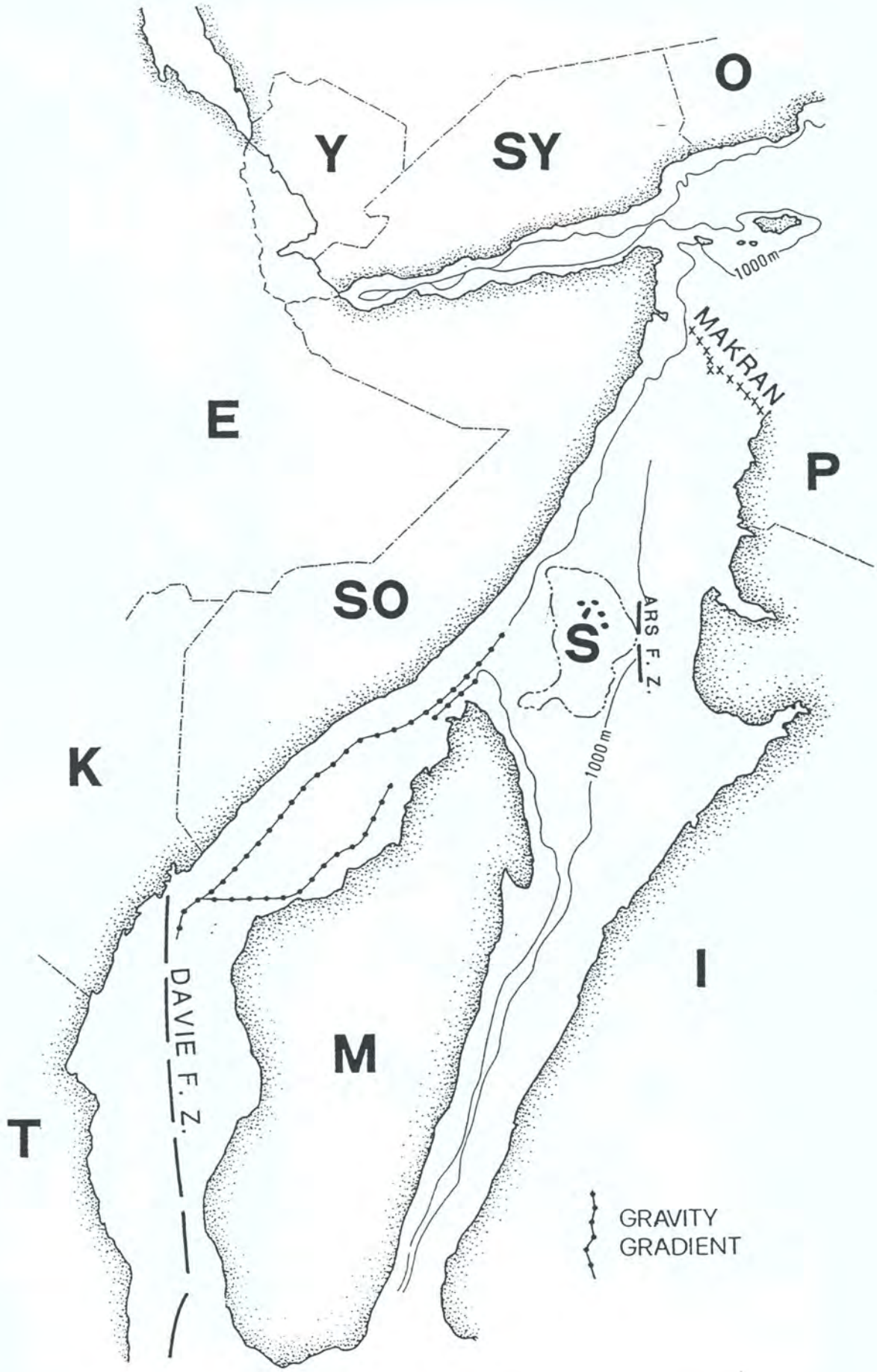


Figure 5. Pre-drift reconstruction (of Coffin and Rabinowitz, 1987) of relevant part of Gondwana (Bosellini, 1989, 1992). Y, Yemen; SY, South Yemen; O, Oman; E, Ethiopia; P, Pakistan; SO, Somalia; K, Kenya; S, Seychelles; T, Tanzania; M, Madagascar; I, India.

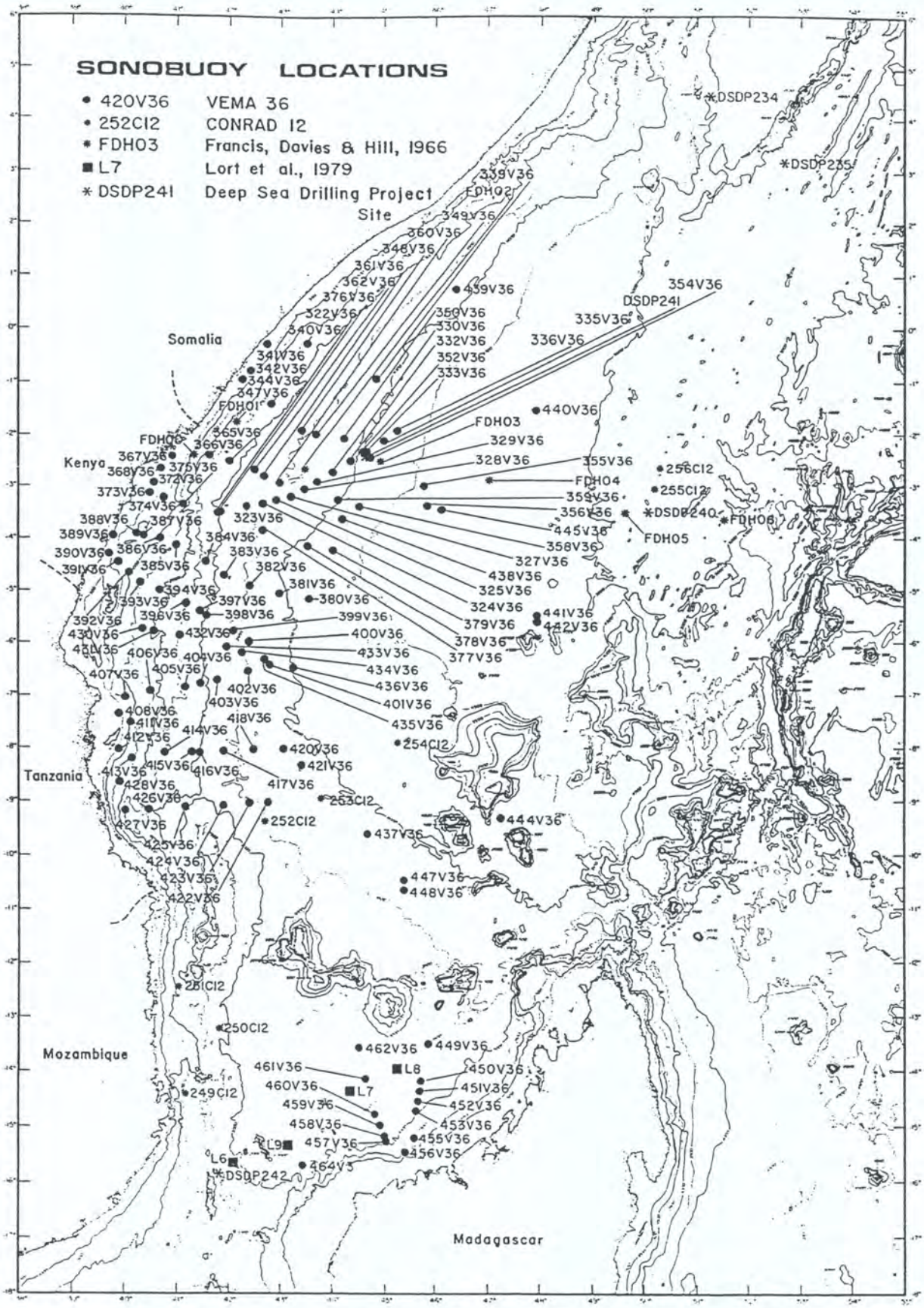


Figure 6. Sonobuoy wide-angle reflection and refraction experiments and Deep Sea Drilling Project sites in the Western Somali Basin. From Coffin et al., 1986.

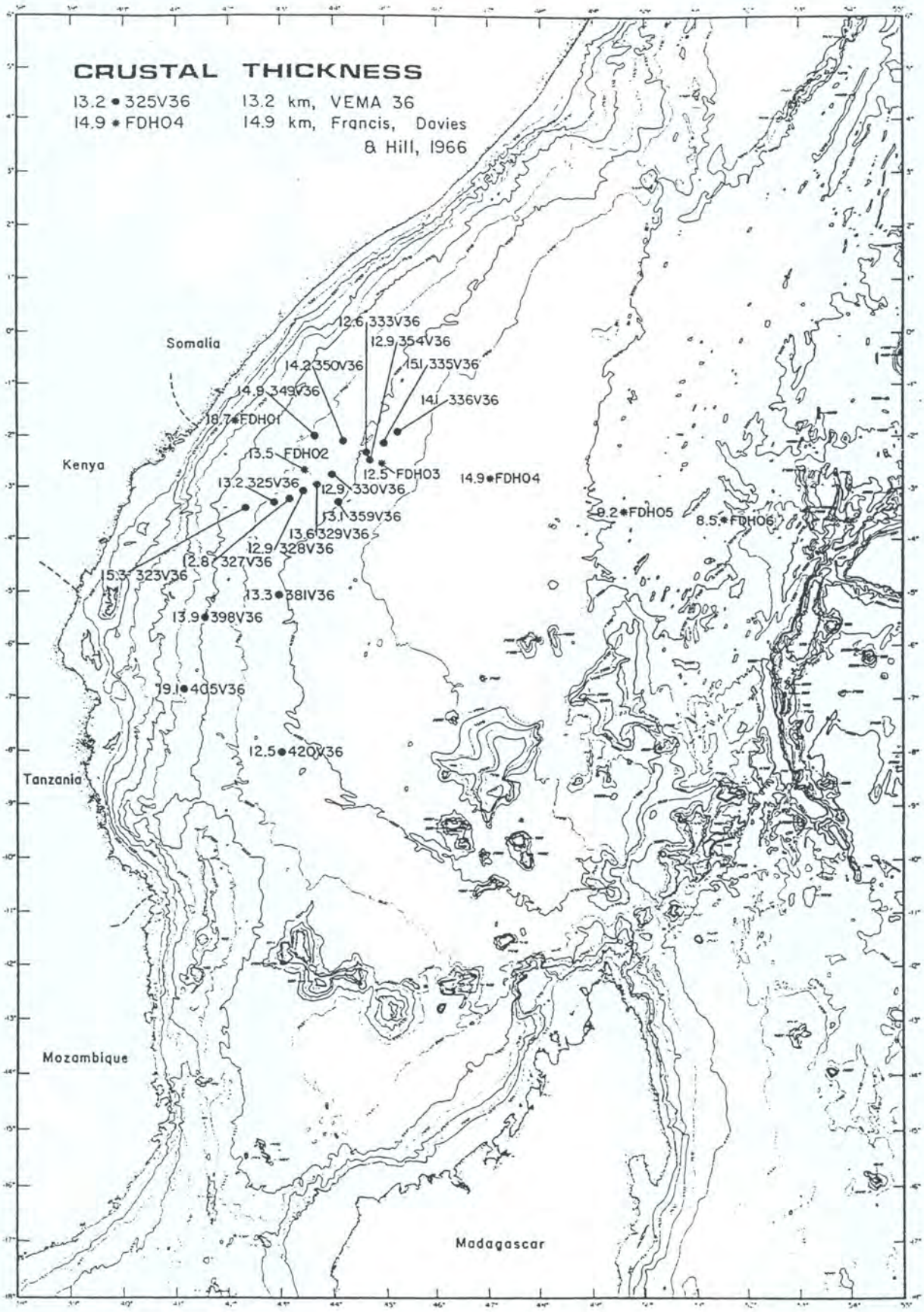


Figure 7. Crustal thicknesses (sea surface to mantle) in the Western Somali Basin. See Figure 29 for velocity data used to calculate sediment thicknesses. From Coffin et al., 1986.

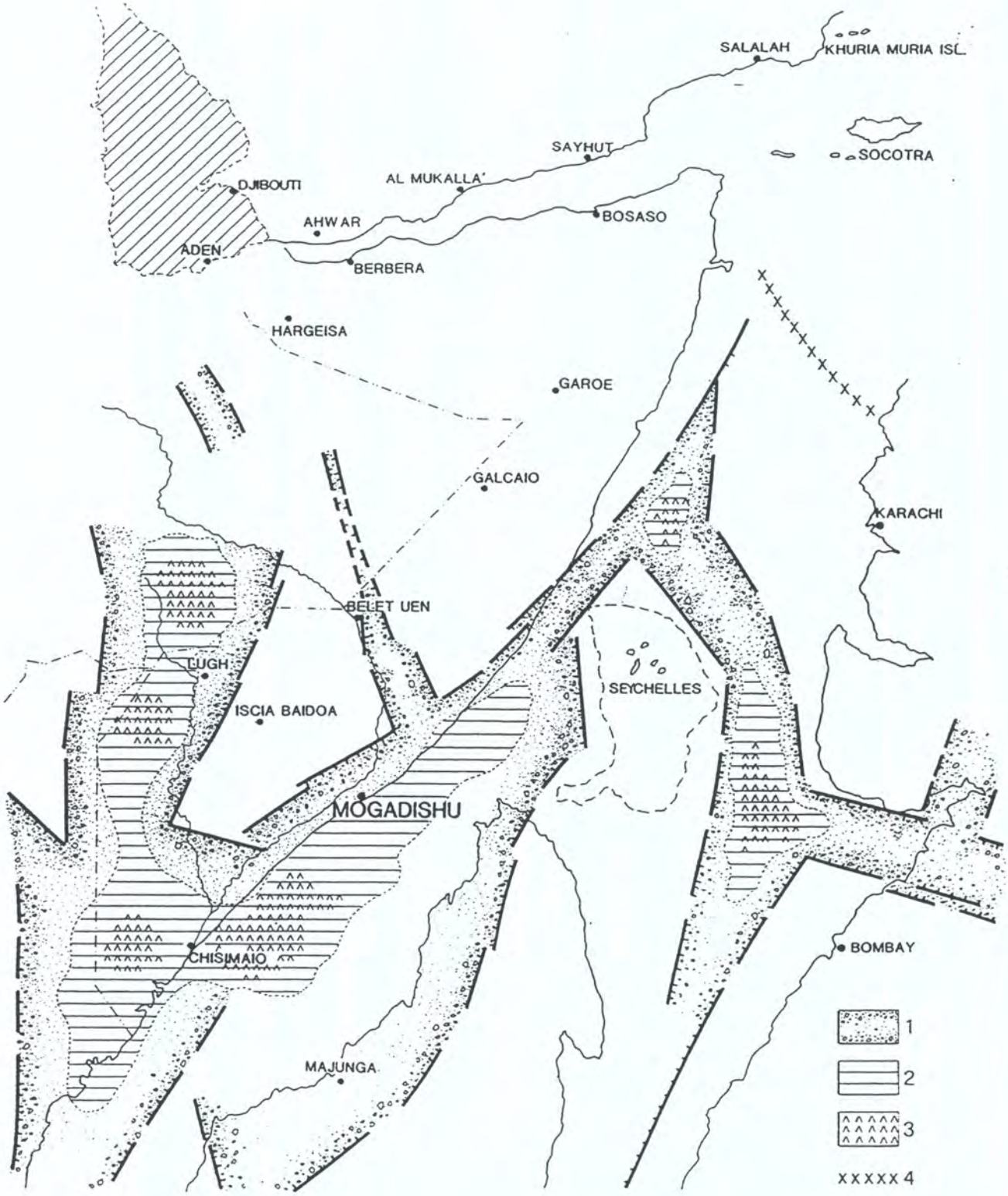


Figure 8. Karoo rift system in East Africa, Madagascar, and India (Bosellini, 1989, 1992). Only major rifts are shown; several smaller ones were present towards Ethiopia and Arabia. 1. Intermontane clastics; 2. Water bodies, mainly lacustrine; 3. Evaporites; 4. Present-day position of Makran front.

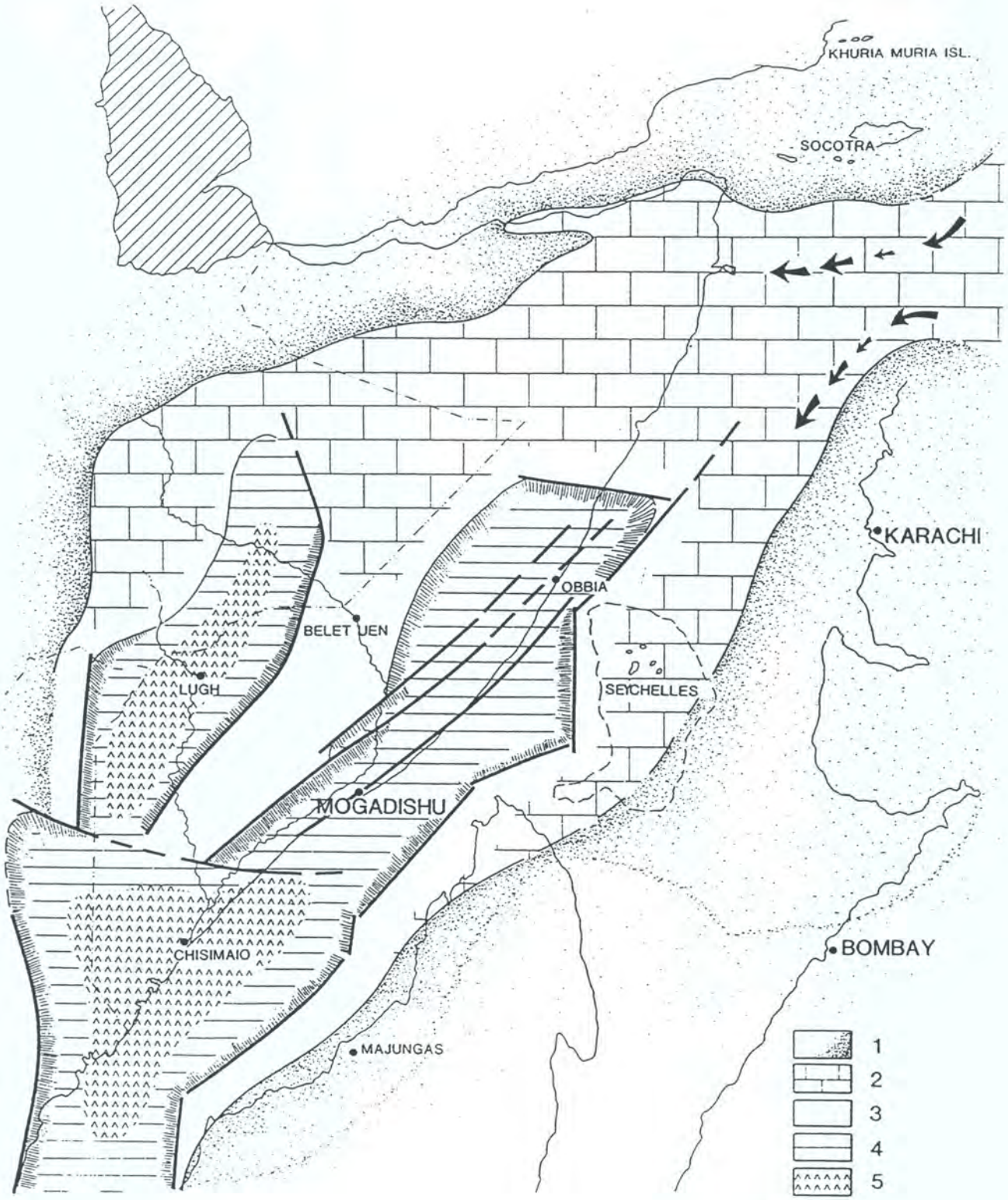


Figure 9. Paleogeography of relevant Gondwana blocks during Late Liassic time, after the major transgression which flooded former Karoo rifts (Bosellini, 1989, 1992). Arrows indicate the "Pakistan portal", i.e., the connection with Tethys. 1. Terrestrial sediment, mainly alluvial; 2. Shallow-water carbonates and evaporites; 3. High-energy carbonate sediment at platform edges; 4. Basinal sediment; 5. Evaporites.

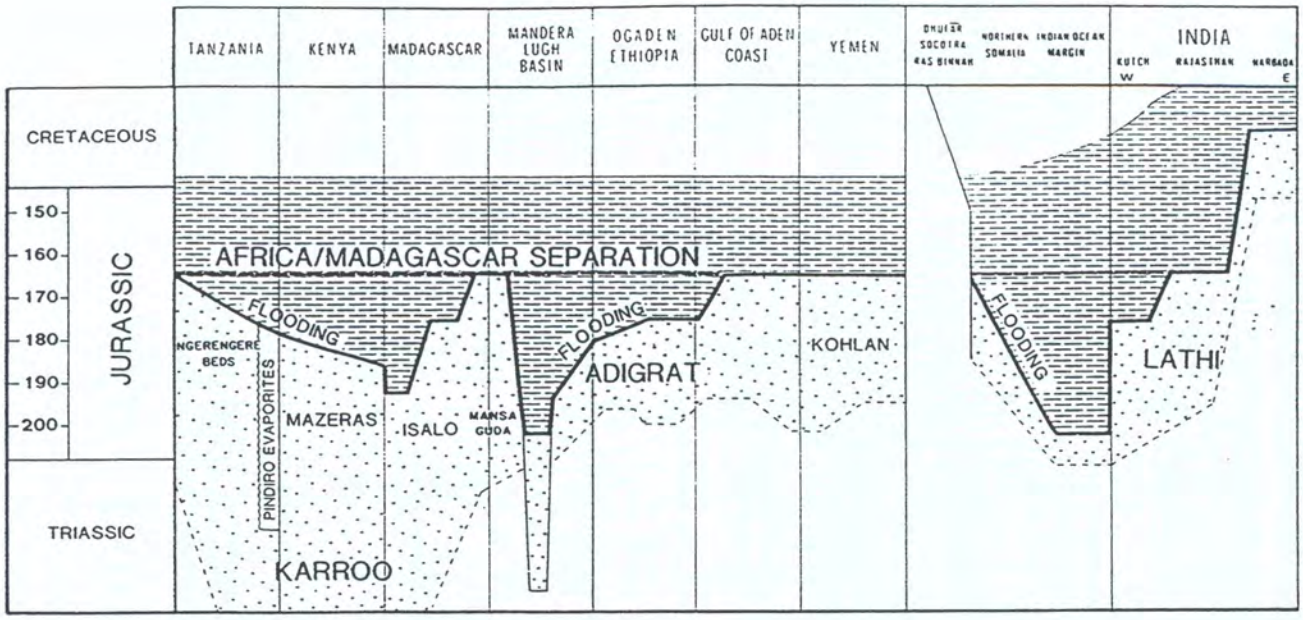


Figure 10. Chronostratigraphic chart showing time of Jurassic flooding in various sectors of Gondwana adjacent to the nascent Somali Basin (Bosellini, 1989, 1992).

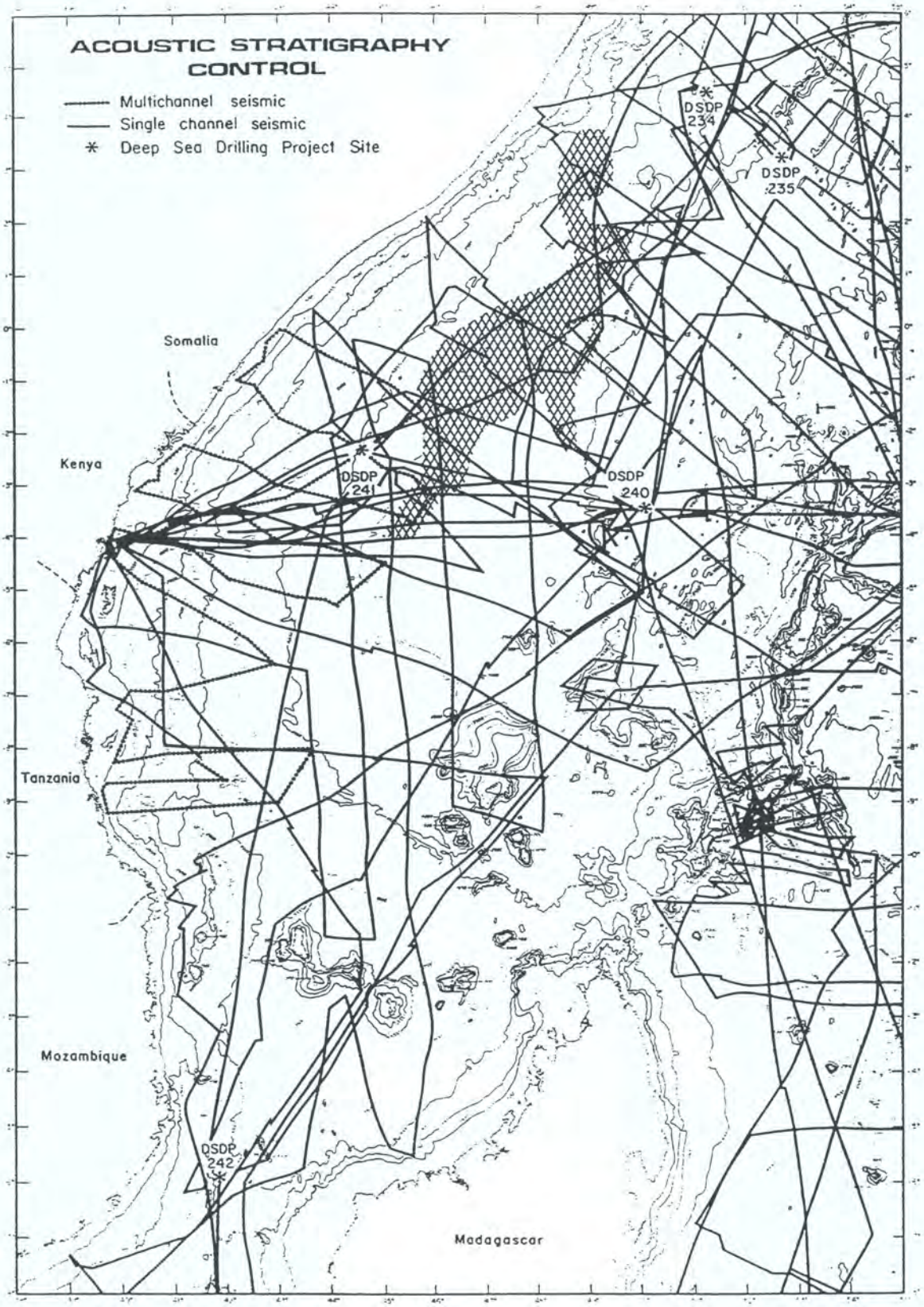


Figure 11a. Ship track lines and drill holes, indicating control for figures 4, 13-16, and 30-34. See Figure 11b for multichannel lines only. From Coffin and Rabinowitz, 1988, 1992. Cross-hatching indicates area of proposed site WSB-1; see figures 30-34 for more detail.

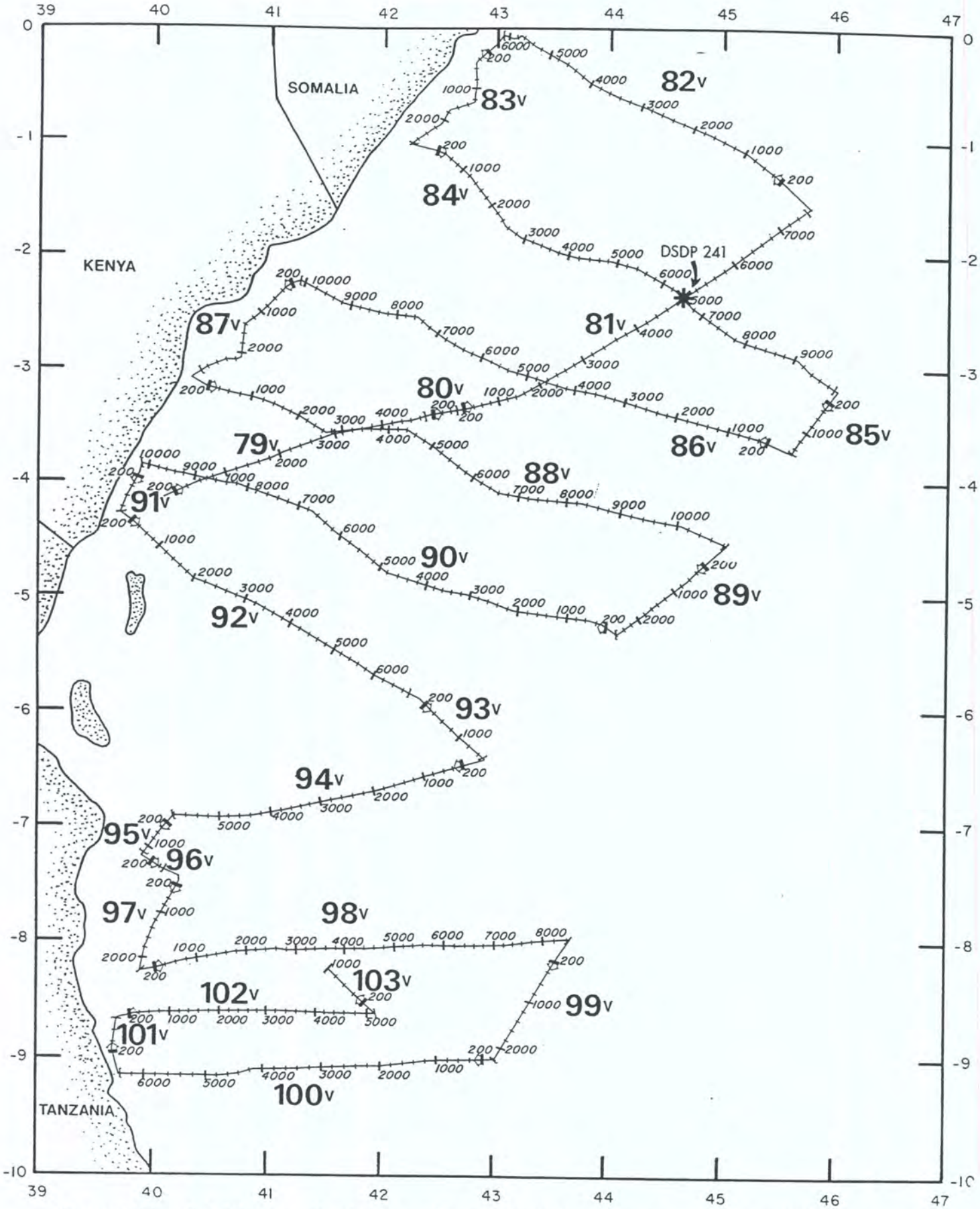


Figure 11b. Multichannel seismic reflection (MCS) navigation data for R/V Vema cruise 3618 (Coffin and Rabinowitz, 1988, 1992). The numbers along the profiles indicate common depth points (CDPs), which are labeled on subsequent profiles.

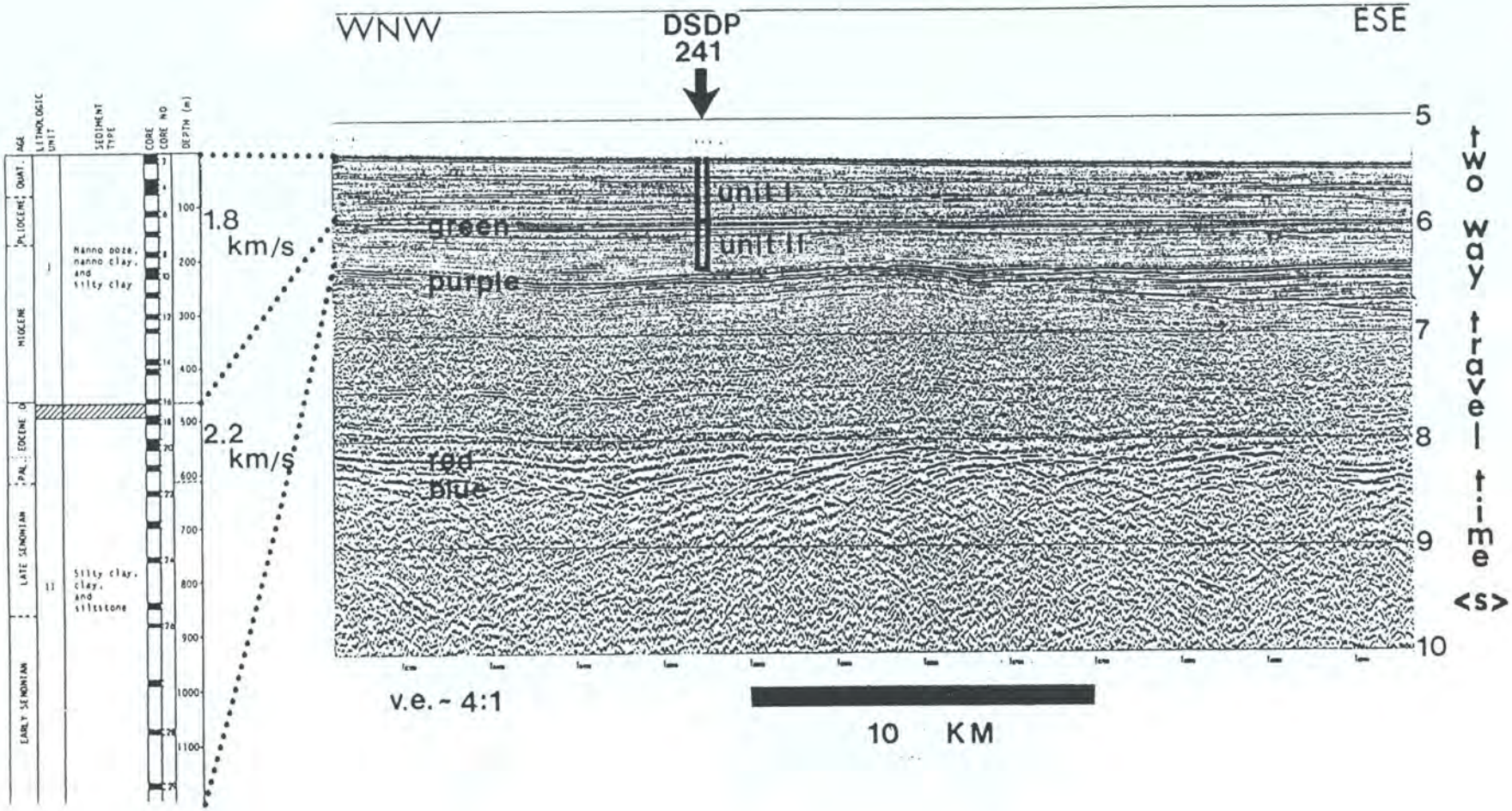


Figure 12. Correlation of MCS data (CDPs 6350-6900) with results from DSDP Site 241 (Coffin and Rabinowitz, 1988, 1992). See Figure 11b for location. Four major reflections are identified on the seismic section; they can be traced through much of the Western Somali Basin. The middle Eocene-late Oligocene hiatus between lithologic units I and II coincides well with the *green* reflection. Drilling in unit II stopped just above the *purple* reflection, to which a mid-Cretaceous age is assigned. The top of oceanic basement is indicated by the *blue* reflector, which is immediately overlain by the Middle to Upper Jurassic *red* reflector.

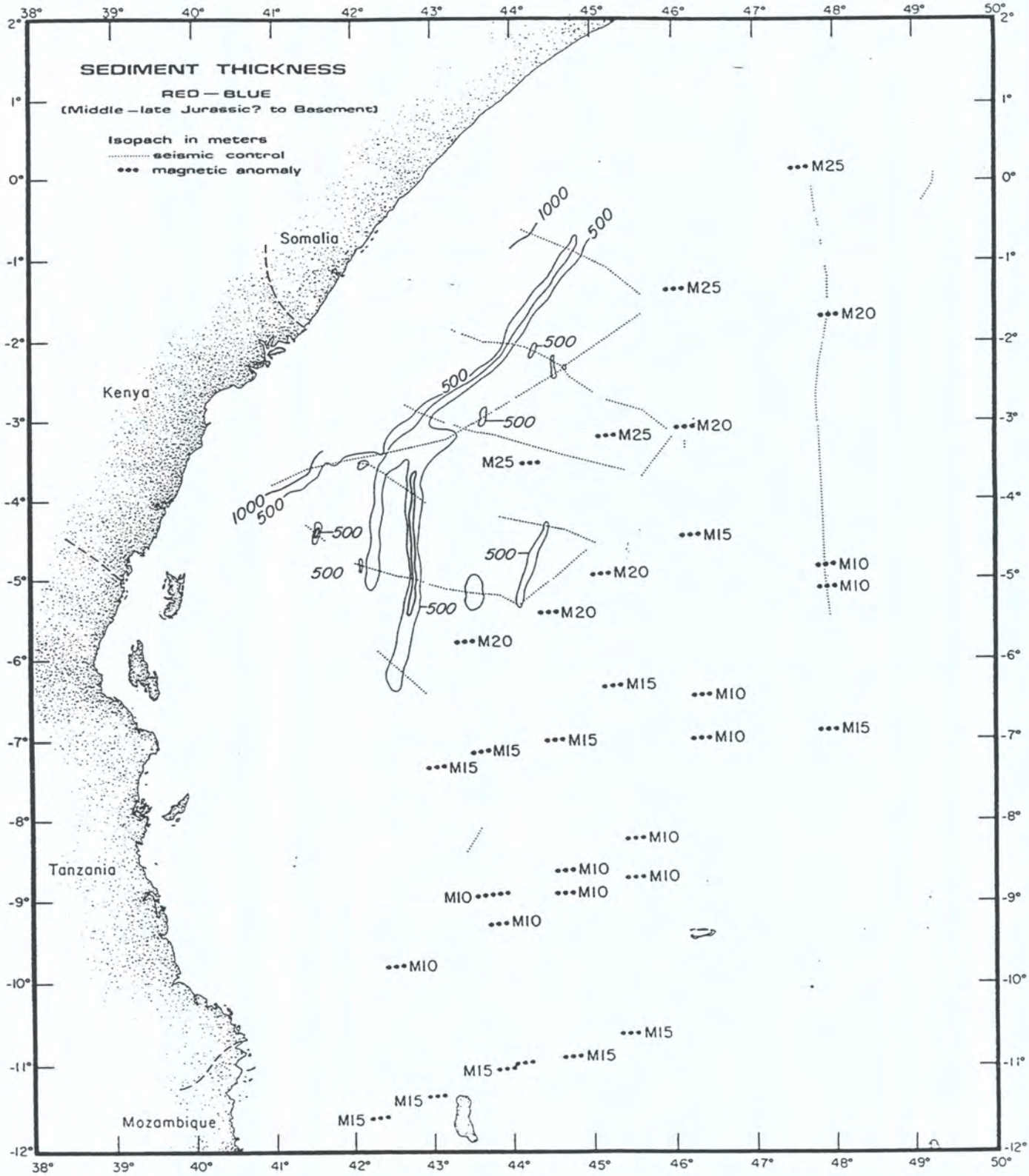


Figure 13. Isopach map, *blue* reflection (igneous basement) to *red* reflection (Jurassic?) compiled and contoured from MCS data (Coffin and Rabinowitz, 1988, 1992) and velocity analyses (Coffin et al., 1986).

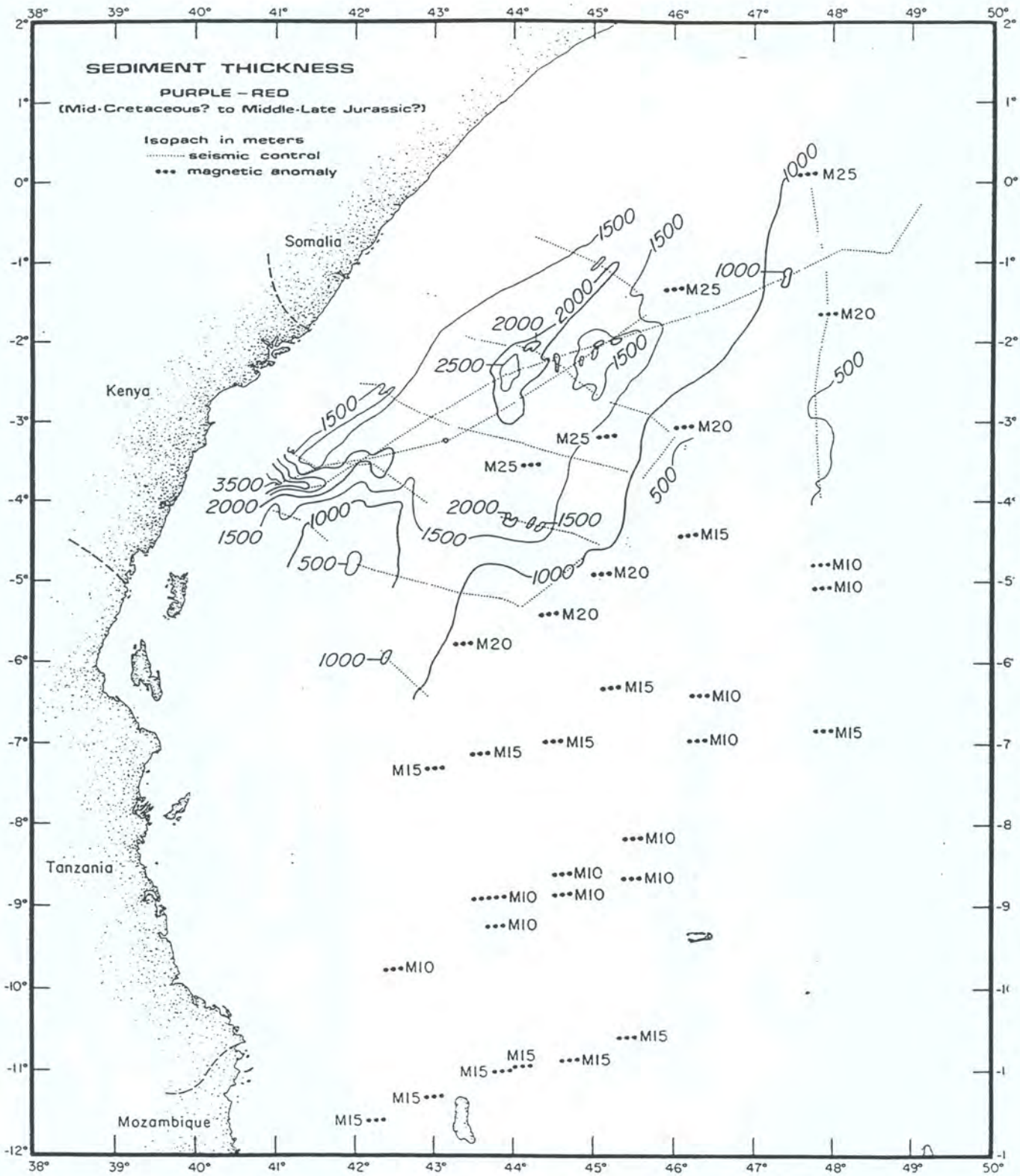


Figure 14. Isopach map, *purple* reflection (mid-Cretaceous?) to *red* reflection (Jurassic?) compiled and contoured from MCS data (Coffin and Rabinowitz, 1988, 1992) and velocity analyses (Coffin et al., 1986).

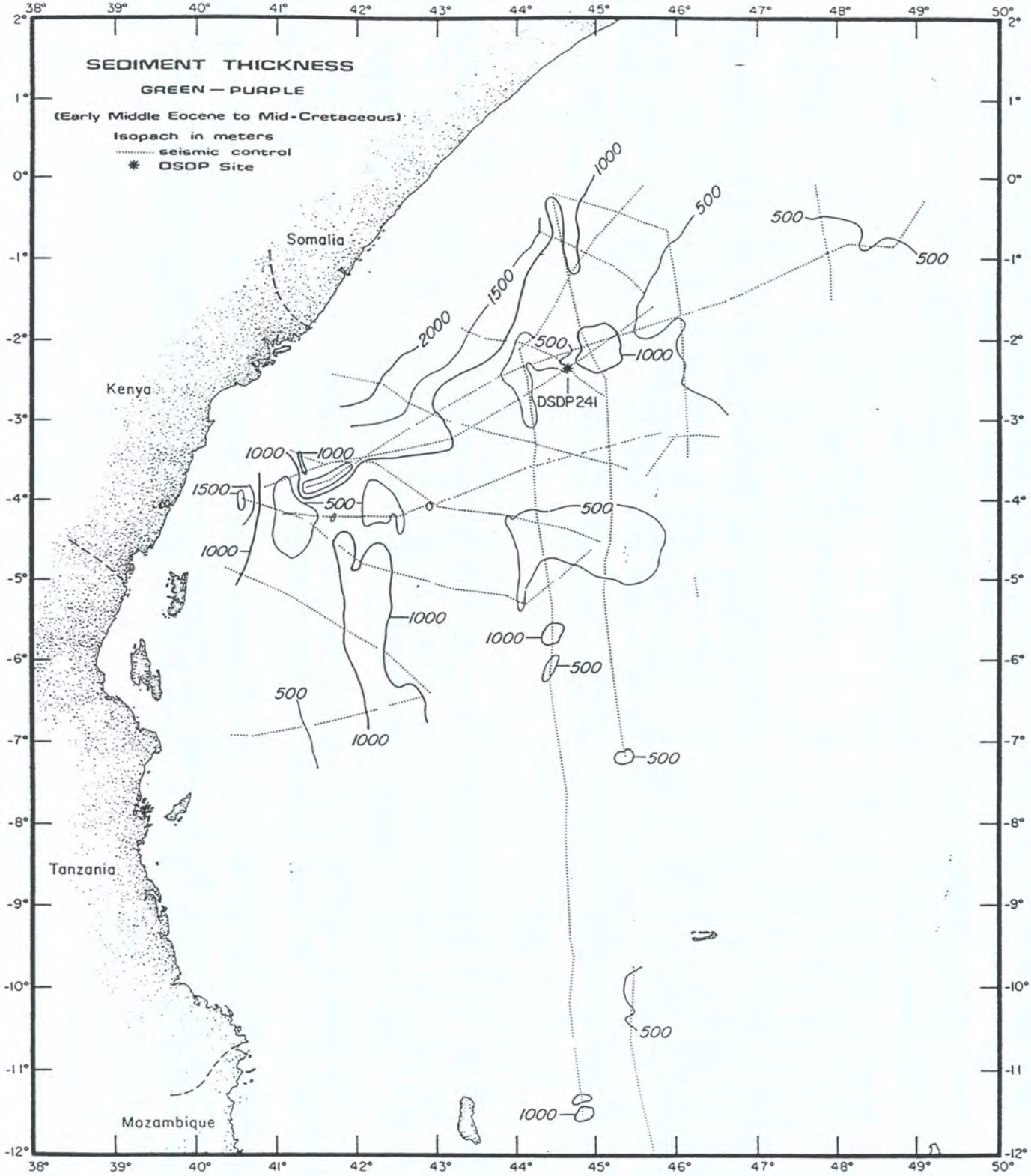


Figure 15. Isopach map, *green* reflection (late Oligocene) to *purple* reflection (mid-Cretaceous?) compiled and contoured from MCS data (Coffin and Rabinowitz, 1988, 1992) and velocity analyses (Coffin et al., 1986).

Figure 16. Total sediment thickness map compiled and contoured from MCS and single channel seismic data and velocity analyses (Coffin et al., 1986). Cross-hatching indicates area of proposed site WSB-1; see figures 30-34 for more detail.

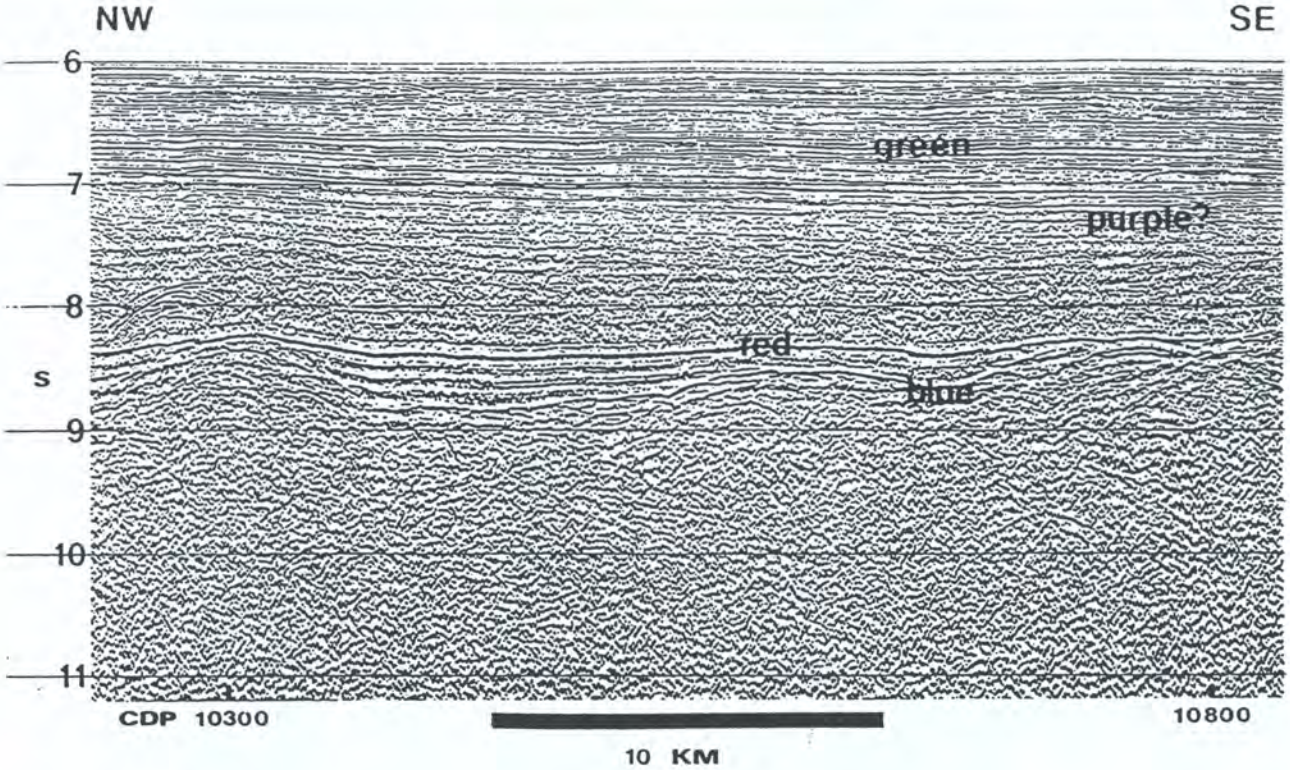


Figure 17. Typical *red* (Jurassic?) reflection character, usually flat-lying or draping basement topography (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

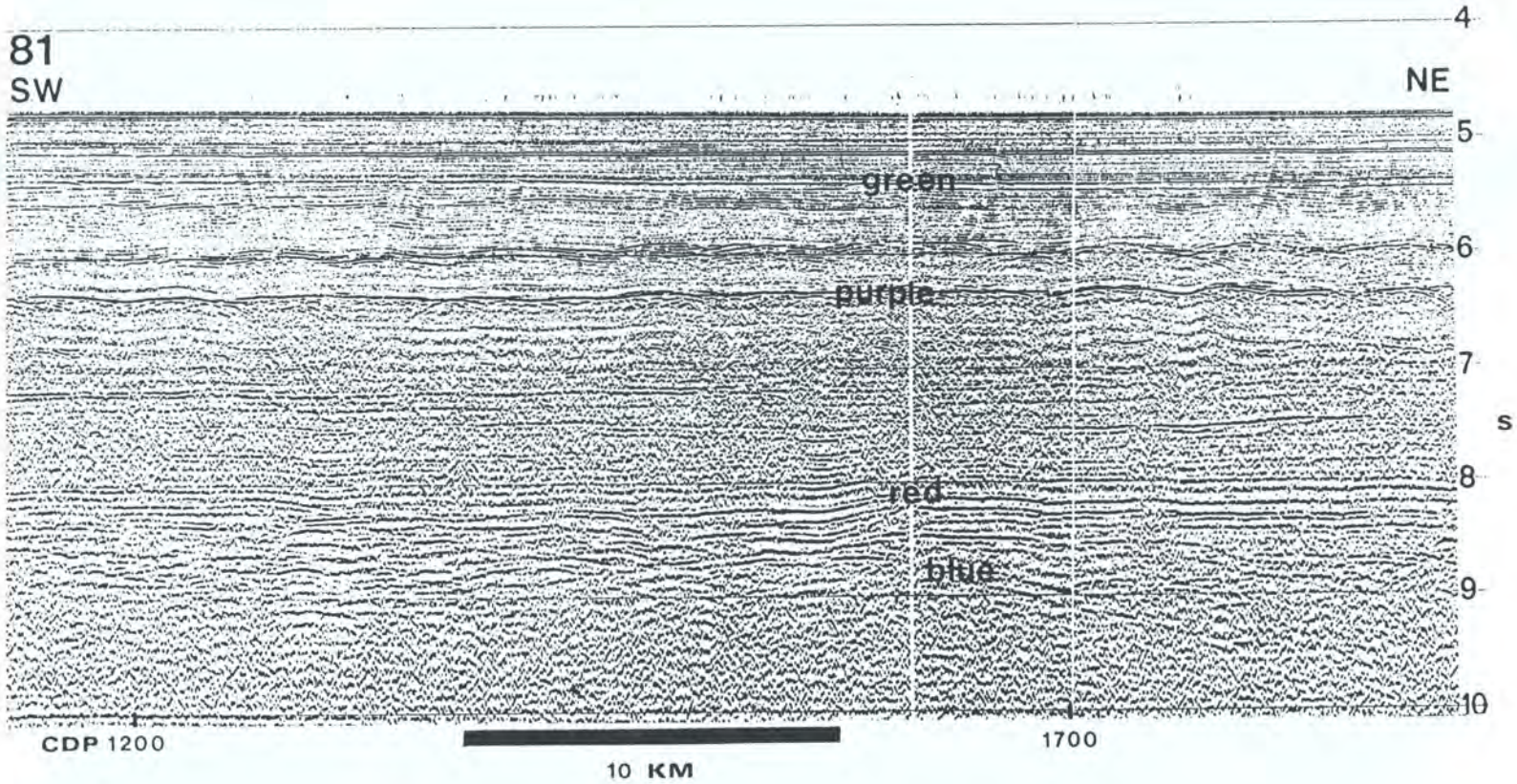


Figure 18. The *purple* reflection, a hummocky, locally hyperbolated horizon, is an unconformity (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

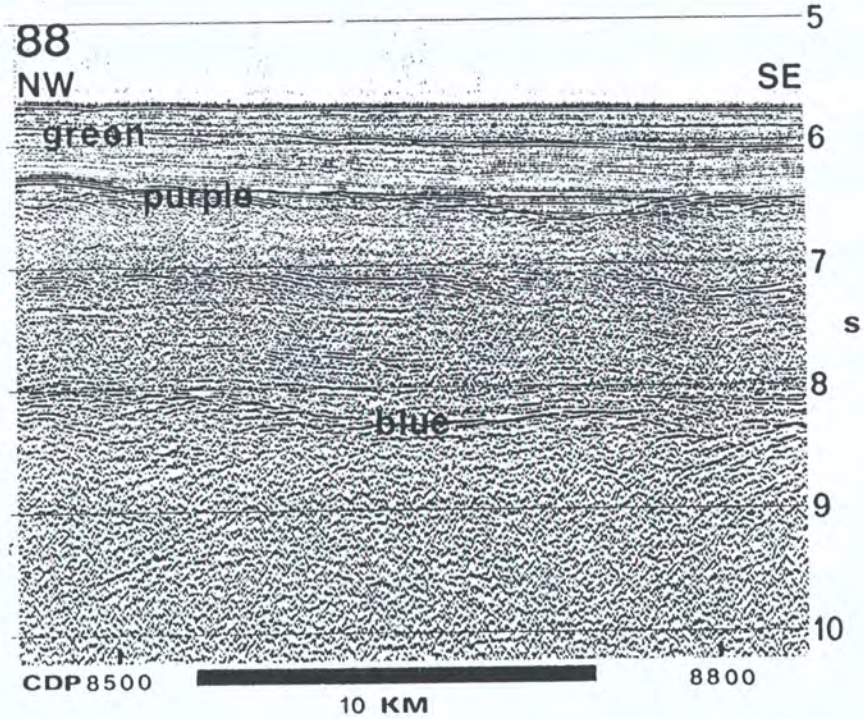


Figure 19. A small channel (CDP 8750) defined by the *purple* reflection, representing an erosional unconformity (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

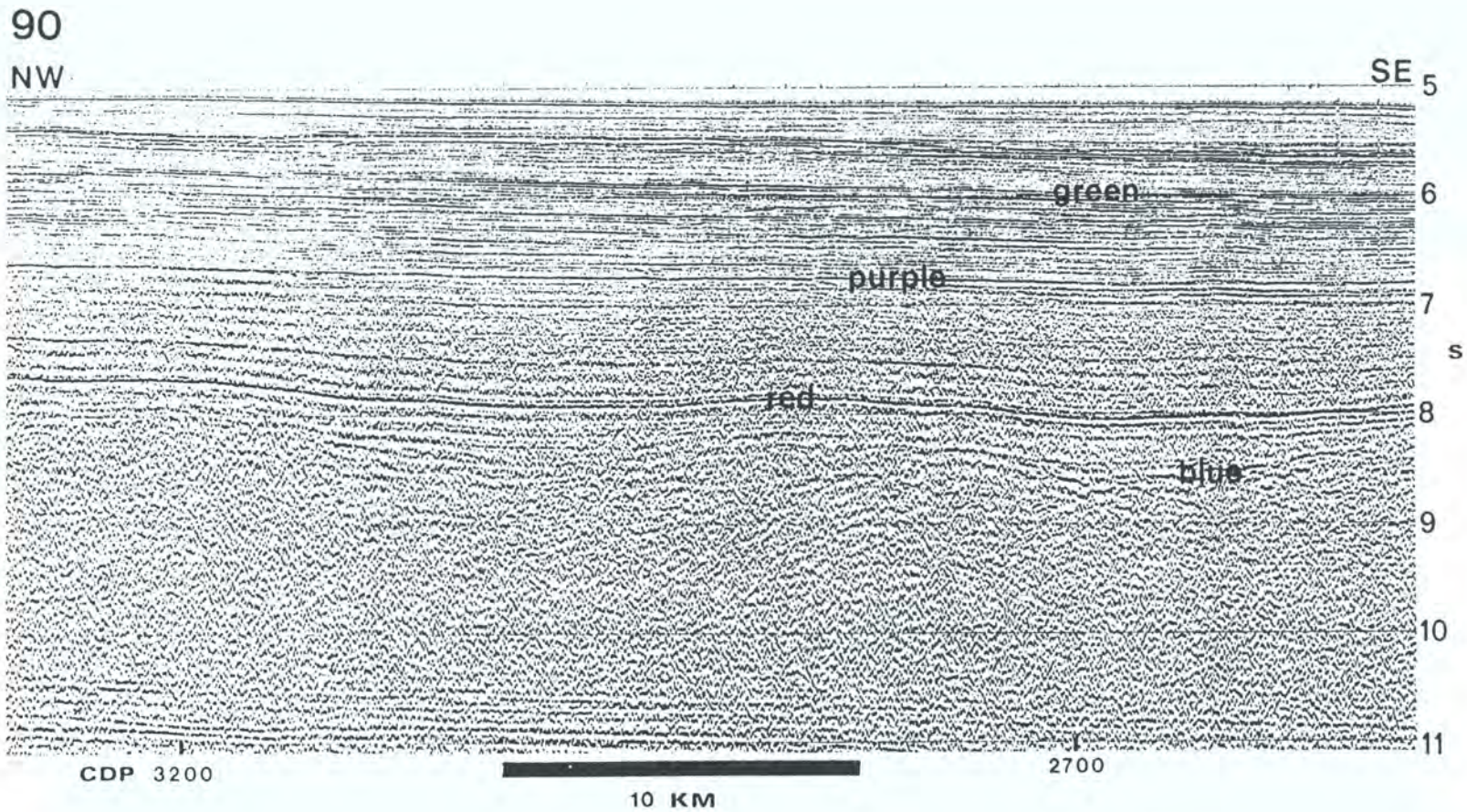


Figure 20. In the south, the *purple* reflection is conformable (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

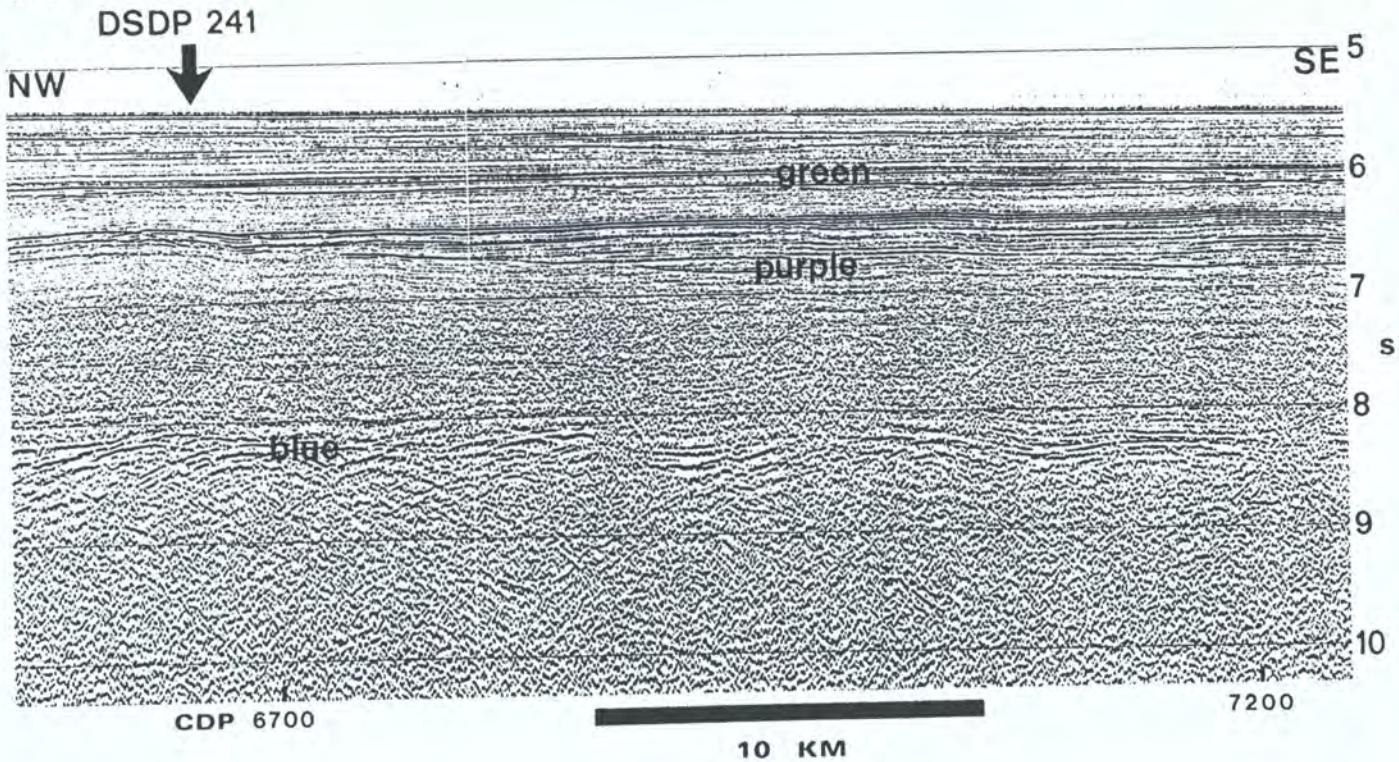


Figure 21. Sediment of the *green-purple* interval lapping onto the *purple* horizon (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

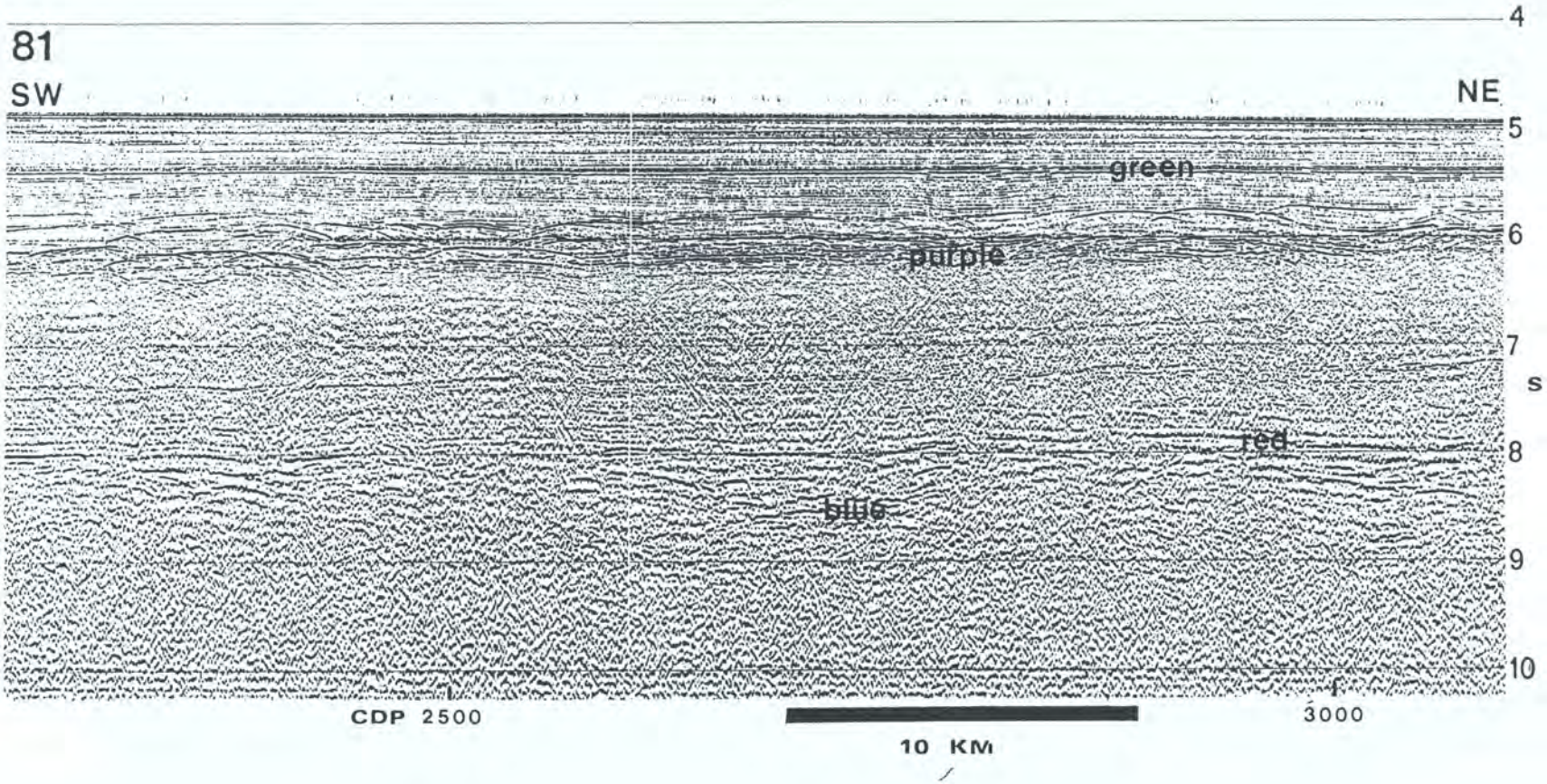


Figure 22. The *purple-green* interval shows reflection configurations indicating high-energy sedimentary processes (Coffin and Rabinowitz, 1988, 1992). See Figure 11 for location of profile.

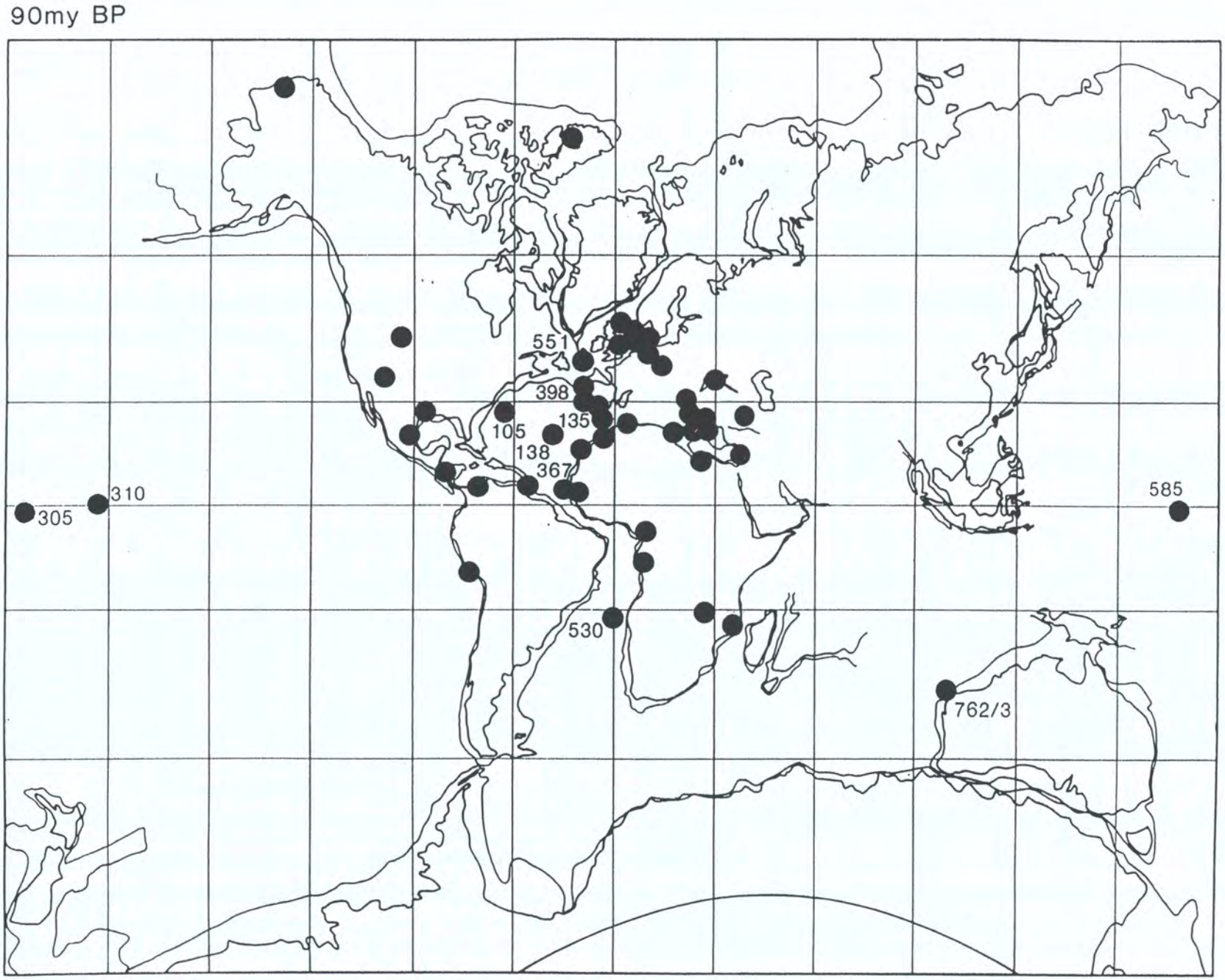


Figure 23. Plate reconstruction for 90 Ma showing Cenomanian-Turonian black shale occurrences (Art[illegible] et al., 1990).

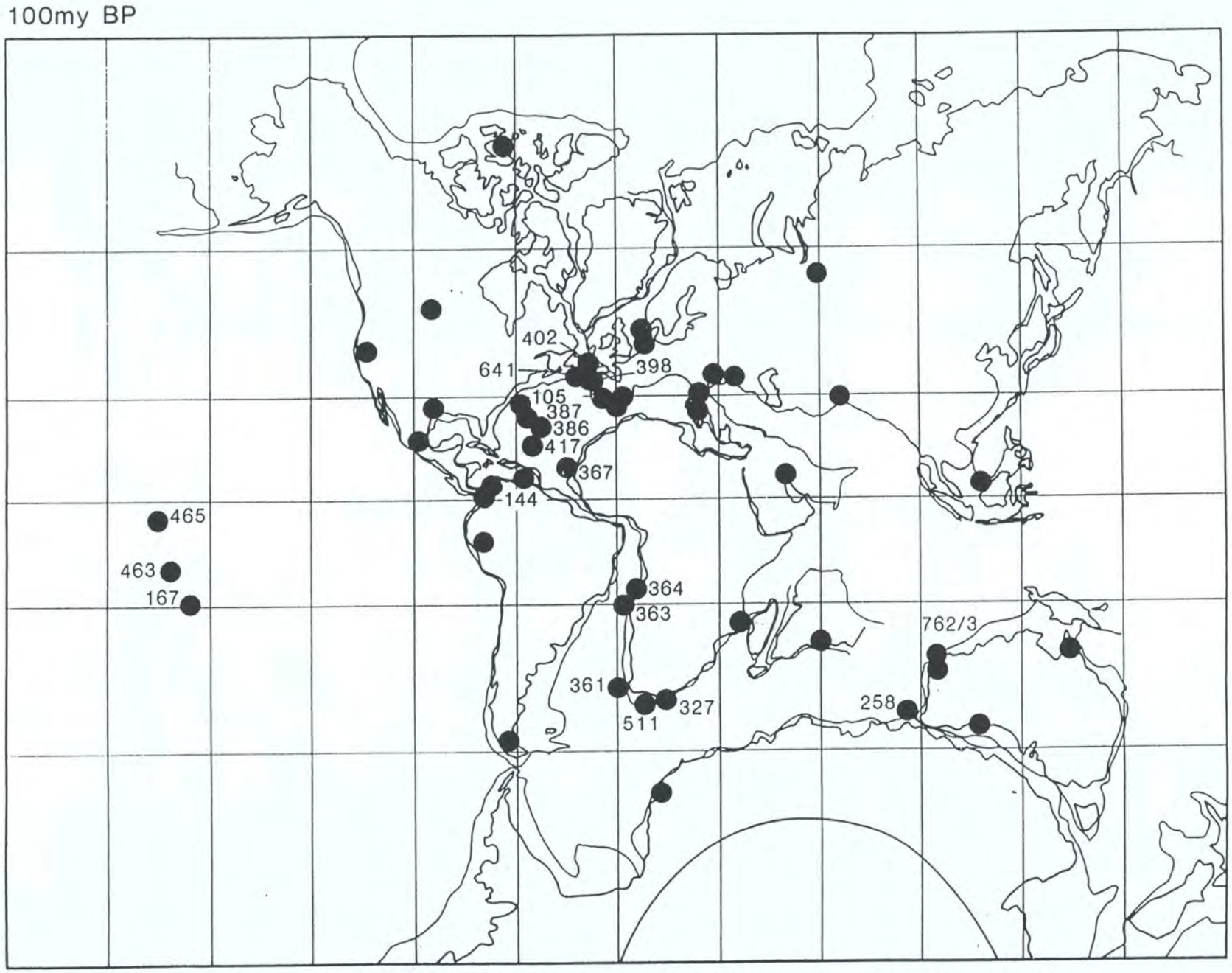


Figure 24. Plate reconstruction for 100 Ma showing Aptian-Albian black shale occurrences (Arthur et al., 1990).

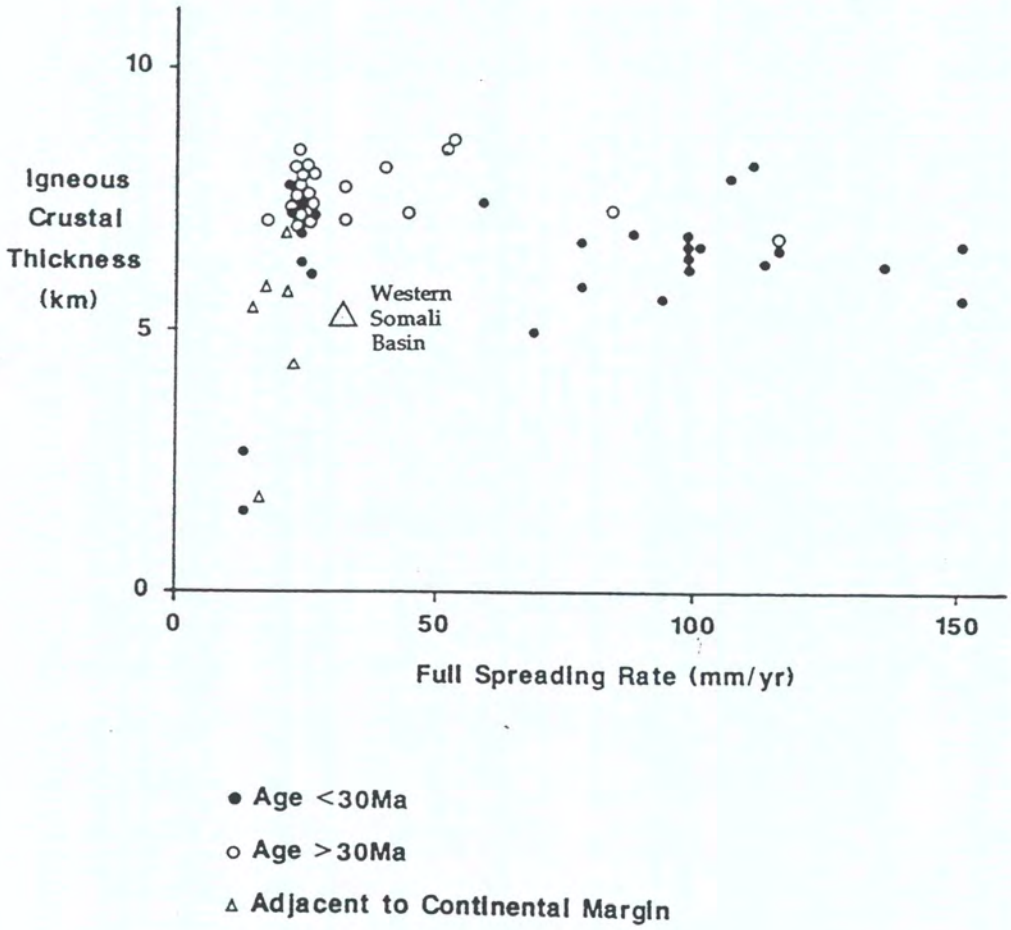


Figure 25. Oceanic igneous crustal thickness as a function of spreading rate for profiles across normal oceanic crust and adjacent to non-volcanic rifted margins, in locations where the magnitude of the residual depth anomaly is less than 0.5 km. After White et al., 1992; Western Somali Basin data point from Coffin et al., 1986.

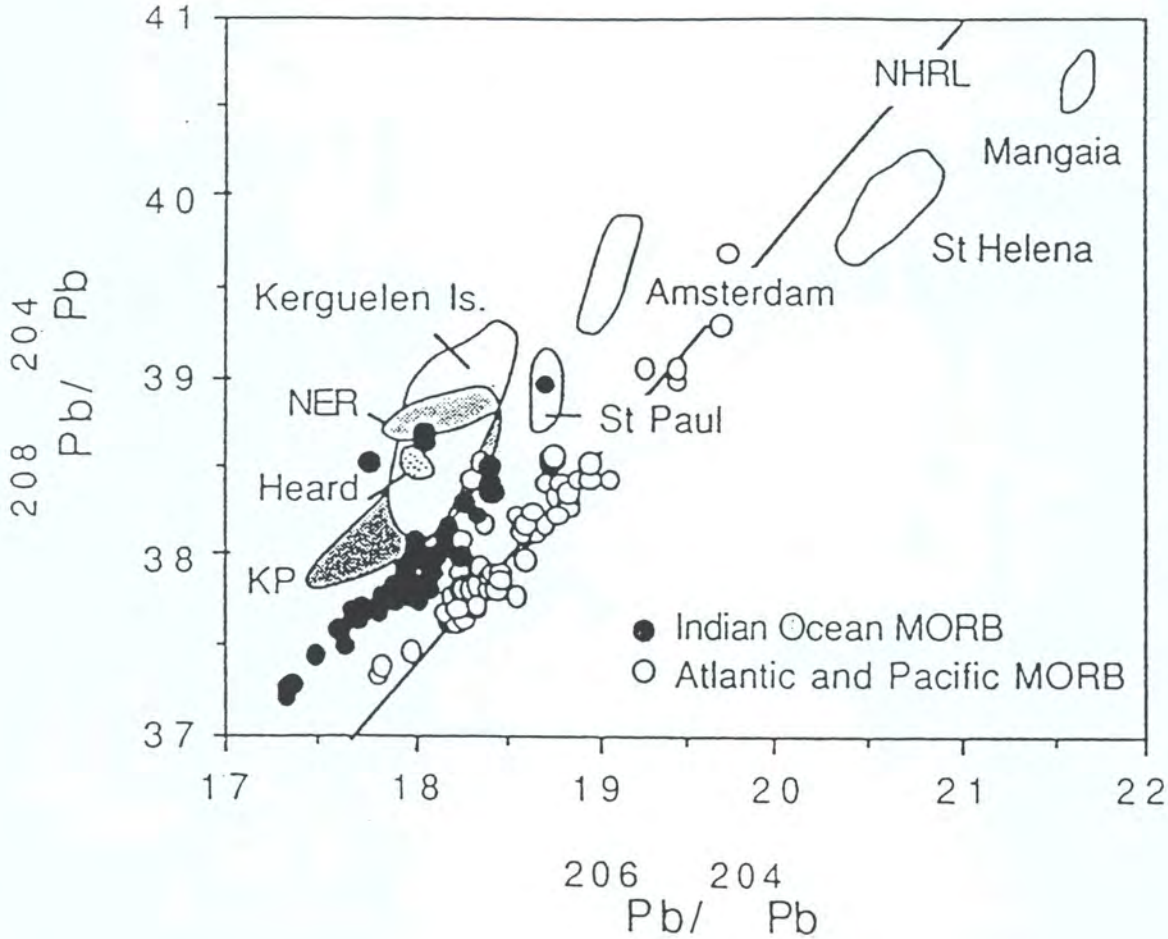


Figure 26. $^{208}Pb/^{204}Pb$ against $^{206}Pb/^{204}Pb$ for Indian, Atlantic, and Pacific oceanic basalts. Indian Ocean MORBs are characterized by the Dupal anomaly, and are clearly distinguishable from Atlantic and Pacific MORBs. From Storey et al., 1989.

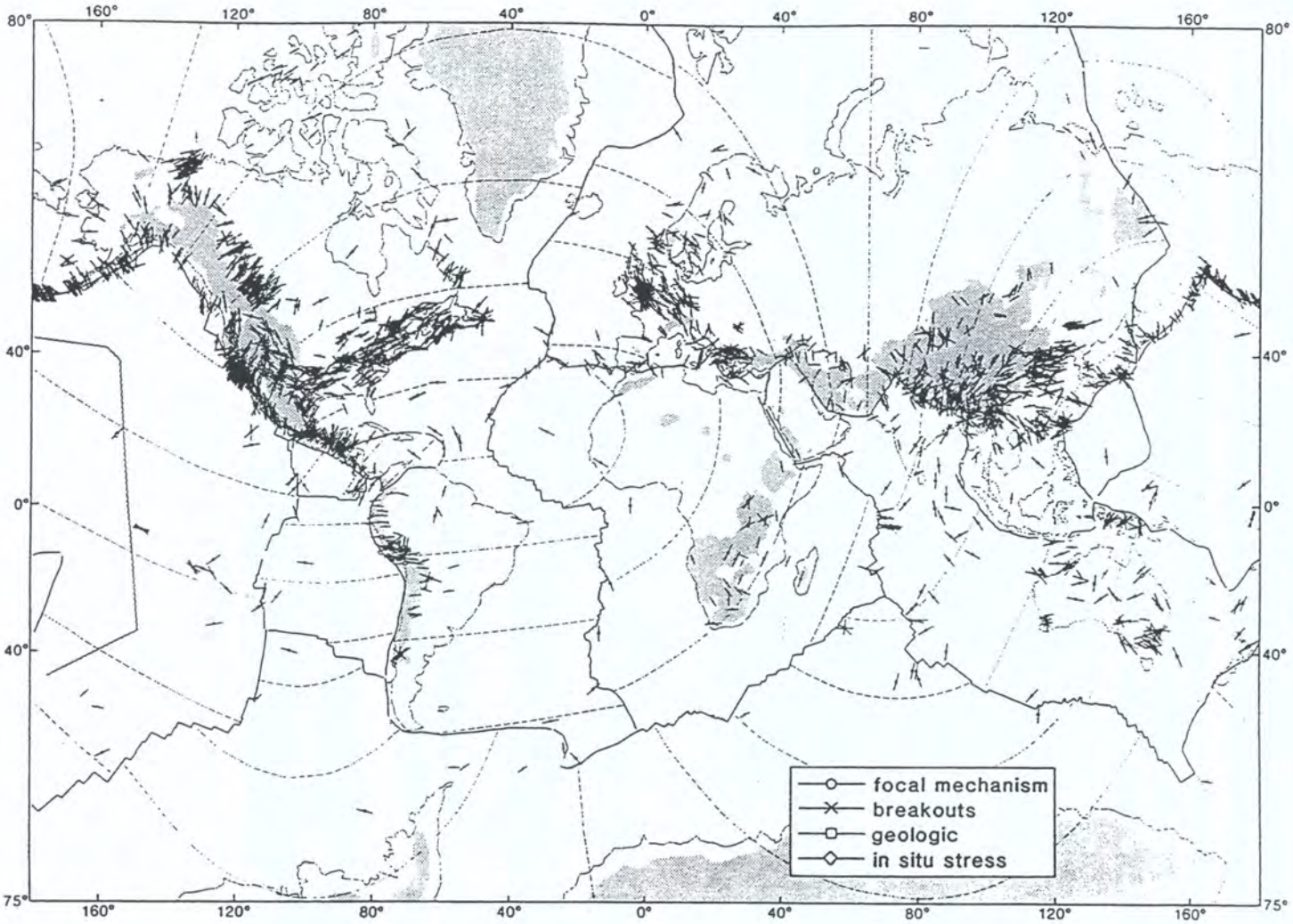


Figure 27. World stress map, transverse Mercator projection. S_{Hmax} orientations are plotted, length of lines are proportional to quality (A, B, or C). Center symbol designates type of stress indicator. Lightly dashed lines correspond to absolute velocity trajectories determined using AM1-2 poles of Minster and Jordan (1978). After Zoback, Zoback, et al., 1989.

Figure 28. Summary of late Quaternary and present-day stress orientation data for central East Africa. S_{hmin} from borehole breakout data is indicated in rose diagrams; Quaternary vent alignments are rotated 90° to correspond with S_{hmin} orientations. Solid bars indicate small-scale kinematic fault data. From Bosworth et al., 1992.

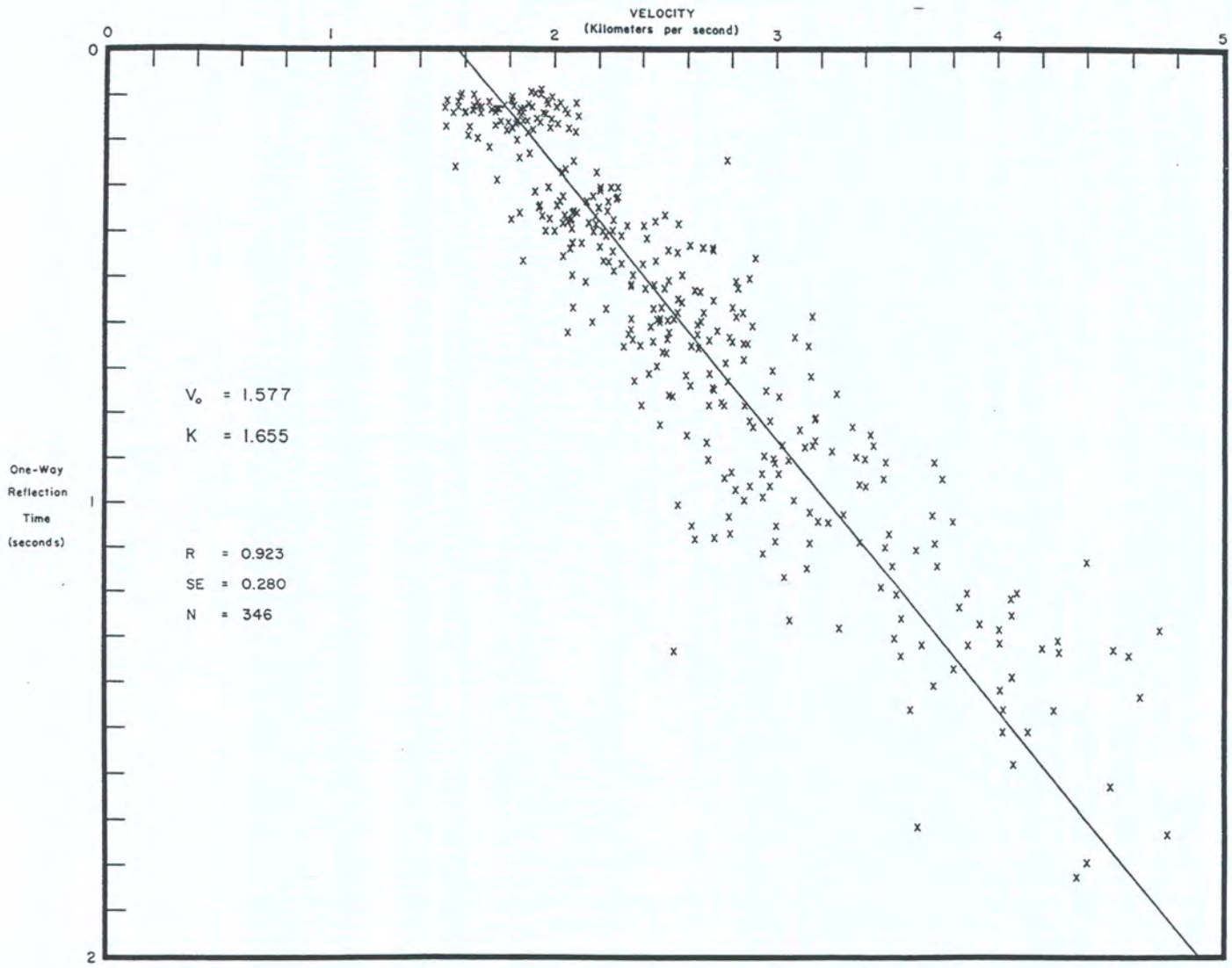


Figure 29. Edited, sonobuoy-derived velocity data used in linear regression analysis to determine a continuous velocity function of the form $v = v_0 + Kt$ (where t is the one-way vertical travel time beneath the seafloor in seconds, v is the 'instantaneous velocity' at time t, v_0 is a statistical projection to the seafloor from data points beneath that approximates the seafloor sound velocity, and K is the acceleration of a vertically descending ray) for sediments of the Western Somali Basin (Coffin et al., 1986).

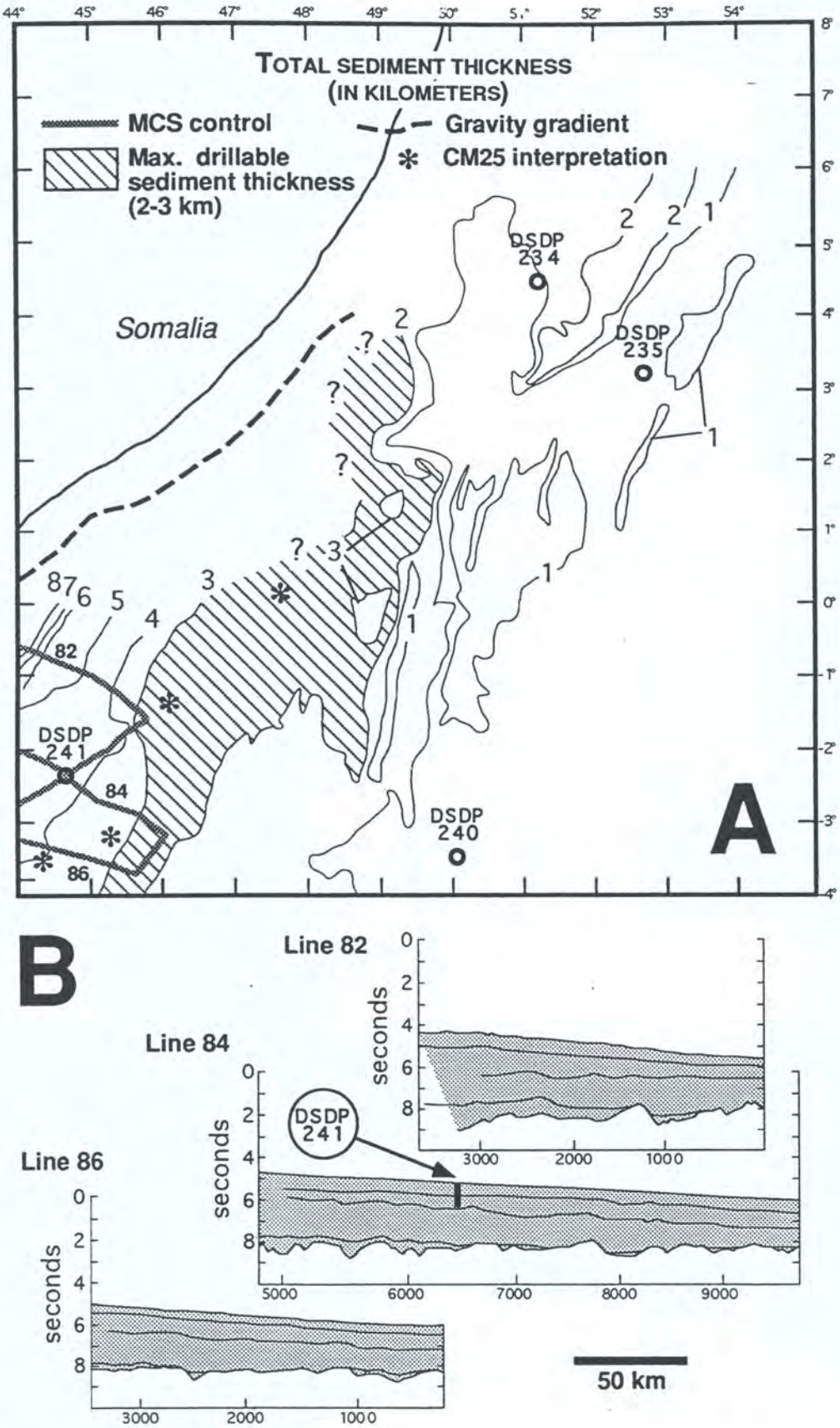


Figure 30. A. Total sediment thickness map (after Fig. 16) showing MCS control, DSDP Site 241, CM25 interpretations, location of gravity gradient (best continent-ocean transition pick), and maximum drillable sediment thickness (2-3 km). Note that contours appear to converge to the northeast along the Somalian margin. B. Line drawings of portions of MCS line shown in (A). Sediment is shaded, and basement is white.

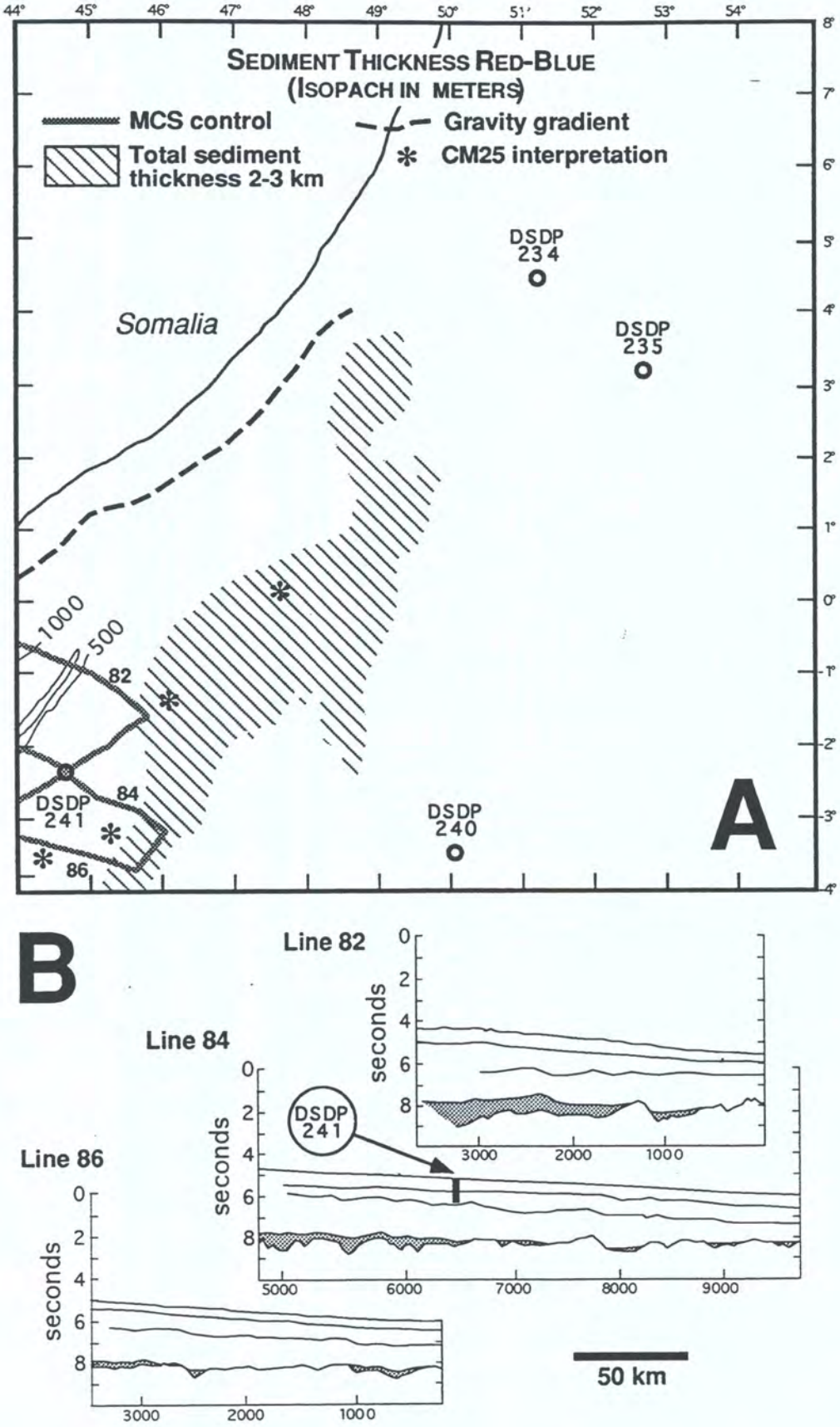


Figure 31. A. Isopach map, *blue* reflection (igneous basement) to *red* reflection (Jurassic?) (after Fig. 13). B. Line drawings of portions of MCS lines shown in (A). *Red-blue* sequence is shaded; other sequences and basement are white.

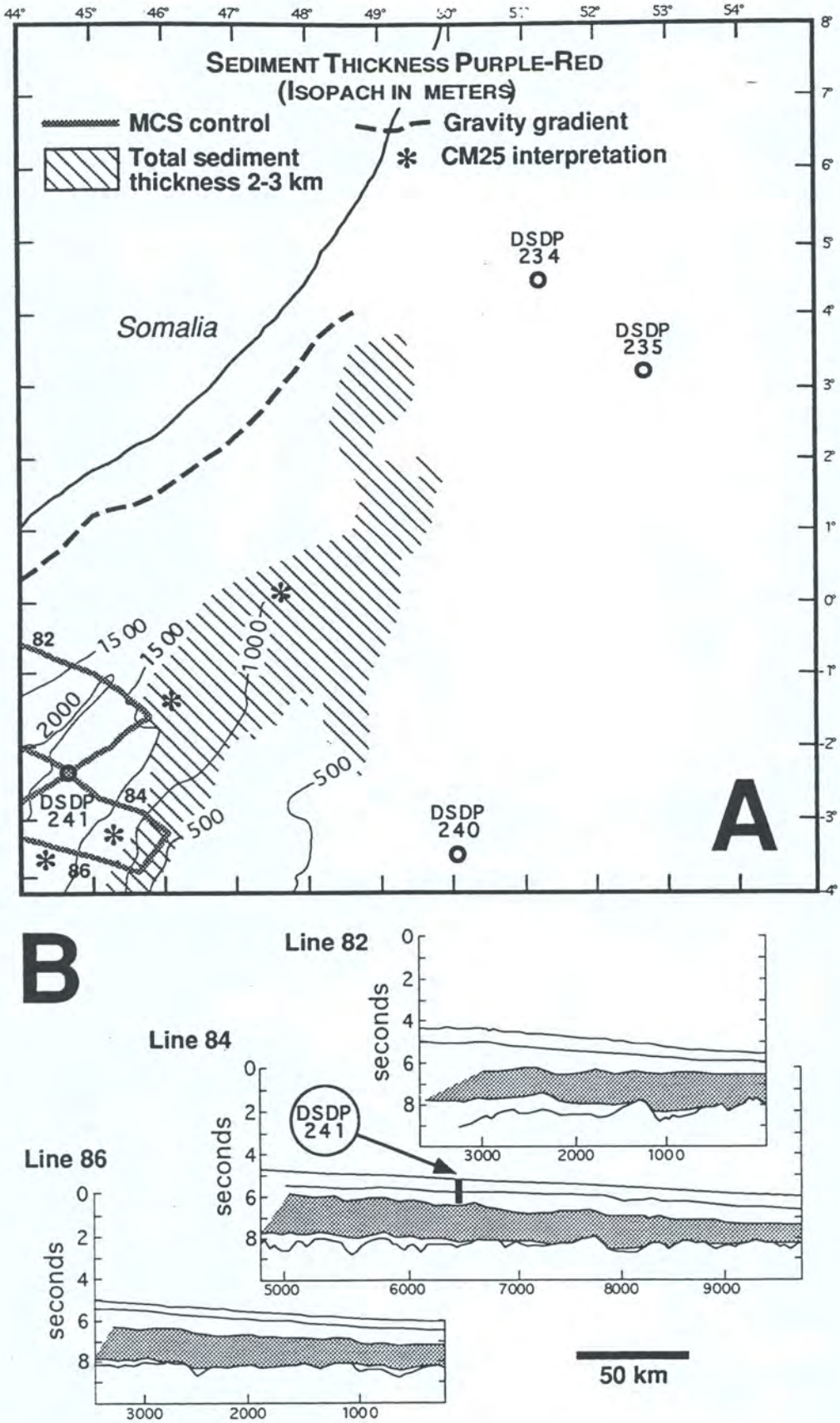


Figure 32. A. Isopach map, *purple* reflection (mid-Cretaceous?) to *red* reflection (Jurassic?) (after Fig. 14). MCS control, DSDP Site 241, CM25 interpretations, and location of gravity gradient (best continent-ocean transition pick) are shown. B. Line drawings of portions of MCS lines shown in (A). *Purple-red* sequence is shaded; other sequences and basement are white.

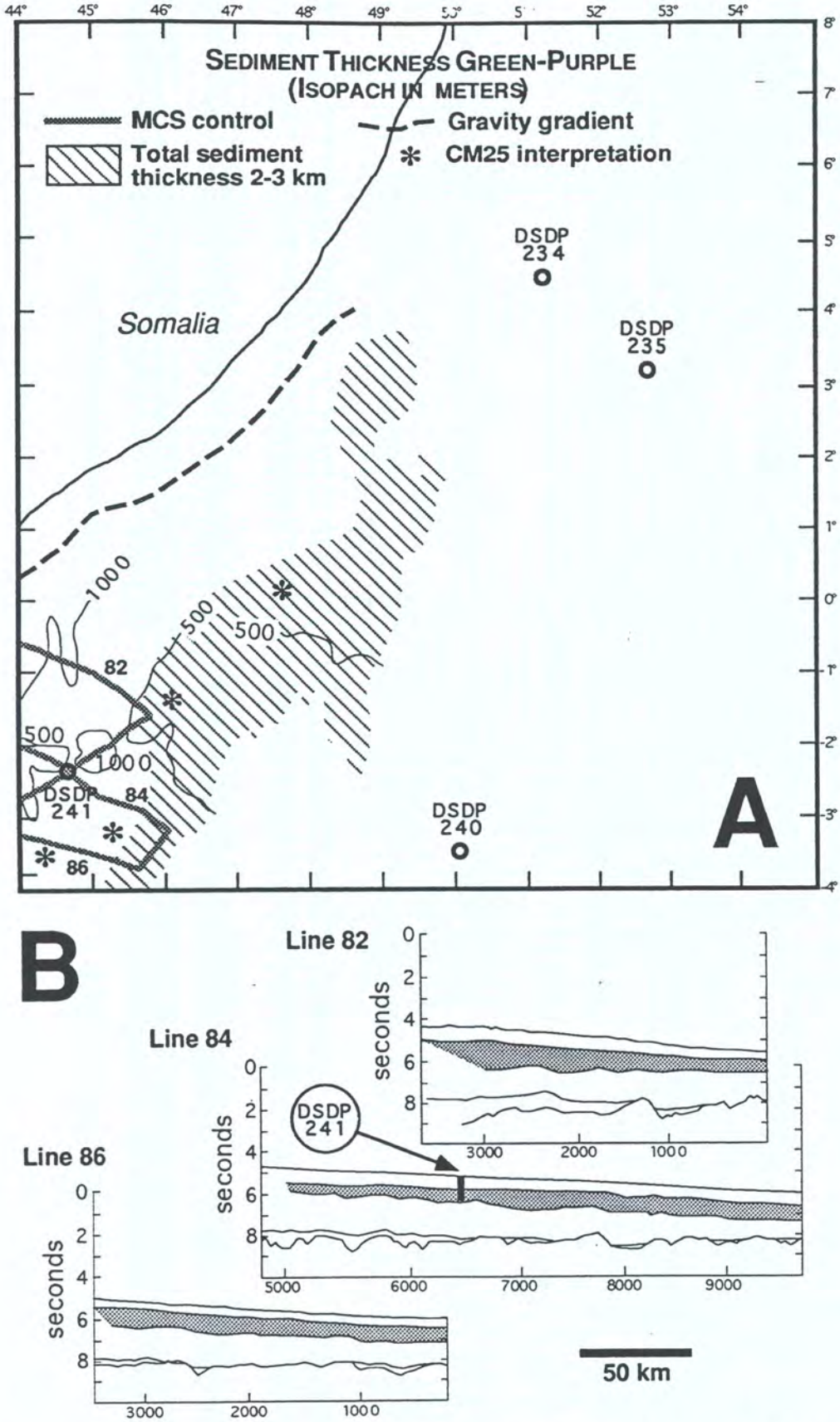


Figure 33. A. Isopach map, *green* reflection (late Oligocene) to *purple* reflection (mid-Cretaceous?) (after Fig. 15). MCS control, DSDP Site 241, CM25 interpretations, and location of gravity gradient (best continent-ocean transition pick) are shown. B. Line drawings of portions of MCS lines shown in (A). *Green-purple* sequence is shaded; other sequences and basement are white.

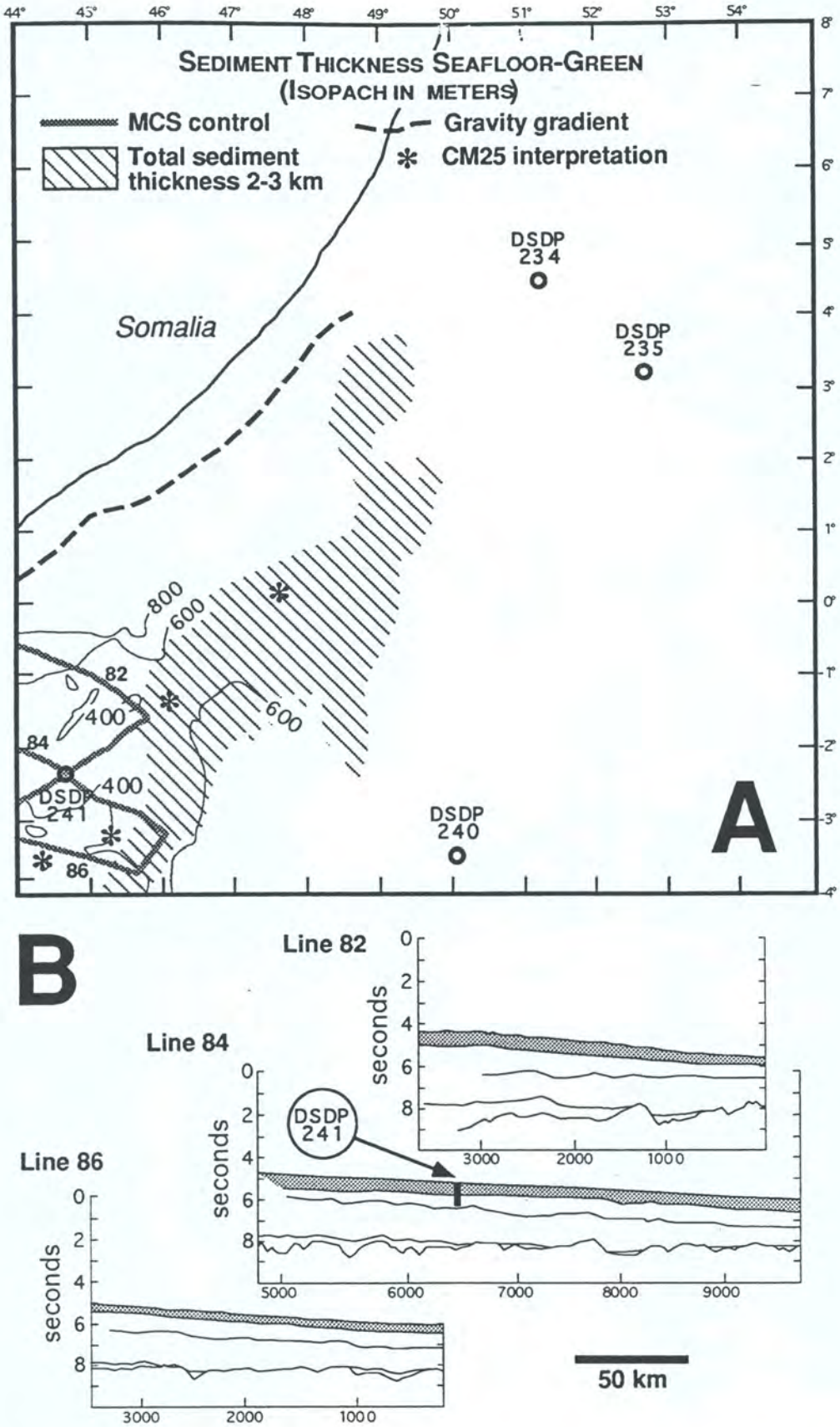


Figure 34. A. Isopach map, *seafloor to green* reflection (late Oligocene) compiled and contoured from MCS data (Coffin and Rabinowitz, 1988, 1992). MCS control, DSDP Site 241, CM25 interpretations, and location of gravity gradient (best continent-ocean transition pick) are shown. B. Line drawings of portions of MCS lines shown in (A). *Seafloor-green* sequence is shaded; other sequences and basement are white.

ODP Site Summary Form 6/91

Fill out one form for each proposed site and attach to proposal

Title of Proposal:	The Mesozoic Somali Basin: Tethys and the Birth of the Indian Ocean
Site-specific Objective(s) (List of general objectives must be inc. in proposal)	1) Mesozoic global change, including paleoceanography and paleoclimate; 2) geochemistry, petrology, and hydrothermal alteration of Jurassic oceanic crust; 3) Gondwanan plate kinematics; 4) Mesozoic bio-magnetostratigraphy and chemostratigraphy; 5) sedimentary mass balance; 6) state of stress of the Somalian plate.

	Proposed Site	Alternate Site
Site Name:	WSB-1	
Area:	Western Somali Basin, Indian Ocean	
Lat./Long.:	3°S-4°N, 45°E-50°E	
Water Depth:	~4000 m	
Sed. Thickness:	~2500 m	
Total penetration:	~3000 m	

	Sediments	Basement
Penetration:	~2500 m	~500 m
Lithology(ies):	deep-sea carbonates, hemipelagics, oozes, claystone, sandstone	pillow basalt
Coring (check):	1-2-3-APC x VPC* XCB MDCB* PCS RCB x DCS* Re-entry x	
Downhole measurements:	Routine logging, stress determinations	

*Systems currently under development

Target(s) (see Proposal Submission Guidelines): D

Site Survey Information (see Proposal Submission Guidelines for details and requirements):

		Check	Details of available data and data that is still to be collected
01	SCS deep penetration		
02	SCS High Resolution		
03	MCS and velocity	x	Vema 3618; assorted French lines; more needed
04	Seismic grid	x	needed
05	Refraction	x	Vema 3618 and 3619; some Lamont, US Navy, British
06	3.5 or 12 kHz	x	Vema 3618 and 3619; assorted US, French, US Navy
07	Swath bathymetry		
08	H.-res side-looking sonar		
09	Photography/video		
10	Heat flow		
11	Magnetics/gravity	x	Vema 3618 and 3619; assorted US, French, US Navy
12	Coring	x	DSDP legs 24 and 25; assorted Lamont piston cores
13	Rock sampling		
14	Current meter		
15	Other		

Weather, Ice, Surface Currents:

Territorial Jurisdiction:

Other Remarks:

	Name/Address	Phone/FAX/Email
Contact Proponent:	Millard F. Coffin UTIG 8701 Mopac Blvd. Austin, TX 78759-8397	Phone: 512-471-0429 Fax: 512-471-8844 email: mikec@coffin.ig.utexas.edu

TECHNOLOGICAL DEVELOPMENTS
DEVELOPMENT ENGINEERING STRATEGY
PHASE III 1999 - 2003

OVERVIEW

The scientific goals of Phase III have been broadly identified and documented by the scientific community, JOI and ODP in several recent publications, more notably the Long Range Plan (LRP) and the Strategic Implementation Plan. The purpose of this paper is to show how the Development Engineering Team at ODP/TAMU is preparing to meet the technological requirements necessary to successfully achieve these goals during Phase III development. These efforts were conducted in accordance with innovation and dry dock SOE's in the FY98 Program Plan.

From 1983-1989, the main developmental thrust at ODP/TAMU was to improve existing tools inherited from DSDP. During Phase I (1989-1993) of the present program,the Development Engineering Team made a concentrated effort to adapt high-speed mining coring technology for use on the *JOIDES Resolution*. Emphasis was placed on the development of a secondary platform (Diamond Coring System [DCS]) and ancillary hard rock coring tools and equipment. Capital expenditures were $6.5 million during this period, 87% of which was devoted to DCS development. The inevitable progression to Phase II (1994-1998) saw an initial injection of $1.4 million into the continuing DCS program, after which capital expenditures through 1996 were restricted to $366,000. During the final two years of Phase II, developmental effort was expanded in order to activate the *JOIDES Resolution* heave compensator and to develop a Hard Rock Re-Entry System (HRRS). This brought the total capital expenditure for this period to about $4 million.

Future plans for development engineering will include a shift in ethos to provide a more coordinated effort requiring thorough technical definition and positive, incremental development. To deliver a vessel capable of meeting the Program goals to the scientific community, development will be required in five key areas:

- Improved Sedimentary Coring;
- Substantial Hard Rock Coring;
- Expanded Downhole Measurements, Measurement-While-Drilling & Logging-While-Coring;
- Deeper Drilling & Cased Holes, Mud riser drilling from the *JOIDES Resolution* for both margins and oceans;
- Legacy Boreholes, New generation of sampling tools and remote data collection.

With this in mind, proposed capital requirements for Phase III (1999-2003) are planned to begin at $875,000 in 1999 and build to $1.3 million per year by 2003 in order to provide a continuum of innovation. Riser drilling will be evaluated from the *JOIDES Resolution* with a mini-riser (drill string) and small blow-out preventer for coring on the margins. In addition, the dry dock project scheduled for 1999 will include equipping the drill ship to improve upon its existing coring and scientific capabilities.

Although still very much in the conceptual stage, Phase IV (2004-2008) is anticipated to involve extensive borehole observatory enhancements requiring significant new instrumentation, remote sampling capabilities and automatic data transmission. Also, this phase would extend the deep drilling objectives of the LRP by investigating systems that allow for both riser and riserless mud circulation and blow-out prevention to set casing in deep holes in the oceans. The depth capability of the *JOIDES Resolution* is 8500 meters, with 3000-4000 meters of drilling/coring capacity. Continued development to achieve the full capability of the *JOIDES Resolution* provides an important contribution to meeting the goals of the LRP and supporting the greater capability of the OD21.

STATUS OF CURRENT DEVELOPMENT

Achievement of many of the scientific objectives within the ODP Long Range Plan requires improved core recovery, the ability to drill in young, fractured oceanic crust and the alternating sequences of very different lithologies, and the initiation of drilling and re-entering holes on sloping, hard rock surfaces. Development Engineering is currently addressing these issues through two challenging technological development programs. The first is to continue development of a Hard Rock Coring System (HRCS) -- an initiative that began several years ago and was known to many as the Diamond Coring System (DCS) development, but that is now taking an exciting new direction. The second innovative program is the development of a Hard Rock Re-Entry System (HRRS) that has been referred to in the past as the Hammer Drill-In System (HDS), but that consists of considerably more than a hydraulic hammer. Both the Hard Rock Coring System and the Hard Rock Re-Entry System are broad developmental programs that are intended to address many different technical requirements and to achieve incremental advances toward discrete improvement of core recovery and quality that are crucial to accomplish the scientific goals of the Long Range Plan of Phase III.

Hard Rock Coring System (HRCS)

Activation of the primary heave compensator aboard the *JOIDES Resolution* (instead of development and deployment of an active heave compensator for the DCS secondary platform) is the next incremental step in providing a more stable platform at the seafloor from which to conduct diamond coring. The existing, passive heave compensator is used to reduce the effect of ship heave on drilling and coring tools, as well as to provide soft landings for Hard Rock Guide Bases and CORKS. In essence, it is a large shock absorber, or pneumatic spring, that translates the increase in drill string weight due to ship heave into air compression. Its capacity for compensating ship heave is related to responsiveness (seal friction and compression rate) and mechanical limits (length of stroke). Seal friction creates a threshold (lower limit) operational value, where very small sea swells (heave forces) cannot overcome compensator seal friction, and therefore lift and drop the drill string some small amount. This variation of weight-on-bit (WOB) is only an inconvenience for roller-cone bits, but the consequence for diamond bits is much more serious.

Active heave compensation is the adaptation of computer technology to ship movement sensors in order to hydraulically move the heave compensator in cycle with ship heave, rather than to allow the passive heave compensator to react to heave forces. The significant difference is that the active system is responsive enough to reduce ship heave to some small threshold amount due to systemic friction. However, this technology does not address activities that occur below the ship, such as drill string reaction to dynamic positioning, ocean currents, heave friction, WOB drill-off and hole friction, as effectively as it deals with ship heave. Capital expenses for activating the heave compensator are shown in Figure 1. See pages T-59-T62.

Recent advances in petroleum exploration include "smart" tools that can be adapted to isolate the bottom-hole assembly (BHA) from the remaining ship heave and drill string dynamics and to provide the necessary conditions for coring at the seafloor. Diamond coring requires higher rotational speed than is routinely available from the *JOIDES Resolution* but that could be supplied with downhole motors. Allowable WOB variation is also much less than for rotary-cone (RCB) bits. For example, 250 kg is the allowable variation for an HQ size core versus 3000 kg for the RCB. Sea floor solutions may involve the adaptation of such smart tools as a WOB Sub and Vertical Thruster to provide downward force-on-bit (FOB), much like the existing Motor Driven Core Barrel (MDCB) and other (DCB) tools. With greater structural stability available at the seafloor, ODP's existing suite of diamond coring tools would be revisited during both major workshops planned for March 1998 and February 1999.

Hard Rock Re-entry System (HRRS)

The Hard Rock Re-Entry System consists of a unique set of drilling tools that are designed to create a re-entry hole on sloping, hard rock seafloor. A hard rock drill-in casing re-entry system is being developed around a water hammer to be compatible with ODP's existing casing program. The objectives of such a system are to:

- spud-in on bare, sloped hard rock;
- drill into hard rock with an improved rate of penetration;
- carry casing into the hole along with the drilling tools;
- achieve a setting depth adequate to structurally support re-entry.

Because the heart of the system is a hydraulic hammer, actuated by seawater, this project has been referred to in the past as the Hammer Drill-In System (HDS). However, much more innovation is required for this system than a drill hammer. The other components being developed are retractable and eccentric bits, a hydraulically actuated casing running tool, a casing hanger latch system, latch type free-fall re-entry cone and a hardened casing shoe.

The drill-in casing concept was tested by ODP and the hammer manufacturer in mid-1996. In quarry tests, a small hammer was used to drill-in 7" casing. A larger hammer has now been produced and is undergoing performance testing by the manufacturer. ODP plans to test this hammer with a 14-3/4" bit to drill-in 13-3/8" casing prior to sea trials with this system on Leg 179 in April 1998. Capital expenses are shown in Figure 2.

Downhole Measurements Technology

As Development Engineering begins to address the numerous downhole sensors, computational/data packages and telemetry systems that have proven worthy in drilling environments, the means to improve existing tools and integrate new technology will appear. For example, pressure/temperature/accelerometer sensors are available off-the-shelf with certified values of resolution and reproducibility (repeatability, hysteresis, nonlinearity, thermal shift) that can be easily adapted to ODP tools. The benefits are simplicity of use and ease of maintenance or replacement, not to mention significant cost savings.

The ultimate potential is for proven technology that is both rugged and reliable to be adapted to downhole measurement tools in the lab stack as well as at the seafloor. In addition, most logging sensors could be adapted to drilling/coring tools to provide formation evaluation while drilling or coring. Science and Development Engineering must collaborate to determine science needs for coring or lab stack equipment, as well as borehole instrumentation, in order to provide for new tools with application, operation and calibration procedures.

PHASE III DEVELOPMENT

Fundamental to the developmental engineering effort in Phase III is a building budget. It is impracticable to achieve many of the goals of the Long Range Plan if the current climate of flat budgeting is maintained. Therefore, for the purpose of this document as earlier outlined, it is assumed that a base level of funding of $875,000 in 1999, rising to $1.3 million in 2003, will be available to maintain a continuum of innovation. This is in addition to potential Special Operational Expenses that have been estimated at about $2.3 million per year. (See Figures 8 and 9).

The methodology of Development Engineering has been traditionally defined. Simply stated, it is to:

- define the market needs;
- define the product requirements;
- develop product performance;
- deliver products that meet the needs.

Definition of the market need is a collaborative effort that must occur between Development Engineering and its customers, the science community. The role of science in ODP innovation is seminal to the creation of successful tools. Development Engineering began to formulate its response to the requirements of the scientific community, JOI and ODP by creating Work Breakdown Structures for two broad areas: Deep Drilling and Hard Rock Coring Technology, and Legacy Holes Technology (see Figures 6 and 7). Close collaboration shall be required between Development Engineering and the science community, both in workshops and informally, to explicitly define the market needs. This could require many meetings and repeated efforts until both parties agree on a prevailing definition. Major workshops are currently planned for March 1998 on Deep Drilling and in February 1999 for Legacy Holes. These workshops will form the cornerstone of the development process for Phase III. Suggested topics for initiating discussion are shown in the attached Priority List and associated papers, A through D.

The science community must also provide continuing support for product development during the development process. This means that some ship time must be allocated for testing tools and technology at sea. Tools must also be exercised at sea for their benefits to become routinely accepted, and Drilling Services must be prepared to exercise tools at any available opportunity. Finally, product performance must be continuously criticized by both parties, not only to ensure performance, but to adapt new technology as it appears and in a manner that is coordinated within the budgeting process.

Recent advances in petroleum exploration technology may be adapted to ocean drilling and coring with proper planning and execution. This means close communication and coordination between the science community and ODP innovators, appropriate application of the scientific method by Innovators and positive, incremental achievements in order to accomplish the goals of the Long Range Plan for Phase III.

DEVELOPMENTAL ENGINEERING TEAM
March 1997

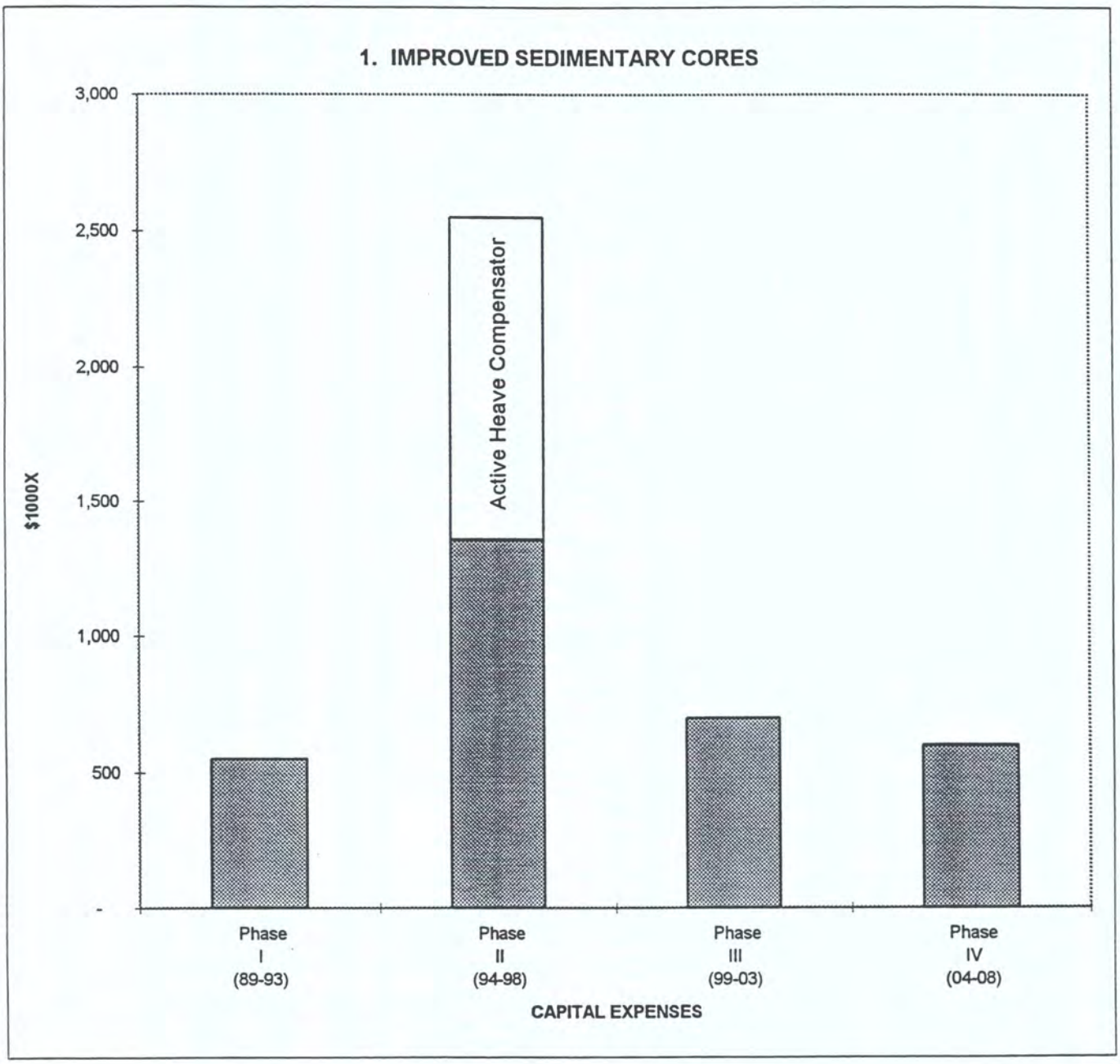
ATTACHMENTS TO APPENDIX III

HISTOGRAMS OF CAPITAL EXPENSES

WORK BREAKDOWN STRUCTURES

PHASE III LEVEL FUNDING FOR CONTINUUM OF INNOVATION

TECHNOLOGICAL DEVELOPMENT LISTS



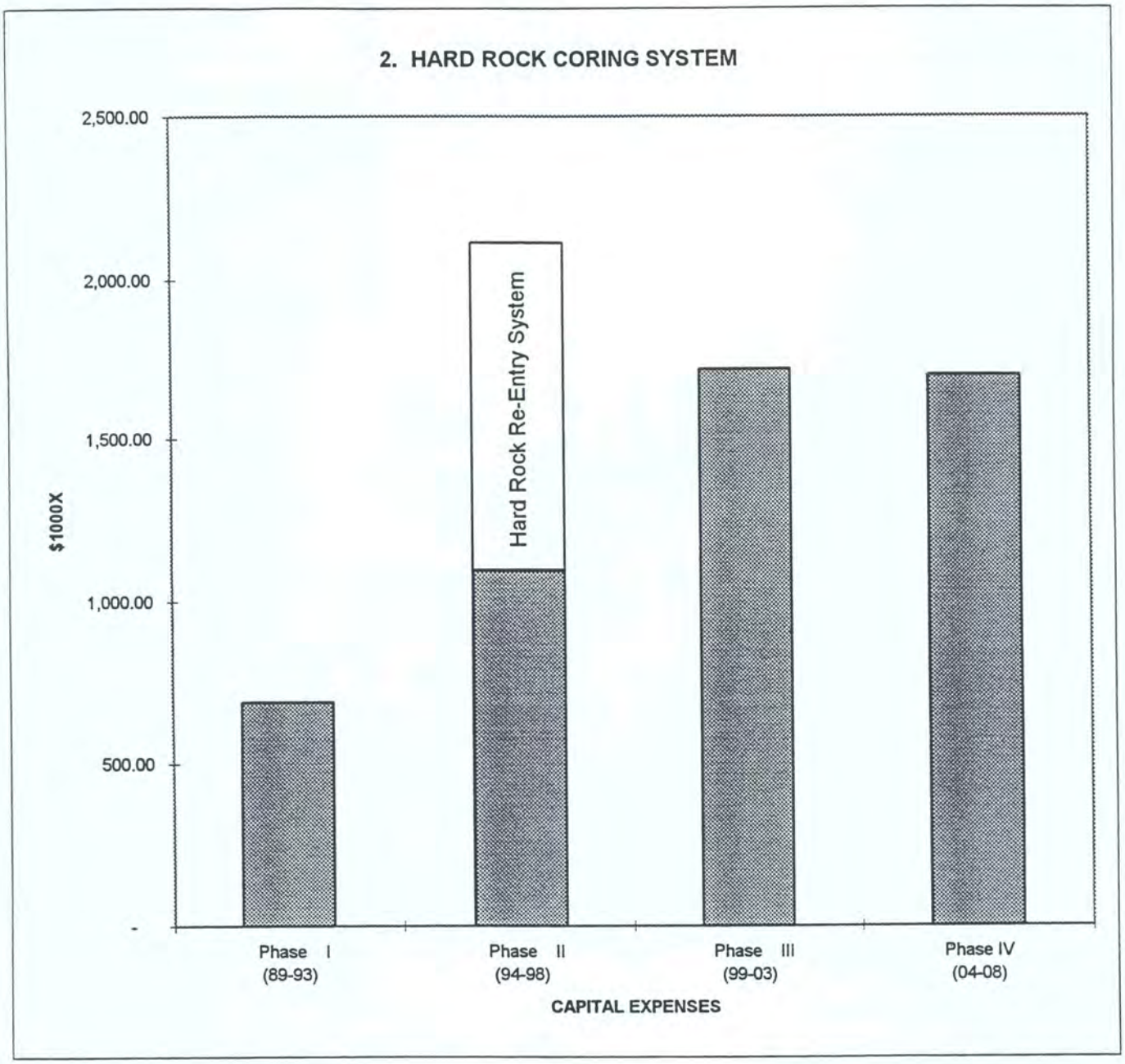
- Figure 1 -

Phases I & II

Drill Bit Motion Indicator	Pressure Core Sampler	Core Liner Analysis
Sonic Core Monitor	Hydraulic Piston Corer	Active Heave Compensator
Advanced Piston Corer	General Coring Improvements	Core Liners
Extended Core Barrel	Core Orientation	Drilling Recorder

Phases III

Tool technology and innovation utilized to improve drilling/coring operations aboard the J/R.



- Figure 2 -

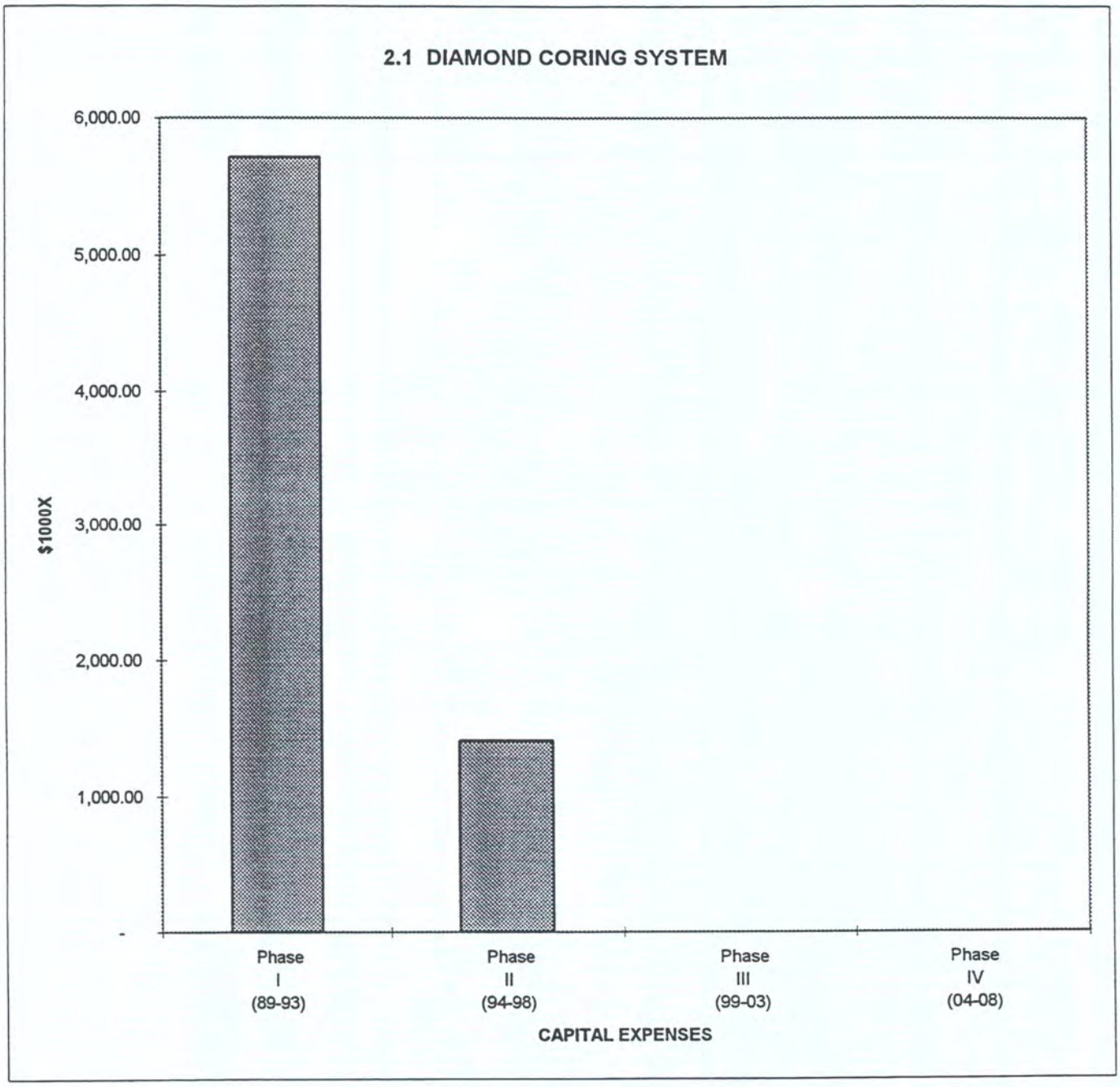
Phases I & II

Vibra-Percussive Corer	Motor Driven Core Barrel	Hard Rock Guide Bases
Hammer Drill-In System	Coring Motor	Hard Rock Orientation
Drill-In Casing	Diamond Core Barrel	Core Bits/Diamond/PDC

Phase III

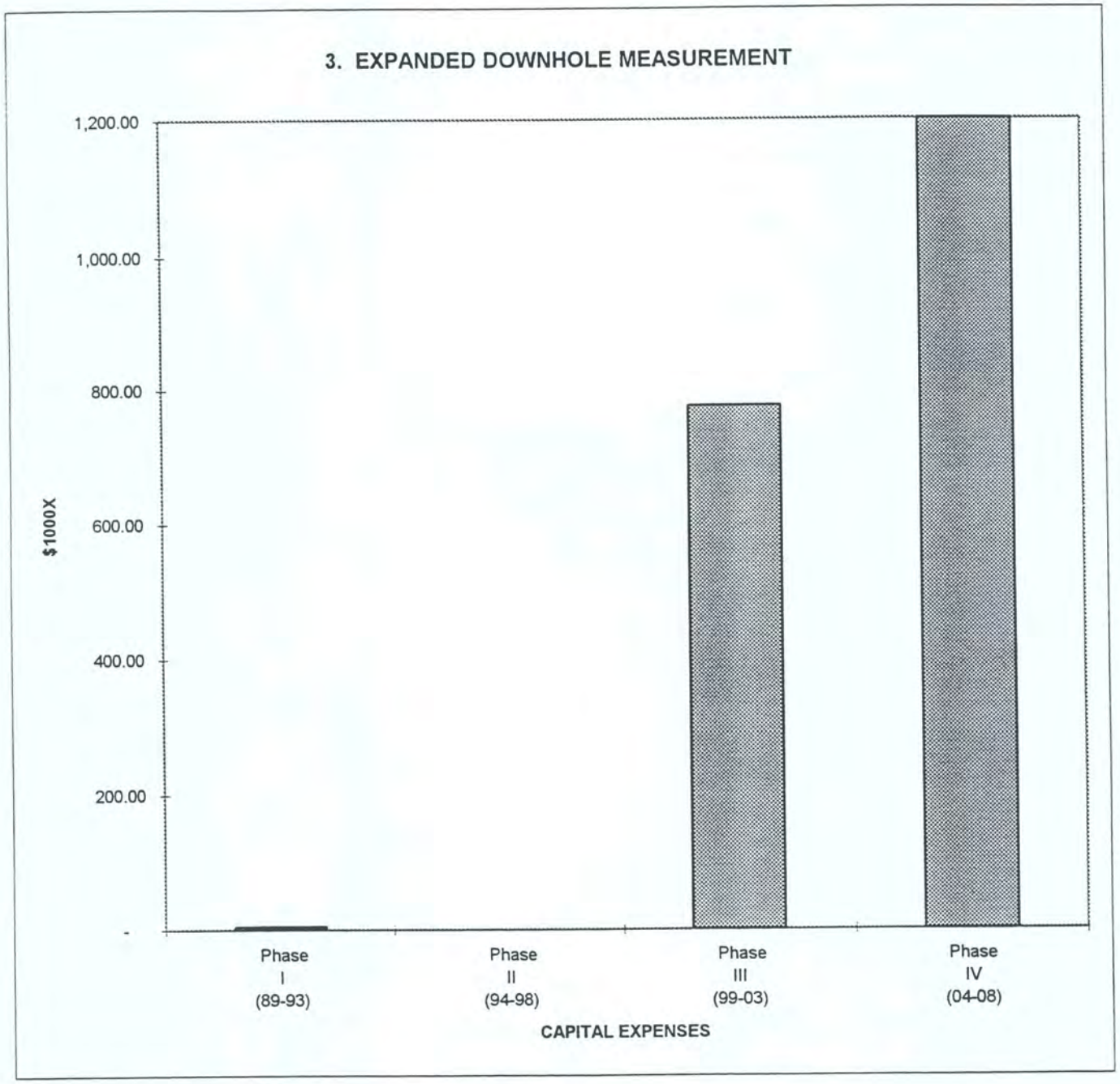
Technology and innovation in pursuit of casing drill-in re-entry system and hard rock coring.

See Figure 2.1 Diamond Coring System



- Figure 2.1 -

The DCS was placed on "hold" status pending review of the activation of the passive heave compensator aboard the J/R.



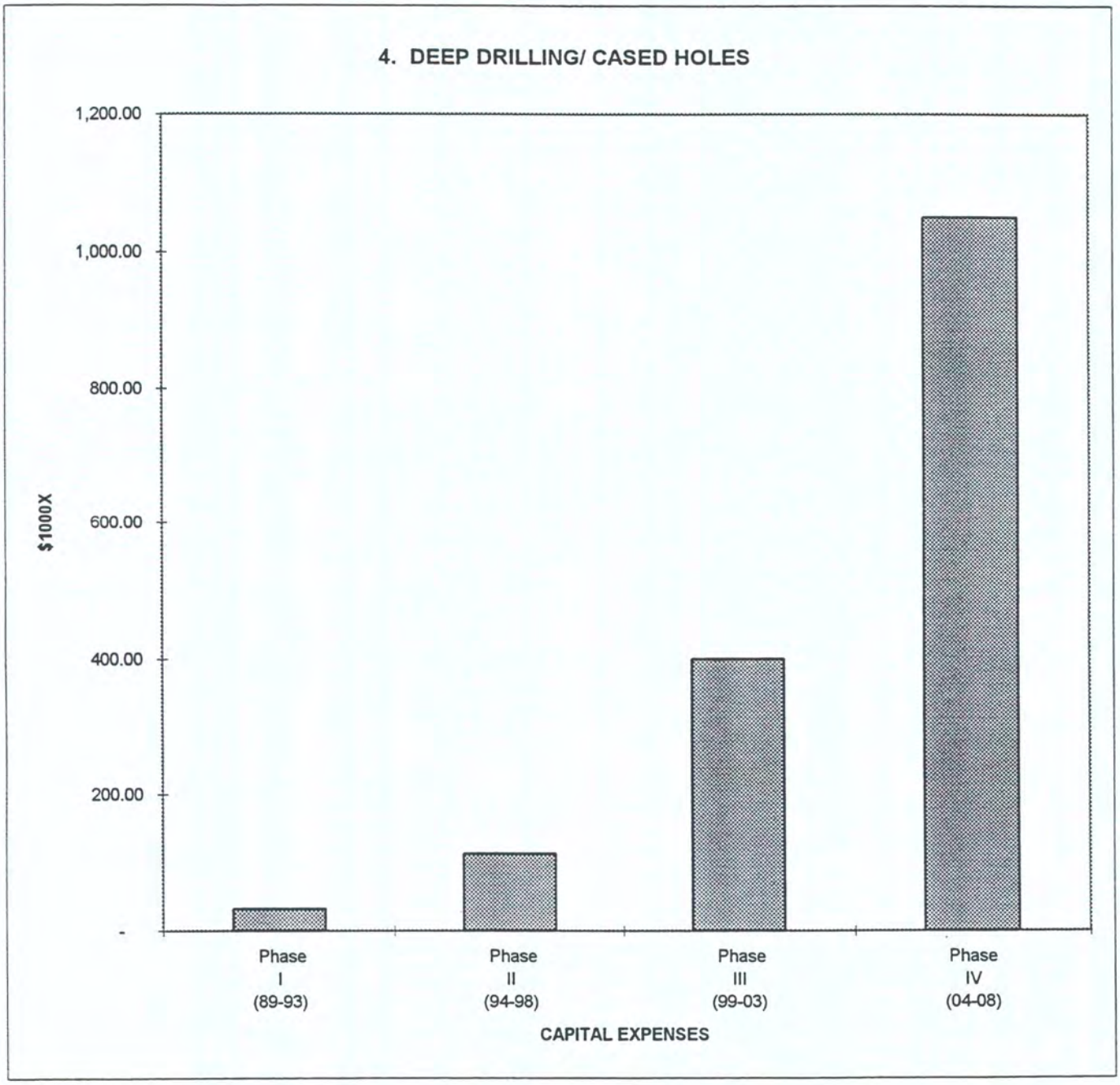
- Figure 3 -

Phase I

Scanning Sonar Mesotech Sensors

Phase III

Technology and innovation in pursuit of downhole measurement instrumentation.



- Figure 4 -

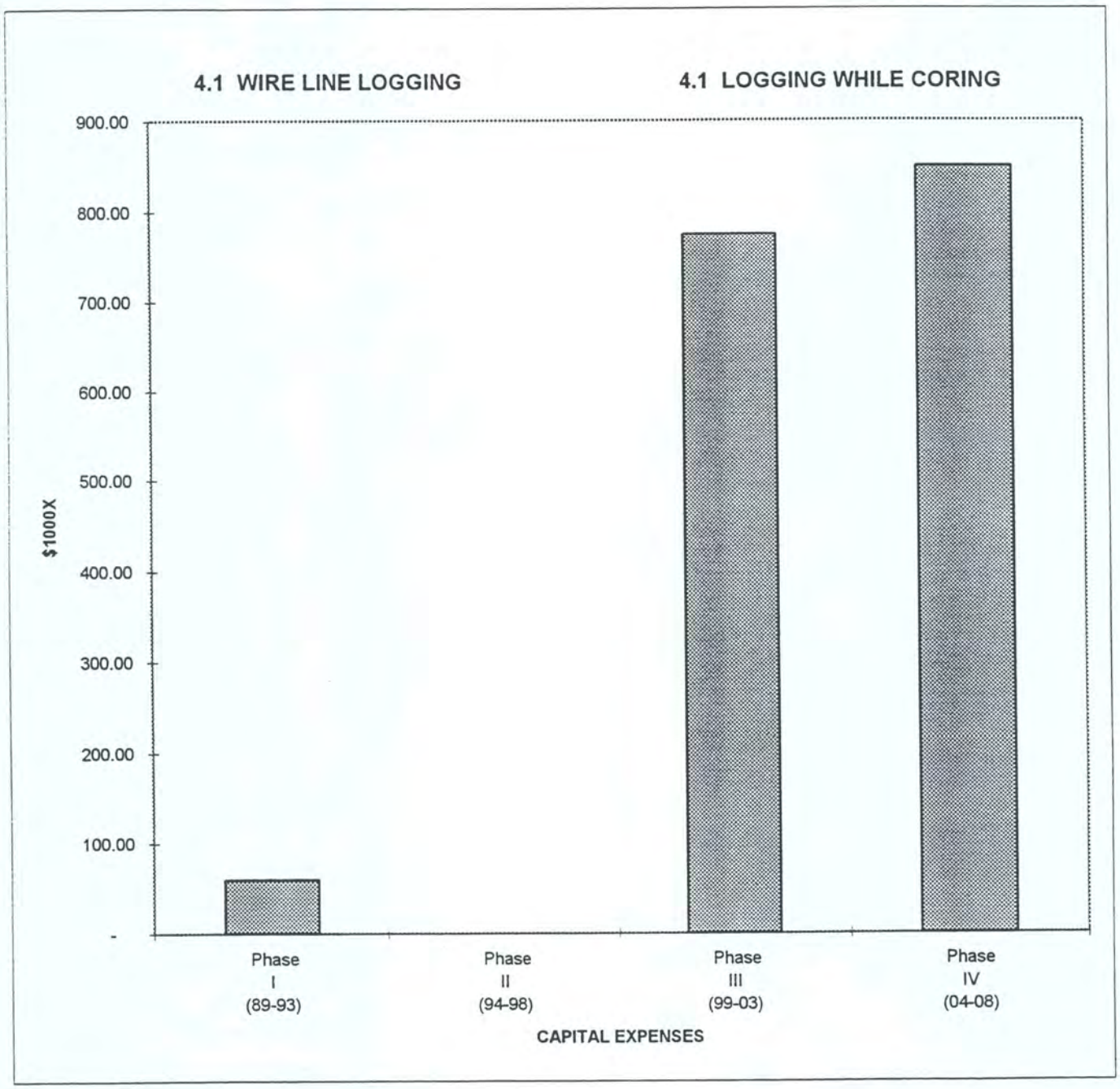
Phases I & II

Drill String Studies
Drill Bits & Hole Openers
Drill String & Pup Joints

Phase III

Technology and innovation in pursuit of deep drilling activities - BOP with drill pipe riser for Margin drilling and mud circulation for ocean drilling

See Figure 4.1 Wire Line Logging/ Logging While Coring



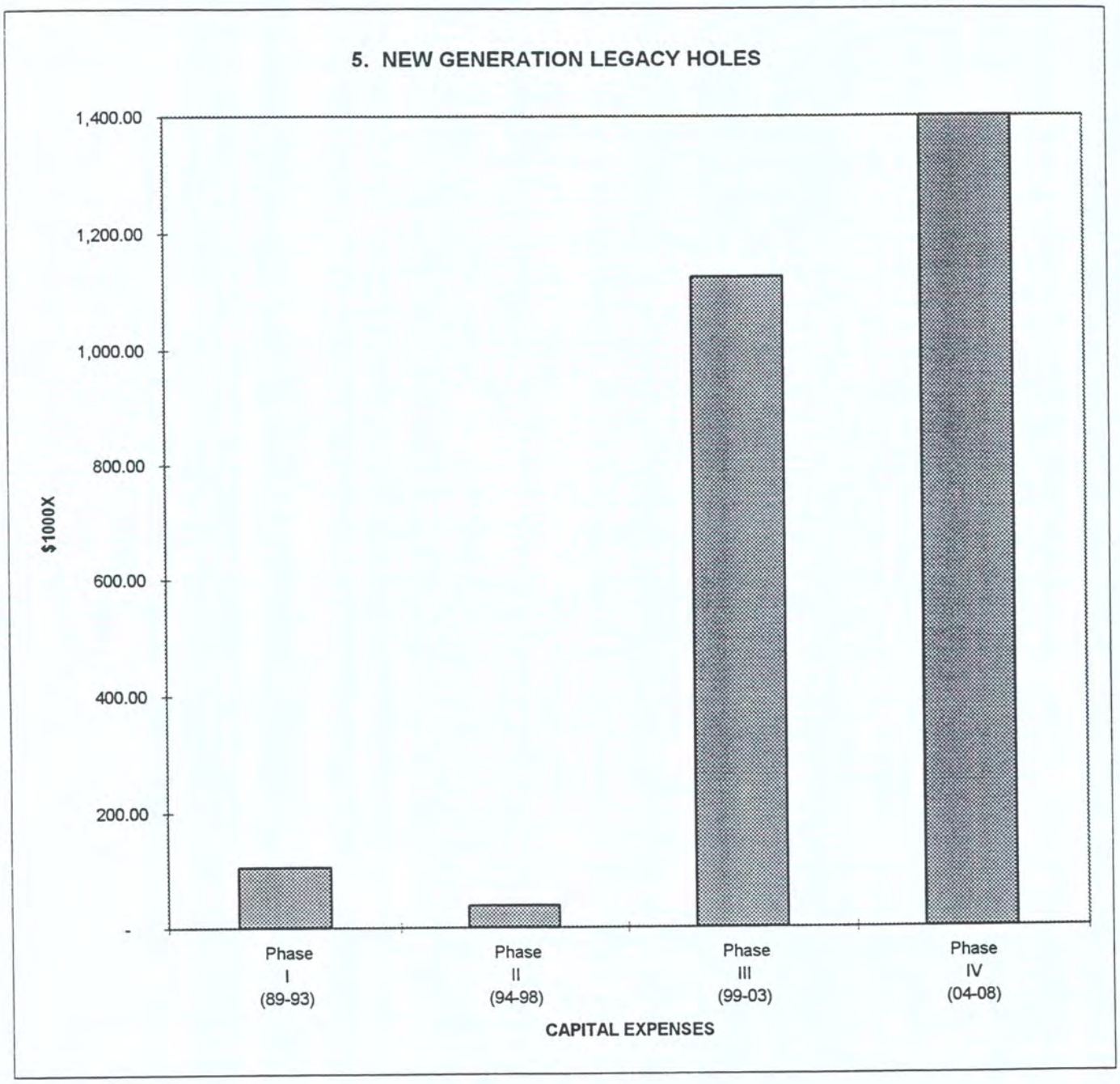
- Figure 4.1 -

Phase I

Lamont/BRG

Phase III

Technology and innovation in pursuit of logging while coring activities.



- Figure 5 -

Phases I & II

In-situ Pore Water Sampler
TAM Drilling Packer
Flow Insulation Plug

Phase III

Technology and innovation in pursuit of BOREHole observatories - more extensive instrumentation and remote data link.

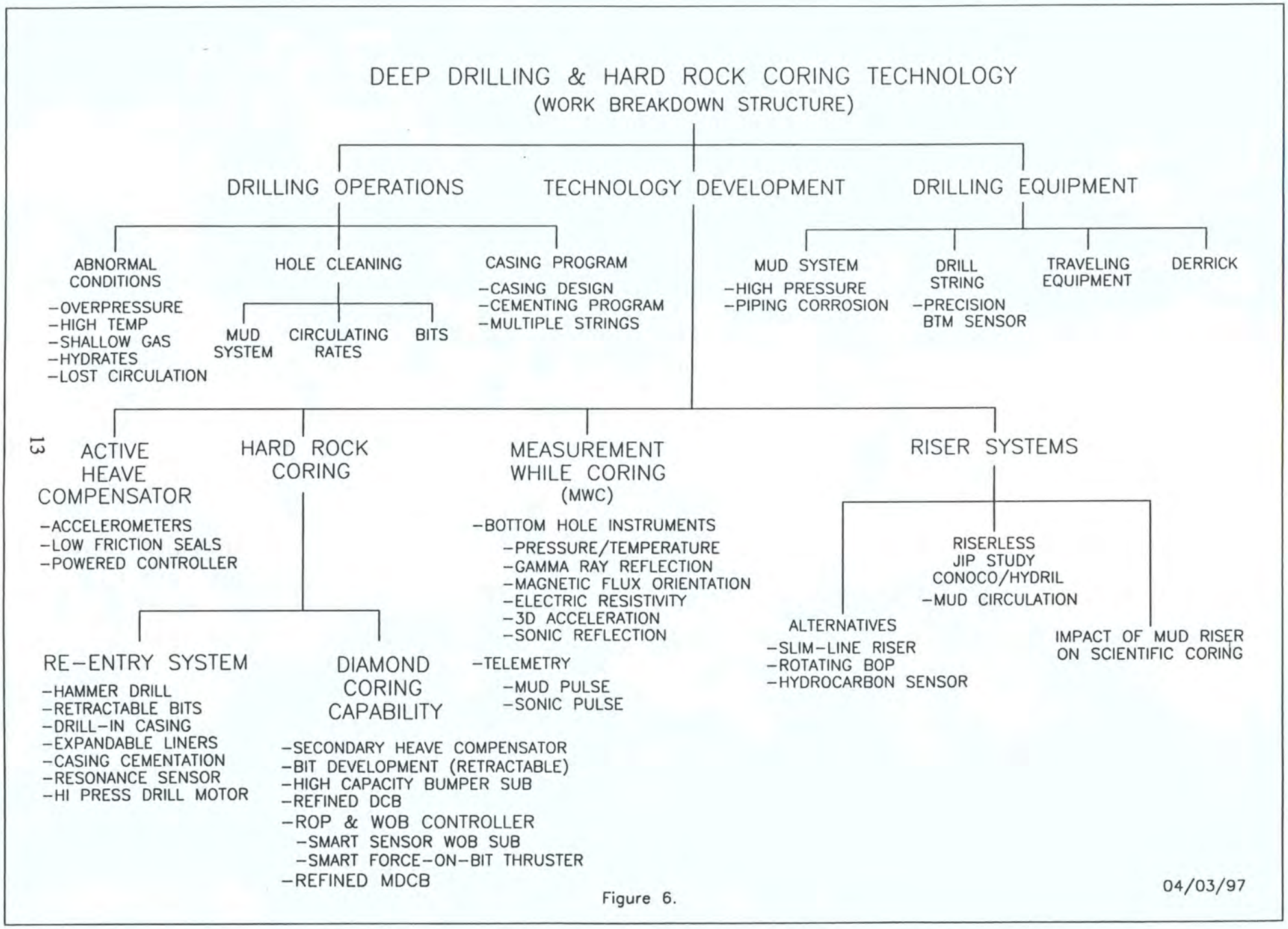

DEEP DRILLING & HARD ROCK CORING TECHNOLOGY
(WORK BREAKDOWN STRUCTURE)
DRILLING OPERATIONS
TECHNOLOGY DEVELOPMENT
DRILLING EQUIPMENT
ABNORMAL CONDITIONS
-OVERPRESSURE
-HIGH TEMP
-SHALLOW GAS
-HYDRATES
-LOST CIRCULATION
HOLE CLEANING
MUD SYSTEM
CIRCULATING RATES
BITS
CASING PROGRAM
-CASING DESIGN
-CEMENTING PROGRAM
-MULTIPLE STRINGS
MUD SYSTEM
-HIGH PRESSURE
-PIPING CORROSION
DRILL STRING
-PRECISION BTM SENSOR
TRAVELING EQUIPMENT
DERRICK
ACTIVE HEAVE COMPENSATOR
-ACCELEROMETERS
-LOW FRICTION SEALS
-POWERED CONTROLLER
HARD ROCK CORING
RE-ENTRY SYSTEM
-HAMMER DRILL
-RETRACTABLE BITS
-DRILL-IN CASING
-EXPANDABLE LINERS
-CASING CEMENTATION
-RESONANCE SENSOR
-HI PRESS DRILL MOTOR
DIAMOND CORING CAPABILITY
-SECONDARY HEAVE COMPENSATOR
-BIT DEVELOPMENT (RETRACTABLE)
-HIGH CAPACITY BUMPER SUB
-REFINED DCB
-ROP & WOB CONTROLLER
-SMART SENSOR WOB SUB
-SMART FORCE-ON-BIT THRUSTER
-REFINED MDCB
MEASUREMENT WHILE CORING (MWC)
-BOTTOM HOLE INSTRUMENTS
-PRESSURE/TEMPERATURE
-GAMMA RAY REFLECTION
-MAGNETIC FLUX ORIENTATION
-ELECTRIC RESISTIVITY
-3D ACCELERATION
-SONIC REFLECTION
-TELEMETRY
-MUD PULSE
-SONIC PULSE
RISER SYSTEMS
ALTERNATIVES
-SLIM-LINE RISER
-ROTATING BOP
-HYDROCARBON SENSOR
RISERLESS JIP STUDY CONOCO/HYDRIL
-MUD CIRCULATION
IMPACT OF MUD RISER ON SCIENTIFIC CORING
04/03/97

Figure 6.

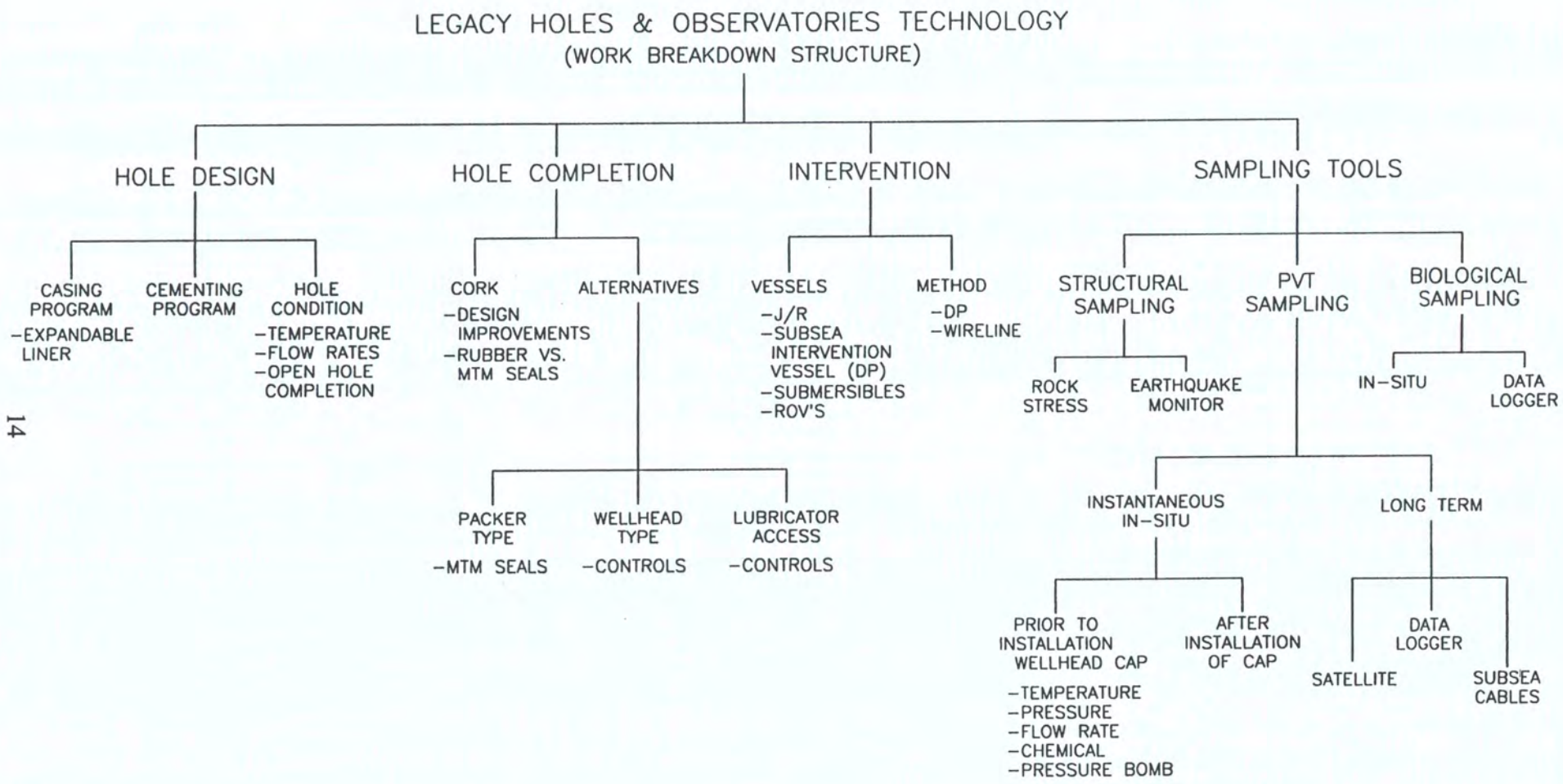


Figure 7.

04/03/97

DEVELOPMENT ENGINEERING PROJECTS

Project Expenditures

	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Deep Drilling and Hard Rock Coring Technology							
● Active Heave Compensator (AHC)	640,000	556,000					
● Hard Rock Coring System (HRCS)							
- Hard Rock Re-Entry (Hammer) System (HRRS)	589,000	267,000	75,000	345,000	100,000	100,000	100,000
- Improve Core Recovery & Quality	-	-	300,000	100,000	100,000	100,000	100,000
- Hard Rock Coring Tools		-	200,000	200,000	200,000	200,000	200,000
● Deep Drilling System							
- March 98 Workshop Position Papers	-	-					
- Downhole Measurement Systems		-	100,000	150,000	300,000	500,000	500,000
- Deep Drilling Equipment		-	50,000	50,000	100,000	100,000	100,000
Legacy Holes							
- February 99 Workshop Position Papers	-	-					
- Hole Completion Equipment			100,000	50,000	50,000	50,000	50,000
- Downhole Sampling Tools			50,000	75,000	200,000	250,000	250,000
Tool Improvements/Maintenance							
- Downhole Tools	-	-	-	-	-	-	
- Lab Stack Science Equipment	-	-	-	-	-	-	
- Ship's Equipment	-	-	-	-	-	-	
DEV ENGR EXPENDITURES:	1,229,000	823,000	875,000	970,000	1,050,000	1,300,000	1,300,000
Dry-dock - 1999 & 2004							
- Drilling Services	-	105,000	217,000				100,000
- Science Services	-	-	-				
Laboratory Equipment Upgrades							
- Science Services	-	-	519,000	-	-		
DRY DOCK EXPENDITURES:	-	105,000	736,000	-	-		100,000

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Figure 8

DEVELOPMENT ENGINEERING PROJECTS

Manpower

	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Deep Drilling and Hard Rock Coring Technology							
● Active Heave Compensator (AHC)	312	88					
● Hard Rock Coring System (HRRS)							
- Hard Rock Re-Entry (Hammer) System (HRRS)	2577	472	750	1000	1000	500	300
- Improve Core Recovery & Quality	500	500	500	500	500	500	500
- Hard Rock Coring Tools		1500	1500	1000	1000	1000	1000
● Deep Drilling System							
- March 98 Workshop Position Papers	900	200					
- Downhole Measurement Systems		500	1500	1500	1500	1500	1500
- Deep Drilling Equipment		400	500	500	500	1000	1000
Legacy Holes							
- February 99 Workshop Position Papers	100	500	200				
- Hole Completion Equipment			600	1000	1000	1000	1000
- Downhole Sampling Tools			500	1000	1500	2000	2000
Tool Improvements/Maintenance							
- Downhole Tools	250	500	100	100	100	200	200
- Lab Stack Science Equipment	250	500	200	200	200	200	200
- Ship's Equipment	120	120	120	120	120	120	120
DEV ENGR MAN-HOURS:	5009	5280	6470	6920	7420	8020	7820
Dry-dock - 1999 & 2004							
- Drilling Services	500	1000	1000				500
- Science Services	1100	1100	6000				600
Laboratory Equipment Upgrades							
- Science Services	200	400	150	150	150	150	200
DRY DOCK MAN-HOURS:	1800	2500	7150	150	150	150	1300

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Fig. 9

PHASE III INNOVATION PRIORITY LIST

Hard Rock Coring Tools (Workshop '98): Evaluate "smart" subs to control weight-on-bit variation to achieve diamond coring in hard rock, as well as improve overall core quality and recovery. Suggested topics are:

- Translation Isolation Sub for Bottom-Hole Assembly
- Weight-On-Bit Transmitter Sub
- Force-On-Bit Receiver/Thruster Sub
- Torque Controller For Existing Top Drive
- Sea Trials With Diamond Core Barrel System
- High Pressure Drilling Intensifier

Downhole Measurement Systems (Workshop '98): Adaptation of oil field downhole logging instrumentation to measure extensive physical conditions as well as continuous coring aboard the *JOIDES Resolution*. Some currently available technology for discussion are:

- Measurement-While-Coring (MWC) System
- Logging-While-Drilling (LWD) Instrumentation
- Formation-Evaluation-While-Coring (FEWC) Tools
- PCS Tool for P/T/A Sensors and Clean Fluids Retrieval
- Side-Wall Coring System

Deep Drilling Equipment (Workshop '98): Review the equipment necessary to achieve deeper holes, such as large diameter drill-in casing system and mud riser systems. Topics for discussion may include:

- Larger Drill-In 20"X16" Casing System
- Hydrocarbon Sensor/Transmitter System
- Pore Pressure Sensor/Transmitter
- Rate-of-Penetration Indication System
- Continuous Casing/Cementation System
- Evaluate Multiple Lateral Hole System

Legacy Holes (Boreholes Workshop '99): Adapt the wide variety of oil field downhole sensors to in situ conditions for greater accessibility for retrieval. Develop multi-access re-entry completion methods for existing and future Legacy Holes. Topics may include:

- Cork Seals for Elevated Temperature
- New Physical Measurement Sensors
  - Straddle Pack Pore Pressure
  - Elevated Temperature
  - Seismic Activity
  - Hole Strain - 3D
- Lubricator Access System
- Floating Data Receiver/Transmitter for Satellite Retrieval.

Hard Rock Coring Tools

Diamond coring requires that weight-on-bit be closely maintained to achieve effective results. Although the weight-on-bit requirement is significantly lower than for rotary cone bits, the narrow kerf requires much higher speed. This may require control at the seafloor as well as from a heaving vessel. Vessel heave should be minimized, but an isolation sub may be required to restrict vessel heave from the bottom-hole assembly (BHA). Unlike a true Shock Sub, an Isolation Sub would limit significant effects of the drill string from being transferred to the BHA.

A Torque Controller should also be considered for placement on the existing top drive unit. A Torque Controller can sense increasing torsional loading with decreasing drill pipe rotation due to stuck pipe, and maintain a torque range by allowing the top drive unit to slip until the bit breaks loose to resume rotation. This prevents torsional impact (shock) on tool joints, core barrels and cores.

Drill collars provide primary weight-on-bit, but this could be reinforced with a smart system such as a Weight-on-Bit Sensor/Transmitter Sub above the bit and a Force-on-Bit Receiver/Thruster Sub above the WOB Sub to maintain a narrow range of variation for Weight-on-Bit, for example 250 kgs for an HQ size core. Such technology is now available from several sources.

A Weight-On-Bit (WOB) Transmitter Sub, located above the drill bit, would be developed from Measurement-While-Drilling (MWD) technology to sense weight variations and transmit a real time signal to a Force-On-Bit (FOB) Receiver/Thruster Sub located above it that would convert hydraulic horsepower from the ship's pump flow to downward thrust. The FOB Thruster would regulate the downward forces in response to the WOB signal to mitigate WOB variations of the bit.

With adequate control devices in place, ODP can expand its knowledge and testing of coring tools. The existing Diamond Core Barrel should be evaluated for continuous coring, as should new bit materials and configurations. Recent motor technology could be adapted to increase the capacity of the MDCB, as well. Retractable bit technology could also be applied to the existing DCB system.

Also, it would be an appropriate opportunity to evaluate high pressure coring. High pressure coring might improve core quality, recovery and rate-of-penetration. It could provide the DCB with greatly improved performance in hard rock. However, a pressure intensifier would be required above the BHA to generate about 25,000 psi jet pressure.

Downhole Measurement Systems

Technology has literally rescued the international petroleum industry by restoring profitable margins. Paramount among this technology has been the application of sophisticated sensors coupled with digital processing - computers. Worldwide Global Positioning Systems (GPS) and Three Dimensional Seismic evaluation have greatly lowered finding costs and accelerated revenue valuation. Lateral and extended reach drilling, whereby drill motors and real time steering tools have provided Measurement-While-Drilling (MWD) Systems, has greatly reduced production costs. An extensive array of "intelligent" tools is now rugged, simple and AVAILABLE for adaptation by ODP.

Downhole measurement systems include both sophisticated developments and simple improvements. Measurement-while-drilling technology has been adapted by industry to transmit logging parameters, so that measurement-while-logging (MWL) technology is now routine. As a consequence, formation evaluation-while-drilling (FEWD) technology is currently utilized, whereby local seismic information is gathered in front of the bit during drilling for direct comparison with surface seismic. Drill bit steering is then used to alter course.

This technology is rapidly becoming available at production prices so that ODP could apply these advantages to accomplish the objectives of the Long Range Plan. Probably the most straight forward adaptation would be to utilize MWD technology to provide a real time definition of the formation during coring. Logging-while-coring (LWC) tools could measure formation density, porosity and magnetic orientation. Likewise, formation-evaluation-while-coring (FEWC) technology could be used to evaluate lithology below the bit in real time.

Additionally, side-wall coring could be developed to acquire three-dimensional samples with precise orientation. The Pressure Core Sampler could be improved to provide clean samples. Technology in the form of "Intelligent Tools" can bring greater precision and cost effectiveness to our downhole measurement capability, both in the lab stack and as at the seafloor.

Deep Drilling Equipment

Deep drilling brings new requirements for hole support, hole cleaning and exposure to hydrocarbons. The usual control method is drilling mud that supports the hole, cleans the hole and balances pore pressure. However, petroleum objectives involve multiple casing strings that are set at different pressure zones to 10,000 meters. Conversely, ODP coring objectives involve casing strings set in lieu of drilling mud to several hundred meters. The deep drilling capabilities of the *JOIDES Resolution* and associated drilling equipment and operational limitations (3000-4000 meters to mudline and 8500 meters TD) should be documented for discussion at the workshop in March 1998.

One alternative to (concentric) riser drilling is to drill underbalanced (with seawater) and to provide a Hydrocarbon Sensor that monitors hydrocarbon flow and transmits a continuous signal to the surface to indicate the need for a drilling mud influx to kill (over balance) the hole (pressure). Although this procedure would be too damaging for hydrocarbon production, it would be acceptable for abandonment at random coring locations. The question is, "Would mud be acceptable in cores?"

However, the LRP involves objectives that require coring in locations that necessitate a riser, blow-out preventer and mud circulation. The obvious solution is a mud riser system to drill the margins. The deep objectives (greater than 500 meters) in these settings will be carried out by the OD21, but the *JOIDES Resolution* could play a supporting role by drilling shallow objectives (less than 500 meters) to define spacial relationships. If this role is considered important, a riser tensioner system would have to be reinstalled aboard the *JOIDES Resolution* to support the mini-riser (drill string).

When drilling deep crustal holes without a riser, drilling mud is not available to make a wall cake. This limitation requires more casing strings to support the hole. With our present capability, casing strings are limited to relatively shallow hole depths because we don't have recirculation. New technologies like expanded metal piping and plasticiser cement could be evaluated to deal with this limitation. Another solution to achieve more effective crustal penetration is to use more casing strings to support the hole and, therefore, a larger (20"X16") Hammer-Drill-In Casing System could be developed to complement the 13-3/8"X10-3/4" system currently under development for coring the ocean crust.

Deeper drilling requires Rate-Of-Penetration (ROP) information for operational drilling/coring decisions. An ROP Indication System would be developed, related to pore pressure measurements and weight-on-bit comparisons. This data could be transmitted to the Driller's console on the *JOIDES Resolution* to provide real-time information.

Finally, technology is now available to drill multiple lateral holes for the science community. Much like Legacy holes, science may have use for multiple, directional bores at different depths from a central hole. The technology is currently available.

Legacy Boreholes and Observatories Equipment

Legacy Holes bring an entirely separate dimension to science than coring the oceanic crusts of the Earth. Only 30 of the more than 1000 drilled holes are Legacy Holes, with only eight having CORKS emplaced. In the quest for new and improved data sampling, borehole completions could be significantly enhanced. Current oil industry technology involves pressure, temperature, density, salinity and magnetic orientation sensors. This information could be transmitted to floating receivers for remote retrieval by ROV from a smaller craft. Receiver power sources could be continuously recharged with solar panels.

Although the science community desires to emplace additional Legacy Holes, desired access is marginal and the amount of ship time required is particularly limiting and not cost effective. One solution might be to miniaturize the access system so as to allow smaller seagoing vessels with lighter equipment to perform in situ measurement. Most logging tools are packaged within a 4 cm diameter and could easily be adapted to smaller sized cased holes.

Conversely, the access opening of the existing class of CORKS could be designed to accommodate larger diameter instrumentation, such as seismometers. Well-head technology could also be utilized for physical accessibility, such as a "lubricator" pressure lock, or series of valves for remote intervention and in situ measurement.

The variety and reliability of physical measurement instrumentation currently available are extensive. Rugged (50g's), accurate, reliable timer technology, pressure, temperature, density, salinity, and porosity sensors are readily available, but must be packaged by ODP. Sonic or pressure pulsed telemetry is available, as is the CPU and storage capacity, for accumulating data over several years, rejuvenating batteries and providing ready access for high-speed retrieval.

The major workshop planned for February 1999 is appropriate to explore the avenues available for collecting, storing and transmitting data for satellite retrieval. Novel configurations for CORKS should be evaluated as well.

LOGGING TECHNOLOGY DEVELOPMENT

D. Goldberg
LDEO Borehole Research Group
April 3, 1997

LWD Tool Modifications

At this juncture, the deployment of Logging While Drilling (LWD) tools by ODP has been extremely successful in achieving LRP objectives in accretionary prisms. The tools used to date (natural gamma ray, electrical resistivity, bulk density, and neutron porosity) have been first generation LWD technology. The next generation of these tools has been significantly improved and new "at-the-bit" and acoustic technologies are currently available. However, our ability to deploy some of these tools is limited by the size of ODP drill bits and collars. Moderate re-engineering of the Resistivity-at-the-Bit (RAB™) tool could make it suitable for ODP deployment. The current RAB tool configuration requires a 8-1/2" drill bit for the imaging system to remain at a close proximity of the borehole walls and produce high resolution data. Since ODP routinely uses 9-7/8" bits, mechanical tool modifications to the imaging sleeve need to be developed. We propose to collaborate with Schlumberger-Anadrill to build an extended sleeve for use in standard 35 cm (9-7/8") diameter ODP holes. In addition, the new geometry will require the algorithms for absolute resistivity measurements to be revised. The modified tool would be capable of obtaining log data in moderate-to-high resistivity environments, such as crustal sites, as well as downhole engineering parameters of shock, torque, and instantaneous penetration rate. In view of other technological developments, such as the hammer-in casing system, which are designed to improve recovery under difficult drilling conditions the RAB tool could prove to be quite complementary where lithological and structural information has characteristically been restricted. Logs and engineering parameters could be acquired as continuous profiles below the seafloor in these environments.

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Fluid sampling and permeability logging

The sampling of *in situ* formation fluids and the measurement of bulk permeability in basement rocks is a key objective of the LRP. We propose to develop a deployment approach which allows straddle packer elements to be lowered into a re-entry hole for fluid sampling

and permeability measurements. The design will use the existing Schlumberger MDT™ tool. Since current ODP logging is limited to tools that can be lowered through a 10-cm drill pipe, use of the MDT will require a protective sleeve and a conventional wireline 'wet-connect' cablehead to deploy this large-diameter tool below a re-entry cone. Following a feasibility study by staff engineers from LDEO, ODP-TAMU, and Schlumberger of the engineering requirements, cost, reliability, and deployment risks of this approach, a prototype system will be developed and tested. Follow-on development using the wet-connect in conjunction with other new technologies, will also be investigated. This could expand logging tool selection to other large-diameter tools which are currently available from industry.

Logging-While-Coring Feasibility Study

Logging-While-Coring (LWC) is short hand for the simultaneous use of Logging-While-Drilling (LWD) and coring tools in ODP (or other) drilling applications. In addition to the present advantages of acquiring LWD data alone, several additional benefits of LWC are anticipated, including: (1) considerable time savings by coring and logging simultaneously, (2) improved drilling safety from log data recovered at the bit, and (3) simultaneous and combined core and log depth measurement, essentially eliminating depth uncertainty for core-log integration. LWC concepts have been previously discussed and endorsed by the JOIDES Downhole Measurements Panel in September 1994. The development of Logging-While-Coring capabilities, however, will require considerable modification of existing LWD tools. In simplest terms, the mechanical systems and battery assemblies which fill the annulus of these tools need to be re-engineered so that coring tools can to pass through them. A feasibility study is proposed to examine the detailed engineering efforts and costs that would be required for LWC development either through a JIP (Joint Industry Project) or a specific ODP-industry collaboration.

Table 1. Approximate Cost and Duration of Logging Technology Developments:

	Project	**Cost**	**Duration**
I	RAB modification	$90K	~ 6 mo.
II	MDT design	$185K	>1 yr.
III	LWC feasibility	$75K	~ 9 mo.

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Dr. Susan Humphries,
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Woods Hole, MA 02543

3 March 1997

Dear Susan,

Following receipt of the Fall '96 reviews of ODP proposal #447-Rev3, I provided as much information as then available to the JOIDES structure, specifically to those panels about to make decisions. A complete data package was already lodged with the ODP data bank at LDEO, as SSP confirmed in November by giving the proposal 1A status. In the short time before the December PCOM meeting, I provided to the designated PCOM watchdog for the Woodlark proposal (Tom Shipley - who was also the PCOM liaison at the Fall TECP meeting) the key items requested by TECP to address their primary concern, that of the present activity of the low-angle fault.

Specifically, I sent Tom copies of the (TECP requested) critical 3.5 kHz and SeaBeam data (previously deposited with the ODP data bank at LDEO), as well as a preprint of the Abers et al. JGR paper documenting the present day earthquake activity on the fault. Presumably this and the other site survey data convinced PCOM's watchdog that the fault was indeed active, thereby allowing PCOM to schedule Woodlark drilling on Leg 180.

TECP also requested a variety of products related to reprocessing and further analysis of the MCS data, namely, reprocessed and depth converted seismic data, a structure contour map of the fault surface and a seismic stratigraphic study of the region. Reprocessing of the MCS data is continuing. At their November meeting, SSP both recommended the Woodlark proposal as site-survey ready for drilling and requested a PPSP pre-review. As you witnessed, I gave PPSP a Leg 180 pre-review at their recent meeting. I included in the presentation large scale reprocessed seismic data for the normal fault site ACE-8a. PPSP members also questioned the interpretation of the initial MCS data with respect to the fault activity but were convinced when they saw the reprocessed data.

Structure contour maps of the rift-onset unconformity at the northern sites (but not of the fault surface) were requested by PPSP for the full proposal review at their next meeting and will be prepared. Further velocity analysis,

depth conversion and seismic stratigraphic analysis is also planned, as other commitments allow. I plan to send a reprocessed MCS data package to the ODP data bank at LDEO by the July 1st deadline. Shiri Shrivastiva informed me that SSP has the brief and will continue to monitor further data processing and analysis prior to drilling. As co-chief scientist of a scheduled drilling leg, I plan to follow JOIDES guidelines relative to continued interaction with the JOIDES office, PPSP, SSP, TAMU and LDEO.

Respectfully yours,

Brian Taylor

Brian Taylor
Acting Assoc. Dean of Research