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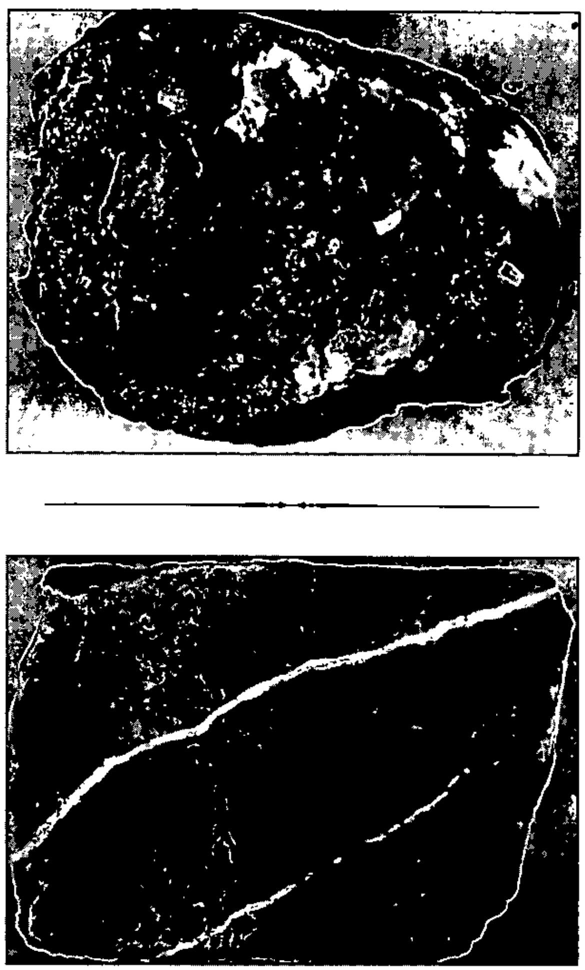

Samples from Hole 504B, DSDP Leg 83.

Leg 83 co-chief scientists Roger Anderson (right) and Jose Honnorez (middle) and Robin Newmark, geophysicist (left), compare a nearly real-time photograph of a 2-meter section of the Leg 83 televiewer log with a composite of the Leg 69 televiewer results in the same hole. Hole 504B was cored and logged 214 meters into basement during Leg 69, 561.5 meters during Leg 70, and 1075.5 meters (1350 m beneath the seafloor) during Leg 83.

Cover:

Hole 504B, 80-2, 65-72 cm. Mineral stockwork cored at 910-930 meters sub-bottom, 635-655 meters into basement. Note large pyrite crystal. Sphalerite and chalcopyrite was also identified by XRD and optical methods, respectively. White minerals include calcite, laumontite, quartz, and talc, in order of abundance. This stockwork resembles the feeder dikes for the massive sulfide ore deposits known from the lower parts of the pillow basalts in ophiolite sequences around the world.

Hole 504B, 82-1, 40-50 cm. Two generations of mineral veins from about 930 meters sub-bottom, 655 meters into basement, showing complex alteration sequence. White, probably laumontite-rich, veins cut a dark chlorite vein, indicating that zeolite facies mineral paragenesis occurred after greenschist facies mineral paragenesis.

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VOL. VIII, NO. 1, FEBRUARY 1982

TENTATIVE *GLOMAR CHALLENGER* SCHEDULE, LEGS 84 - 88[1]

Leg	Departs	Departure Date	Total Days	Days Opers.	Days Steaming	Terminates at	Arrival Date	Port Days	Re-entry	Objective
84	Balboa, Panama	11 Jan 82	46	39	7	Manzanillo, Mexico	26 Feb 82	5	No	Mid-America Trench
85	Manzanillo, Mexico	3 Mar 82	52	29	22	Honolulu, Hawaii	24 Apr 82	5	No	Equatorial Pacific Paleoenvironment
86	Honolulu, Hawaii	29 Apr 82	51	32	19	Hakodate, Japan	19 Jun 82	5	No	NW Pacific Paleoenvironment
87	Hakodate, Japan	24 Jun 82	51	47	4	Hokodate, Japan	14 Aug 82	5	Possible	Japan Trench
88	Hakodate, Japan	19 Aug 82	30	19	11	Yokohama, Japan	18 Sep 82 .0.5	14	Yes	DARPA — Drydock

[1]Compiled 18 January 1982.

SHIPBOARD SCIENTIFIC PARTIES

Leg 83

R. Anderson	Co-chief scientist	USA - L-DGO
J. Honnorez	Co-chief scientist	USA - University of Miami
K. Becker	DSDP representative/ downhole instrument specialist	USA - SIO
A. Adamson	Igneous Petrologist	UK - The University Newcastle upon Tyne
J. Alt	Igneous petrologist	USA - University of Miami
R. Emmermann	Igneous petrologist	FRG - University of Giessen
P. Kempton	Igneous petrologist	USA - Southern Methodist University
C. Laverne	Igneous petrologist	France - Lab. de Geologie Universite de L'Ocean Indien
M. Mottl	Inorganic geochemist	USA - WHOI
H. Kinoshita	Paleomagnetist/physical properties specialist	Japan - Chiba University
R. Newmark	Geophysicist (sonic logging)	USA - L-DGO

Leg 84

J. Aubouin	Co-chief scientist	France - University Pierre et Marie Curie
R. von Huene	Co-chief scientist	USA - USGS
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R. Arnott	Sedimentologist	UK - University of Oxford
J. Bourgois	Sedimentologist	France - University Pierre et Marie Curie
R. Helm	Sedimentologist	FRG - Ruhr Universtity
Y. Ogawa	Sedimentologist	Japan - Kyushu University
K. Kvenvolden	Organic geochemist	USA - USGS
T. Mac Donald	Organic geochemist	USA - Texas A&M University
K. McDougall	Paleontologist (foraminifers)	USA - USGS
M. Filewicz	Paleontologist (nannofossils)	USA - Union Oil Co.
B. Winsborough	Paleontologist (diatoms)	USA - Estey, Houston & Assoc.
B. Leinert	Paleomagnetist	USA - University of Hawaii
E. Taylor	Physical properties specialist	USA - Texas A&M University

Leg 85

L. Mayer	Co-chief scientist	USA - University of Rhode Island
F. Theyer	Co-chief scientist	USA - University of Hawaii
E. Thomas	DSDP representative/ paleontologist (foraminifers)	USA - SIO
To be determined	Paleontologist (foraminifers)	
J. Barron	Paleontologist (diatoms)	USA - USGS
A. Pujos	Paleontologist (nannofossils)	France - Universite de Bordeaux
C. Nigrini	Paleontologist (radiolarians)	USA - SIO
D. Dunn	Sedimentologist	USA - University of Rhode Island
S. Hills	Sedimentologist	USA - SIO
I. Jarvis	Sedimentologist	UK - City of London Polytechnic
N. Pisias	Sedimentologist	USA - Oregon State University
P. Stout	Sedimentologist	USA - SIO
T. Handyside	Organic geochemist	UK - The University Newcastle upon Tyne
J. Channel	Paleomagnetist	USA - L-DGO
R. Wilkens	Physical properties specialist	USA - Mass. Inst. of Technology
To be determined	Heat-flow specialist	

Leg 86

L. Burckle	Co-chief scientist	USA - L-DGO
Ross Heath	Co-chief scientist	USA - Oregon State University

GLOMAR CHALLENGER OPERATIONS

CRUISE SUMMARIES

Leg 82 — Mantle Heterogeneity and Azores Triple Junction

Leg 82 began in Ponta Delgada, Azores on 19 September 1981 and ended in Balboa, Panama on 15 November 1981.

[1]Abridged from a preliminary Leg 82 report prepared by Henri Bougault, Steven C. Cande (co-chief scientists), Joyce Brannon, David M. Christie, Murlene Clark, Doris M. Curtis, Natalie Drake, Dorothy Echols, Ian Ashley Hill, M. Javed Khan, William Mills, Rolf Neuser, Marion Rideout, and Barry L. Weaver.

Introduction

During Leg 82 of the *Glomar Challenger* we sampled the oceanic crust at nine sites west and southwest of the Azores Triple Junction (Fig. 82-1 and Table 82-1) and, by means of shipboard analysis for key trace elements, showed that the relationship between "abnormal" basalts associated with the Azores platform and normal mid-ocean ridge basalt (MORB) is much more complex than expected. We also discovered serpentinite and serpentinized gabbro at shallow depths at three sites, established an almost complete Oligocene through lower Pleistocene biostratigraphic and magnetostratigraphic section, and discovered sea water draw-down into 35 million-year old basement.

The abnormal basalts found near the Azores Triple Junction and associated with other anomalous topographic features are characterized by high $^{87}Sr/^{86}Sr$ ratios and by enrichment in light rare-earth elements relative to heavy rare-earth elements. In contrast normal mid-ocean ridge basalts have low $^{87}Sr/^{86}Sr$ ratios and are depleted in light rare-earth elements. These abnormal basalts are significant because their isotopic ratios suggest that they are derived from a different mantle source than are the normal MORBs. Although, theoretically, petrogenetic processes may contribute to enrichment or depletion of light rare-earth elements, such enrichment or depletion is also an indicator of distinct mantle sources. By systematically sampling the basaltic basement, we were able to study the geo-

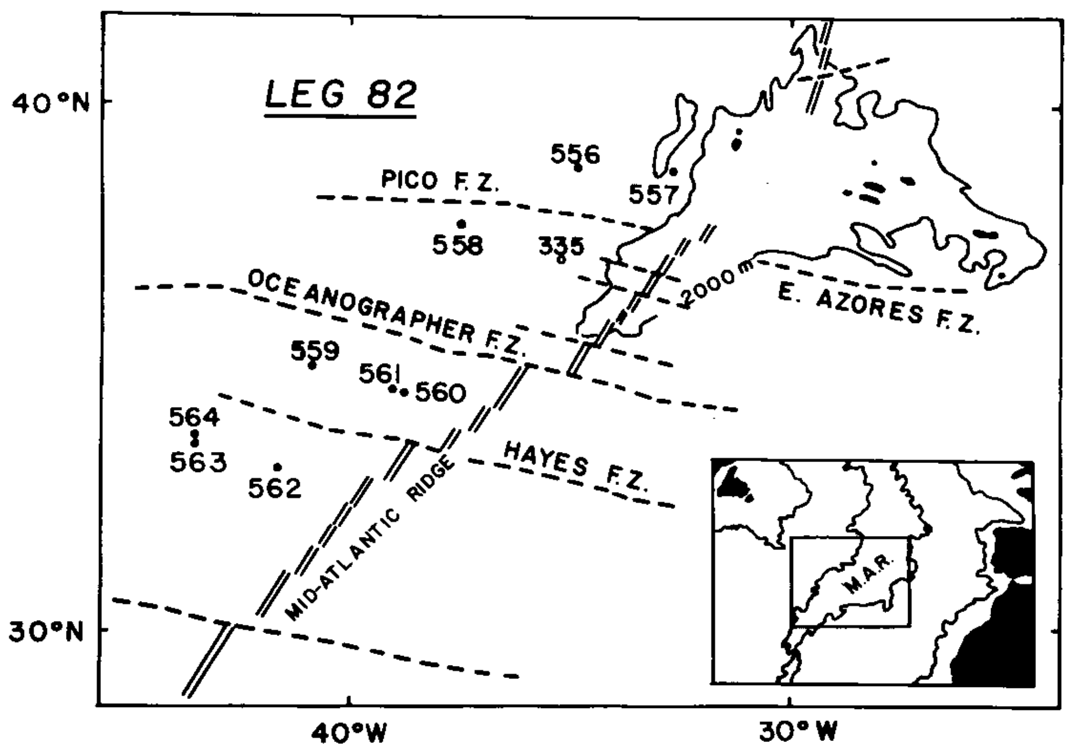

Figure 82-1. Location of Leg 82 sites: Site 335 (open circle) was drilled during Leg 37.

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Table 82-1. Leg 82 coring Summary

Hole	Dates (1981)	Latitude	Longitude	Water Depth	Penetration (m)	Sediment Thickness (m)	No. of Cores	Total Meters Cored	Meters Basement Cored	Per cent Basement Recovery	$(Nb/Zr)_{Ch}$ Range
556	22-29 Sep	38°56.38'N	34°41.12'W	3672	639.0	461.5	22	184.0	177.5	44.6	0.15-0.30
557	29-30 Sep	38°49.95'N	32°33.58'W	2143	463.5	460.0	1	3.0	3.0	40.0	1.30-1.90
558	03-11 Oct	37°46.24'N	37°20.61'W	3754	561.0	406.0	44	403.5	155.0	38.4	0.50-1.60
558A	11-12 Oct	37°46.24'N	37°20.61'W	3754	131.5	406.0	16	131.5[a]	--	--	
559	14-16 Oct	35°07.45'N	40°55.00'W	3754	301.0	238.0	8	63.0	63.0	37.0	1.5
560	16-18 Oct	34°43.33'N	38°50.56'W	3443	421.5	374.5	6	48.5	48.5[b]	16.0	0.8
561	18-20 Oct	34°47.10'N	39°01.70'W	3459	426.5	411.5	3	15.0	15.0	40.0	0.30-2.20
562	21-24 Oct	33°08.49'N	41°40.76'W	3172	331.0	240	11	90.0	90.0	44.9	0.30
563	24-28 Oct	33°38.53'N	43°46.04'W	3796	382.5	364.0	25	226.0	18.5	48.7	0.30
564	28 Oct-1 Nov	33°44.36'N	43°46.03'W	3820	365.0	284.0	9	81.0	81.0	43.0	0.37-0.54

[a]Per cent recovery piston coring: 94
[b]Only serpentinized gabbro and serpentinite

graphic extent and time variation of the Azores mantle anomaly and its relationships with geodynamic processes.

In particular, we hoped to test or constrain various hypothetical causes of mantle heterogeneity: mantle convection cells, mantle plumes (or blobs), mantle layering and mantle veining. Our objectives required that we drill a large number of single-bit holes both on different flow lines transverse to the ridge crest and on different isochrons parallel to the ridge crest. Dredging at the ridge crest has shown that the zero-age boundary between normal and abnormal basalts is located near the Hayes Fracture Zone which intersects the ridge about 400 miles south of the Azores Triple Junction.

As the cruise progressed, we selected each site from a grid of eleven potential locations on the basis of shipboard chemical determination (by X-ray fluorescence spectrometry) of abundances of key trace elements niobium (Nb), zirconium (Zr), titanium (Ti), yttrium (Y), and vanadium (V). The behavior of each of these trace elements mimics that of a different rare-earth element. For example, niobium behaves like lanthanum (La) (the lightest rare-earth element) and zirconium behaves like samarium (Sm) (an intermediate atomic number rare earth); consequently the ratio of Nb/Zr can be used in place of La/Sm to determine the depleted or enriched character of the basalts. When expressed in their most convenient form, normalized to chondritic meteorite values, these ratios are nearly equal: $(Nb/Zr)_{Ch} \simeq (La/Sm)_{Ch}$.

We analyzed 163 samples for both major (except Na_2O) and trace elements. Analytical data were then combined with thin section and visual observations to produce the best feasible discrimination of basaltic units, and hence to provide constraints for possible genetic relationships between different basaltic units.

We also had two other objectives: (a) to run a complete set of geophysical logs where basement penetration was deep (more than 50 meters) in order to best describe the sequence -- especially where basement recovery was poor and (b) to recover a complete sedimentary section for biostratigraphy, magnetostratigraphy and sedimentology in this part of the Atlantic.

Drilling Results

Site 556

We drilled Hole 556 on anomaly 12 on the west flank of the Mid-Atlantic Ridge, about 50 miles north of the Pico Fracture Zone on a flow line passing through the Azores Triple Junction. At 461 meters sub-bottom, basalts occur as clasts in breccias, as pillow flows, and as massive flows. On the basis of macro- and microscopic descriptions of the samples, together with onboard chemical analyses we were able to define four chemically distinct basalt groups within the different lithological units. From below 561 meters sub-bottom, to the bottom of the hole (78 meters) the core contained two units of partially to completely serpentinized gabbro breccia separated by a thin basalt layer. The depleted character [$(Nb/Zr)_{Ch}$ = 0.15-0.3] of all basalts recovered at Site 556 was not predicted by many of the pre-cruise hypotheses.

We measured a geothermal gradient of 36°C/km within the sediment above basement and ran a complete set of logs upon completion of the hole. These logs showed a constant temperature of about 2°C down to the sediment-basement interface, suggesting sea water was flowing into the hole.

Site 557

Site 557 is located on magnetic anomaly 5D at the center of a broad elevated basin on the same flow line as Site 556 passing through the Azores Triple Junction. Following the unexpected discovery of depleted oceanic crust at Site 556 (in contrast to the well-known enriched character of the oceanic crust in the area of the triple junction) we deemed it important to verify the presence of enriched material closer to the ridge crest. In a duel with hurricane Irene we had just enough time to core three meters of basalt before being forced to abandon the hole. The high Fe-Ti coarse-grained aphyric basalts recovered there have the same typical enriched character [$(Nb/Zr)_{Ch}$] as found at the spreading center.

Site 558

Site 558 is located between anomaly 12 and 13 on a flow line passing through the FAMOUS area (36°N) and through younger off-axis sites drilled during Legs 37 and 49. We decided on a complete program of coring (both sediment and basement) and logging to complement the large amount of data already available near and at the ridge crest.

The upper part of the basement at Site 558 consists of nine lithological units of aphyric basalt — mostly pillow basalts with variable amounts of interpillow breccia and some basaltic breccias. Fresh glass is very common at pillow margins throughout the basaltic layer. Calcite and/or limestone fills cracks and interpillow spaces. The deeper basement cores contain two lithological units of serpentinized gabbro, fresh and altered serpentinite, serpentinite breccia and mylonite.

On the basis of chemical analyses of twenty-nine samples of the basaltic layer we recognized six homogeneous chemical groups (Table 82-2 shows the average compositions), no cogenetic relationship exists between the different groups. The most striking result obtained at Site 558 is the occurrence, in the same hole, of depleted [$(Nb/Zr)_{Ch}$ = 0.4], flat [$(Nb/Zr)_{Ch}$ = 1] and enriched [$(Nb/Zr)_{Ch}$ = 1.6] patterns of magmaphile element abundance (Fig. 82-2). After Holes 413 (Leg 49) and 504B (Legs 69 and 70), Site 558 is the third site presenting this feature.

We recovered nearly the entire sedimentary section (406 m) through a combination of piston coring (Hole 558A; 0 to 131.5 m) and rotary coring (Hole 558; 158 to 406 m). We have for the first time in the North Atlantic a continuously cored section of calcareous pelagic ooze and chalk that appears to be almost complete from the lower Oligocene through the lower Pleistocene. The age of the oldest sediment (34 to 37 m.y.) obtained from nannofossils found in the basalt breccias at the top of basement is in agreement with the position of the hole between magnetic anomalies 12 and 13. A major change in the sediment lithology near the lower/middle Miocene boundary corresponds to a change in carbonate content (90% in the upper part, 50% below) and in the average sediment accumulation rate (20 m/m.y. above and 8 m/m.y. below).

Magnetostratigraphic studies of the lower part of the sedimentary section show a complete record of magnetic polarity reversals, correlating almost one to one with known reversals from chron 16 to the lower part of chron 12.

We attempted to run a complete set of geophysical logs, but owing to poor hole conditions, these were only partially successful. The major lithologic boundary in the sediments is clearly marked in the density, sonic and resistivity logs and in shipboard physical properties measurements. We detected a similar change in the same logs at an equivalent depth at Site 556, implying that this lithologic change is probably a broad regional feature. Other minor changes within the sets of logs at Sites 556 and 558 also appear to coincide.

Site 559

Hole 559, located between anomalies 12 and 13 and midway between the Oceanographer and Hayes Fracture zones, penetrated 63 meters into basement, encountering uniform aphyric pillow basalts which belong to a single magmatic unit. Low temperature alteration effects are variable and randomly distributed, but fresh glass is common at pillow margins. Calcite is present in cracks and veins. The MgO concentration, about 8 per cent in fresh samples, decreases to as little as 3 per cent in badly altered

Table 82-2. Averages of major and trace element concentrations of the different units at Site 558

Chemical Group	I	II	III	IV	V	VI
n[1]	1	3	13	5	6	1
SiO_2	50.67	50.86	50.70	50.19	49.37	48.71
TiO_2	1.22	1.12	1.38	1.22	0.96	0.92
Al_2O_3	14.10	15.11	14.82	14.65	15.49	15.81
Fe_2O_3	10.92	10.08	10.17	10.98	10.17	10.73
MnO	0.16	0.15	0.15	0.16	0.16	0.16
MgO	9.87	7.69	8.33	8.90	9.48	10.55
CaO	10.55	12.23	11.64	11.90	12.06	11.56
K_2O	0.18	0.18	0.30	0.30	0.20	0.10
P_2O_5	0.14	0.12	0.18	0.13	0.12	0.07
Ti	7320	6720	8280	7308	5780	5520
V	207	255	275	266	224	194
Sr	128	92	175	144	115	107
Y	27.7	29.7	28.7	28.1	22.9	23
Zr	83	66	88	80	61	51
Nb	8.6	3.2	14.8	10.5	7.3	2
$(Nb/Zr)_{Ch}$	1.00	0.47	1.63	1.27	1.16	0.38

n - number of samples on which mean is based.

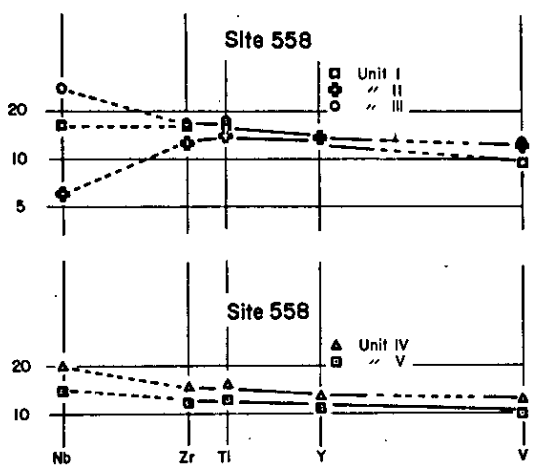

Figure 82-2. Site 558 "extended" Coryell-Masuda Plot. Concentrations of the magmaphile elements of each unit normalized to chondrite meteorite are plotted versus the affinity of the elements for the liquid phase. In such a diagram La would plot close to Nb, Sm between Zr and Ti, Tb close to Y, and La cloe to V.

less, we think that fresh glasses, which are lower in strontium (157 ppm) than the freshest basalts (165 ppm), should be suitable, after leaching, for Sr isotopic ratio measurements. The Site 559 basalts are characterized by a typical enriched distribution of magmaphile elements [$(Nb/Zr)_{Ch}$ = 1.65].

Sites 560 and 561

Hole 560 was drilled on anomaly 5D midway between the Oceanographer and Hayes Fracture zones. At Site 560, serpentinized gabbro and serpentinite with chrysotile veinlets are present throughout the 49 meters of basement cored. Because the only basalt recovered was a single altered fragment within this serpentinized material, we decided to drill a second hole in the same area. This basalt fragment has a slightly depleted magmaphile element pattern [$(Nb/Zr)_{Ch}$ = 0.8].

We drilled Site 561 on anomaly 5E about 10 miles northwest of Site 560. We had cored the basement for only fifteen meters when the bit failed. Despite this low penetration, we sampled three different chemical groups of aphyric pillow basalts. As at Site 558, these groups include both depleted [$(Nb/Zr)_{Ch}$ = 0.3] and enriched [$(Nb/Zr)_{Ch}$ = 2.2] basalts (Fig. 82-3).

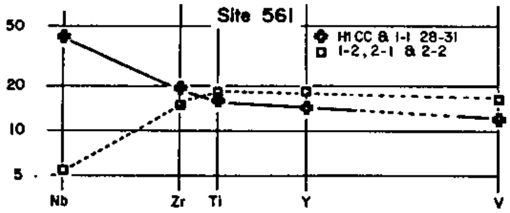

Figure 82-3. Site 561 "extended" Coryell-Masuda plot.

Site 562

Hole 562 is located on magnetic anomaly 5D, 60 miles south of the Hayes Fracture Zone. The basement, cored for 90 meters, consists of sparsely plagioclase-phyric pillow basalts. Fresh glass is very common at the pillow margins. Despite some altered parts, the bulk of the crystalline basalts are fairly fresh and we recognized two units on the basis of major and trace element geochemistry. The magmaphile elements show a typically depleted distribution with a $(Nb/Zr)_{Ch}$ ratio of 0.3.

Site 563

Hole 563 was drilled on anomaly 13, on the same flow line as Hole 562. We continuously cored the lower part (156.5-364 m) of the sediment column was continuously cored and showed the same major change in the rate of sedimentation near the lower/middle Miocene boundary as we observed at Site 558, although the carbonate values, averaging 90 per cent, changed only slightly. In addition, a good correlation exists between the sediments studied at Site 563 and the geophysical logs of Site 564, six miles away, and with the logs and sediments at Site 558, and the logs at Site 556. The change in sedimentation rate near the lower/middle Miocene boundary can thus be considered a general event in this part of the Atlantic.

The basement was cored for only 18.5 meters because of difficult drilling conditions and a premature bit release. It consists of one petrographic unit of sparsely plagioclase phyric pillow basalts. The onboard magmaphile element analyses indicate a depleted character [$(Nb/Zr)_{Ch}$ = 0.3].

Site 564

The poor penetration into the basement at Site 563 (only a single petrographic unit was recovered) forced us to drill another site five miles north to better document the geochemistry of the basement south of the Hayes Fracture Zone.

At Site 564 washed down thrugh 284 meters of sedment to the basement which we cored for 81 meters. The recovered basement section consistts of a single petrographic unit of aphyric pillow basalts interrupted by two massive flows. Fresh glass occurred throughout the sequence. Chemically, the recovered samples form a single group, although forming a compositional gradient. CaO, for example, varies linearly from 12 per cent at the top tto 11.5 per cent at the bottom with very little scatter. We also noted concentration gradients for the magmaphile elements; it appears that the Nb/Zr ratio is not constant downhole, but this variation will have to be confirmed on shore by measurements of lanthanum and tantalum concentrations, inasmuch as the recorded variations in the niobium concentrations are less than three times the estimated precision. In terms of the $(Nb/Zr)_{Ch}$ ratio, which varies from 0.37 to 0.54, the basalts at this site are depleted.

We ran a complete set of geophysical logs in Hole 564, deriving the most significant conclusions from the temperature logs. We recorded two temperature profiles to test for thermal equilibrium. The first run was eighteen hours after circulation was stopped and the second was ten hours later. The two profiles were identical down to below the sediment-basement interface indicating a low gradient of about 5°C/km — which is only a fraction of the normal gradient. In the basement, between 45 and 60 meters, the gradient increased to 250°C/km. This provides additional evidence at anomaly 13 of downflow of sea water when the sedimentary layer is pierced.

Summary

Drilling operations during Leg 82 were very successful; we were able to achieve both the broad coverage necessary for the major objectives of the cruise, and the detailed studies of individual sites required by our secondary objectives. Major results included:

- The unexpected depleted character of the basalts recovered at Site 556 (anomaly 13 on the Azores Triple Junction flow line).
- At two sites (558 and 561) we recovered both depleted and enriched material. Together with two previous occurrences at Site 413 (Leg 49) and Hole 504B (Leg 69-70), this finding demonstrates that the asso-

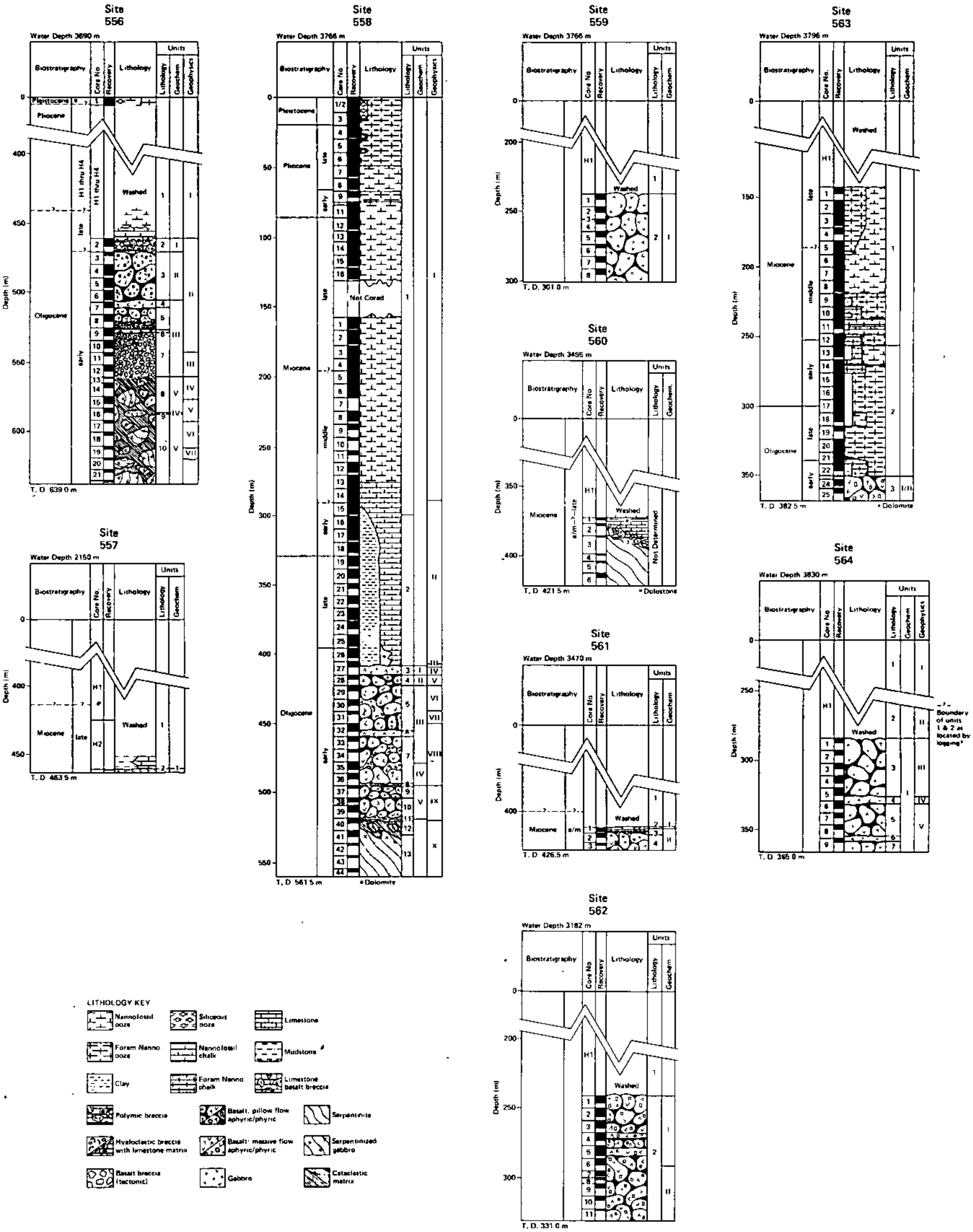

Figure 82-4. Stratigraphy of Leg 82 sites.

ciation of depleted and enriched magmaphile element patterns at the same site is more common than previously thought.

- There are very few examples of possible cogenetic relationships (i.e., related by shallow level fractionation) between the basaltic units recognized at each site.
- Serpentinites, serpentinized gabbros, and serpentinite breccias occurred at shallow depths at three sites (556, 558 and 560) suggesting that this material is common in the basement, probably being related to normal faulting.
- We recovered a nearly complete section of lower Oligocene to lower Pleistocene pelagic sediment from this part of the North Atlantic (Site 558 on anomaly 13). This section will serve as a reference section for biostratigraphy and magnetostratigraphy in the area; of particular importance is the record of a regional increase in the sedimentation rate at about the early/middle Miocene boundary.
- *Bolkoforma* — a tiny calcareous algae(?) — has to date only been recorded from five or six localities. Its discovery in Miocene sediments cored at Site 558 and 563 may provide a good stratigraphic marker and a climatic indicator of cooler temperatures.
- We can deduce from downhole measurements taken above basement and within the basement that, at Site 556, sea water began to flow into the hole when the sedimentary layer was pierced. Other teams have observed this process on younger crust (at Sites 335, 395 and 504), and its occurrence on old crust places constraints on its interpretation closer to the ridge.

Leg 83
Deep Drilling on the Costa Rica Rift[1]

Leg 83 began in Panama 20 November 1981. During 25 days of coring, the shipboard party deepened Hole 504B 514 meters to a total depth of 1350 meters below the sea floor, and 1075.5 meters into basement. The team devoted twelve days to logging and downhole experiments with highly successful results. Glomar Challenger returned to Panama 5 January 1982

Hole 504B

Latitude: 1°13.63'N
Longitude: 83°43.81'W
Water Depth: 3463 meters

Introduction

Drilling during Leg 83 has established the most complete reference section to date through the upper oceanic crust, by deepening Hole 504B to a total depth of 1350 meters below the sea floor — 1075.5 meters into basement. Hole 504B had been drilled to 836 meters below sea floor two years previously during Legs 69 and 70, to investigate young, geothermally active ocean crust (CRRUST, 1981).[2] The Leg 83 shipboard team cored 514 meters deeper into basement, and completed an extensive suite of geophysical experiments.

Hole 504B is located 201 km south of the Costa Rica Rift, the easternmost arm of the Galapagos Spreading Center (Fig. 83-1). The rift is characterized by a spreading half-rate of about 36 millimeters per year. The spreading is possibly asymmetric. Hole 504B is located on magnetic anomaly 3', with an estimated age of 6.2 million years.

Young crust on the southern flank of the Costa Rica Rift passes through the equatorial high productivity zone, with a sedimentation rate of 50 meters per million years. The 274.5

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[1]Abridged from a preliminary Leg 83 report prepared by Roger N. Anderson, Jose J. Honnorez (co-chief scientists), Andrew C. Adamson, Jeffrey C. Alt, Keir Becker, Rolf Emmermann, Pamela D. Kempton, Hajimu Kinoshita, Christine Laverne, Michael J. Mottl, and Robin Newmark.

[2]CRRUST (Costa Rica Rift United Scientific Team), 1981. Geothermal regimes of the Costa Rica Rift, East Pacific, investigated by drilling, DSDP-IPOD Legs 68, 69 and 70. *Geol. Soc. Am. Bull.* (in press).

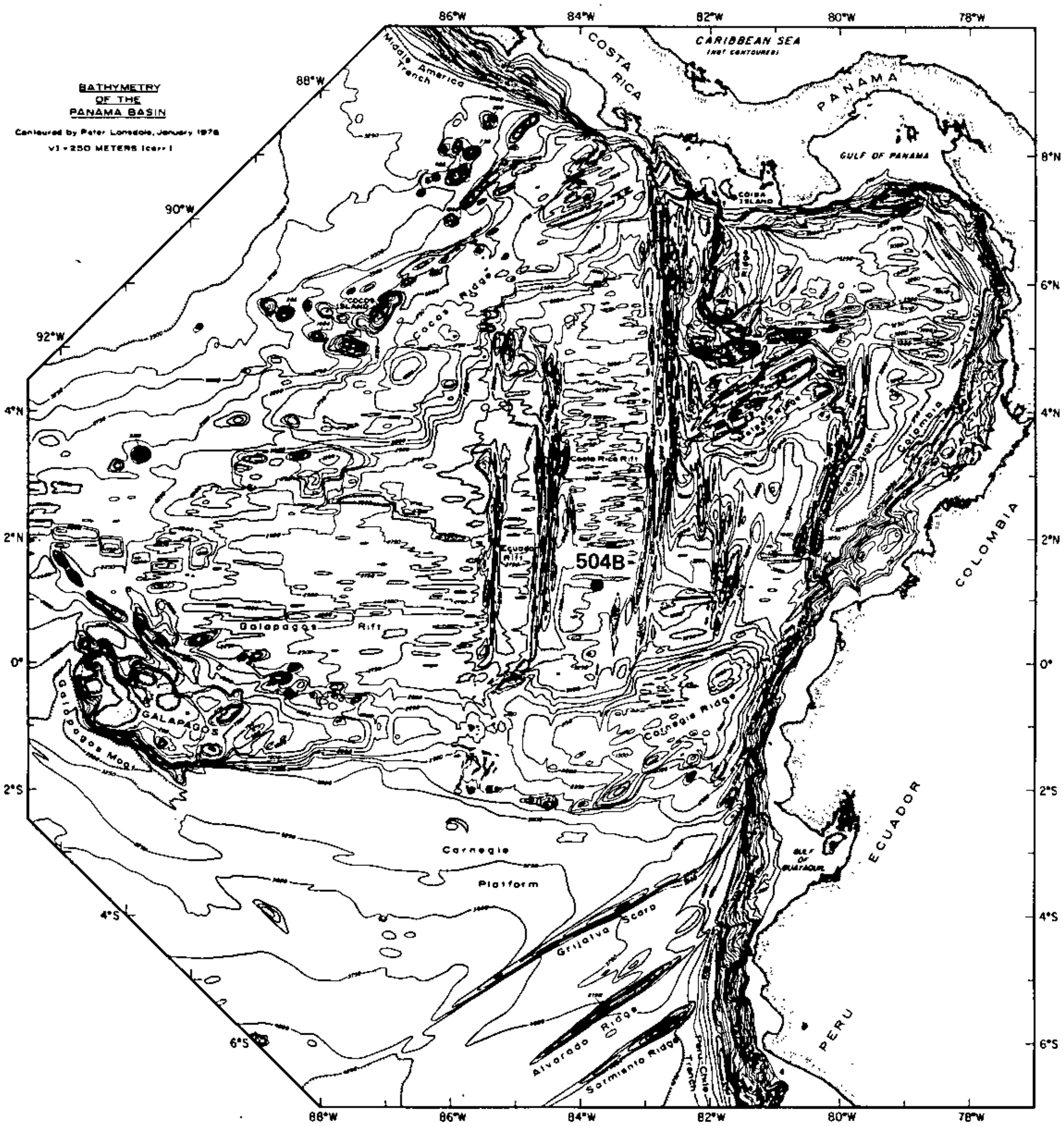

Figure 83-1. Location of Hole 504B on the Costa Rica Rift.

meters of sediment at Hole 504B are dominantly siliceous nannofossil ooze and are upper Pliocene near the basement contact. The youngest chert yet found in the oceans occurs at the base of the sediments (CRRUST, 1981).

Geothermal Setting and Temperature Measurements in Hole 504B

In the vicinity of Site 504, the thick, chert-based sediment has formed an effectively impermeable seal to convective heat loss from the cooling plate. This is demonstrated both by the pattern of surface heat flow measurements (site survey) and by downhole temperatures (CRRUST, 1981), all of which indicate that heat is flowing in agreement with conductive plate cooling predictions of 190-200 mW/m^2. Closer to the spreading axis, where the sediment cover is thinner and the basement topography is considerably rougher than at Hole 504B, surface heat-flow values are much lower than predicted, presumably owing to hydrothermal convection. If the crust at Hole 504B is assumed to have aged through an earlier hydrothermal cooling phase, then crustal temperatures must have re-equilibrated upwards to present values, as the thicknening sediment cover sealed off convective heat loss.

Downhole temperatures measured on Legs 69, 70, and 83 indicate that an equilibrium conductive geothermal gradient holds throughout the full Hole 504B depth (Fig. 83-2). Once Leg 69 drilling punctured the sediment seal, however, borehole temperatures to a depth of 360 meters were strongly depressed below values measured in the sediments. This was interpreted to indicate drawdown of ocean bottom-water into a 30-meter thick aquifer 55-85 meters into basement at a December 1979 rate of 6000 liters per hour. This drawdown is *not* a hydrothermal flow, but is rather convection forced by basement pore fluid underpressures.

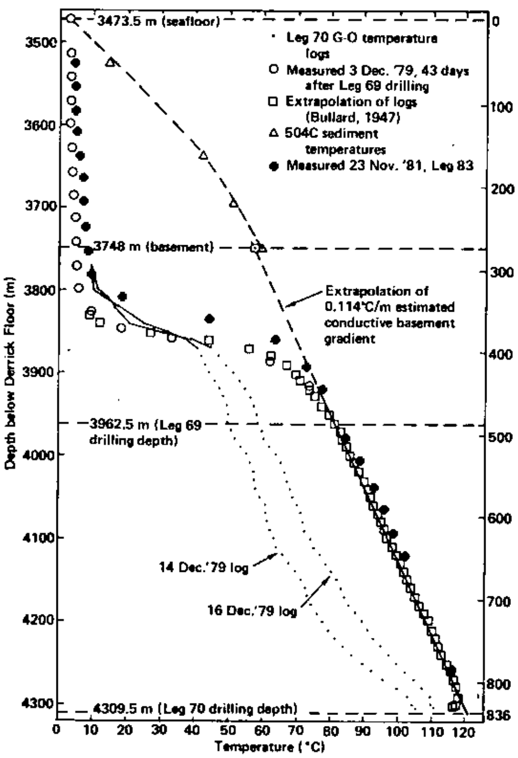

Figure 83-2. Downhole temperature measured in Hole 504B during Legs 69, 70, and 83.

Two years later, Leg 83 measurements of borehole temperatures, which had fully recovered from any Legs 69 and 70 drilling disturbance, showed a similar pattern, with two subtle differences. First, temperatures through the cased sediment, while still considerably depressed, were noticeably higher than Leg 70 values, indicating a slowing of the drawdown to a rate less than 1500 liters per hour. Second, the level of the zone of depressed temperatures was about 20 meters shallower on Leg 83 (Fig. 83-2), suggesting that the entire upper 85-90 meters of basement acts as an aquifer, with somewhat lower permeability (~70 millidarcys) than estimated from the Legs 69 and 70 results. Also, the basement underpressures originally measured on Leg 69 must have been significantly quenched by the two years' mass flux — on the order of 50 x 10^6 kg — down the hole into the formation.

Lithostratigraphy

During Leg 83 we cored 514 meters of basalt to a total Hole 504B depth of 1350 meters below the sea floor. We recovered 106.9 meters, or about 20.8 per cent of the cored interval. The combined drilling efforts of Legs 69, 70 and 83 have penetrated 1075.5 meters into oceanic basement with a total recovery of 273.1 meters (25.4%). See Table 83-1 and Figure 83-3.

The upper 575 meters of basement consist of intercalated pillow lavas, pillow breccias, hyaloclastites, minor flows and localized flow breccias. Tectonic breccias occur toward the top of the upper zone.

The upper zone is underlain by a transition zone consisting of approximately 220 meters of pillow basalt, minor lava flows and dikes. We placed the upper boundary of the transition zone at a depth of 845 meters sub-bottom where three dikes occur within 5 meters of each other. (Sediments comprise 274 meters of the transition zone.) Below this, in the underlying 213 meters of Hole 504B, dikes become progressively more common. Although earlier drilling recovered a single dike at a depth of 715 meters (sub-bottom), we did not use it to delineate the top of the transition zone because 125 meters of pillow lavas separated it from the underlying dikes — those forming the top of the transition zone as defined above. We concluded that this distance of separation between consecutive dikes was too great for a single dike to meaningfully define the boundary. We identified the lavas as dikes by the intrusive nature of their contacts (as determined in hand specimen and in thin section). Macroscopically, the contacts between intrusive material and the adjacent host rock range from brecciated to razor sharp. Non-brecciated contacts, however, vary from planar to irregular. In thin section, the margins of the dikes are chilled against the intruded host. Chilled margins also occur at the rims of pillow lavas, but unlike the range of textures produced there, the range of crystal morphologies in dike margins is far more limited; we did not encounter glass, and saw extensive quench morphologies such as varioles or plagioclase sheafs in only a very few samples. The margin rocks have a dense, cryptocrystalline to very fine-grained equigranular texture (crystals less than 0.004 mm in size). Microlites and microphenocrysts are nearly everywhere pre-

Table 83-1. Leg 83 coring Summary

Hole 504B: Latitude: 1°13.63'N; Longitude: 83°43.81'W, Water Depth: 3470 meters.

Leg	Dates	Total Depth of Penetration (m)	Penetration Penetration (m)	Number of Cores	Basement Cored (m)	Cores Recovered (m)	Percent Recovery
69	7-25 Oct 1979	489	489	28[a]	214.5[a]	73.5[a]	34.3[a]
70	4-13 Dec 1979	836	347	40	347	92.7	26.4
83	24 Nov - 15 Dec 1981	1287.5	451.5	60	451.5	98.4	21.8
	28 Dec - 1 Jan 1982	1350.0	62.5	11	62.5	8.5	13.6
	Total Leg 83	1350.0	514.0	71	514.0	106.9	20.8
	Total All Legs	1350.0	1350.0	139[a]	1075.5[a]	273.1[a]	25.4[a]

[a]Does not include sediment basal chert layer.

ferentially aligned parallel to the contacts and disaggregated material from the host basalt is also commonly observed at the margins.

Lithologically, the pillow sequences are more abundant, more continuous, and more heavily brecciated at the top of the transition zone than at the bottom. Fracturing and brecciation are particularly extensive from 636 to 654 meters sub-basement within a large pillow sequence where a mineralized stockwork occurs. Toward the base of the transition zone the pillow units become thinner and we did not recover many chilled pillow margins. Here the lavas are less convincingly identifiable as pillows which are generally recognized only by their rubbly, brecciated, fine-grained character. Massive units (here defined as basalts possessing a uniform medium-coarse grained texture without chilled margins), and/or dikes, progressively increase in thickness and frequency toward the base. These massive units cannot be identified certainly as dikes because they lack chilled margins. In two places the top surfaces are brecciated and the grain size reduces toward the base, suggesting that these are probably flows. Dike chilled margins, however, do occur at the base of the transition zone, implying that at least some of the massive units throughout the layer are dikes.

The shipboard petrographers chose the 781-meter sub-basement depth as the upper boundary of the next underlying zone which is composed predominantly of massive units and dikes. We recognized no pillow lavas below this boundary. Cores of the dikes show one, and in a few examples two, chilled margins, most of which are steeply inclined (50°-60°) to nearly vertical. Some of these chilled margins are highly brecciated (possibly the result of forceful dike intrusion?) This zone as a whole, however, is far less brecciated than those overlying it. In addition, the host material against which the dikes had been chilled is everywhere fine- to very fine-grained, commonly to the point of showing skeletal or plumose quench textures. In contrast, basalt from the inner portions of the dikes tended on the whole to be among the coarsest textures recovered (medium-coarse grained, subophitic textures). Although our data are not yet sufficient to argue the case convincingly, this suggests that dikes tend to intrude predominantly at the margins of previous dikes which would be consistent with one-way chilling documented in ophiolites. Most of the lavas recovered from the lower zone are massive. Many of these exhibit significant grain-size variation — a fining toward one or both of their implied margins. Such massive units are probably dikes, although (per our definition of a massive unit) no chilled margins were recovered. The remainder of the lavas maintained a constant grain-size over the recovered interval and we can only speculate on their mode of emplacement.

The lavas in the uppermost part of Hole 504B are predominantly fine- to medium-grained olivine plus plagioclase and small amounts of clinopyroxene and spinel phyric basalts; aphyric lavas become progressively more common with depth. We divided these basalts into four petrographic categories on the basis of the phenocryst contents: (1) olivine-plagioclase-clinopyroxene phyric phenocrysts (approximately 29% of the total recovery), (2) olivine-plagioclase phyric phenocrysts (13%), (3) variable olivine-plagioclase-clinopyroxene phyric phenocrysts with accessory chrome spinel (19%), and (4) aphyric

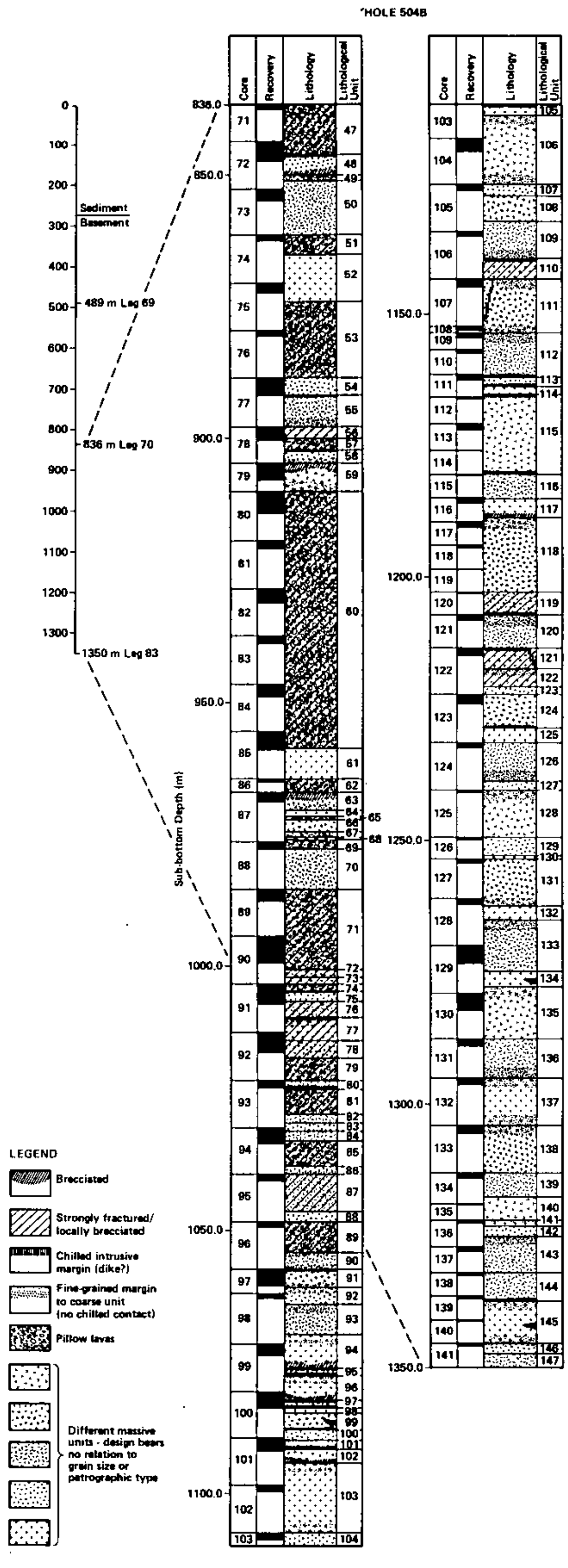

Figure 83-3. Lithostratigraphic section of Hole 504B.

(40%). The majority of the aphyric lavas in Hole 504B were recovered during Leg 83. They are generally coarser grained than the phyric lavas and have so far only been found in the massive units.

Alteration

We divided alteration of basalts in Hole 504B into different depth zones on the basis of the presence of various secondary mineral assemblages. From 0 to 253 meters sub-basement olivine is generally totally replaced by "iddingsite" (mixtures of Fe-hydroxides and clay minerals), celadonite-nontronite mixtures, and various saponites. These minerals also occur in veins and fill vesicles along with phillipsite, aragonite, and minor amounts of calcite. "Iddingsite" and celadonite-nontronite mixtures occur in reddish alteration halos along cracks, whereas saponite occurs throughout the rocks. These occurrences are similar to those commonly observed in drilled submarine basalts altered at low temperatures (i.e., 0° to 40°). We interpret the alteration of the rocks in this interval to be the result of superimposed stages of oxic alteration ("iddingsite" and celadonite-nontronite mixtures) and sub- to anoxic-alteration (saponite).

From 253 to 297 meters the above minerals are present (except celadonite-nontronie-aragonite and phillipsite), but this interval is characterized by the presence of numerous veins of up to 1-cm thick of natrolite-mesolite, thompsonite, analcite, and apophyllite. Olivine is also often replaced by Ca-rich alteration products (Fe-hydroxide + smectite + Ca-carbonate mixtures). Wallrock for up to 1 cm around the zeolite veins is altered to a light green color, and plagioclase in the wallrock is replaced with analcite and thompsonite. We interpret the thick zeolite veins and associated wallrock alteration in this zone to be the result of a later localized stage of hydrothermal alteration superimposed on alteration similar to that in the uppermost 266 meters of the hole.

Reddish alteration halos are present to 310 meters, but we did not see the above mentioned zeolite veins below 297 meters. From 310 to 614 meters, olivine is generally totally replaced by Fe-saponite, minor Mg-saponite and Ni-Fe-rich opaque minerals, and occasional calcite. Veins are filled with Fe-saponite, mixed layer smectite-chlorite, calcite, quartz, pyrite, and minor amounts of talc and anhydrite. The amounts of quartz and pyrite generally increase with depth. Shipboard petrologists also identified single occurrences of gyrolite, heulandite, and chabazite in veins. Clinopyroxene is unaltered above 614 meters; in three cases below this depth aegerine-augite occurs as reaction rims on clinopyroxene bordering Ca-carbonate + Fe = hydroxide + Fe-hydroxide + Fe-saponite veins. Melanite also occurs in one of these three veins. Aegerine-augite is interpreted to have formed as an early deuteric alteration product. On the basis of mineralogical data and bulk rock oxygen and strontium isotopic data collected during Leg 69, we think the alteration reactions probably occurred under sub- to anoxic conditions either with sea water at low water to rock ratios or at slightly higher water to rock ratios with sea water-derived fluids that had previously reacted with basalt. This stage resulted in the bulk of the alteration observed, characterized mostly by the formation of clay minerals. Preliminary oxygen isotopic work on smectite and anhydrite suggests that alteration occurred at 60° to 110°C. Gyrolite, anhydrite, heulandite, and chabazite may be the result of later localized hydrothermal alteration processes.

From 614 to 907 meters sub-basement, olivine is generally totally replaced by, and interstitial areas filled with, chlorite, although smectite or smectite-chlorite mixtures occasionally occur. Titanomagnetite is partly replaced by sphene; plagioclase is partly replaced by albite, chlorite and minor amounts of laumontite. Epidote is common in veins from 624 to 869 meters sub-basement and is most abundant around 738 meters. Actinolite occurs as alteration rims on clinopyroxene from 693 meters to the bottom of the hole, although only minor amounts occur below 907 meters. Minor amounts of prehnite and fibroradial spherules of an unidentified mineral occur from 851.5 to 915 meters sub-basement. Chlorite, laumontite, epidote, quartz, pyrite and minor amounts of talc, scolecite, actinolite, and calcite occur in veins and cementing breccias.

On the basis of vein relationships, experimental data[1], and analogy with Icelandic geothermal fields[2], alteration from 614 to 907 meters is interpreted to have occurred in two stages at decreasing temperatures. The first stage resulted

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[1]Laumontite dehydrates to form wairakite at 235°C and 0.5 kbar P_{H_2O}.

[2]At Reykjanes, smectite is the dominant clay mineral up to about 200°C. Chlorite appears at 230 to 280°C whereas the intermediate temperature interval is dominated by random mixed layer smectite chlorite. Actinolite has only been observed from Krafla, at temperatures greater than 280°C.

in the formation of actinolite, chlorite, sphene, albite, pyrite, and possibly epidote and quartz. Temperatures were at least 230°C, and were greater than 280°C where actinolite formed (below 693 meters). During the second stage, laumontite, scolecite, quartz, epidote, pyrite, minor amounts of talc and calcite, and possibly chlorite, prehnite and the unidentified fibroradial spherules formed at temperatures less than 235°C.

The occasional occurrences of smectite remain a problem and may indicate superimposed stages of alteration at lower temperatures (less than 200°C). We do not clearly understand the transition from lower temperature (smectite-dominant alteration mineral) to higher temperature alteration (chlorite-dominant) at about 614 meters sub-basement at present and this requires more detailed study.

A stockwork consisting of abundant veins of chlorite, laumontite, quartz, minor talc, calcite, sphalerite, calcopyrite(?) and common large crystals (up to 1 cm) of pyrite in highly fractured pillow basalts occurs from 636 to 654 meters. The stockwork altered during two stages similar to those discussed above. The abundant sulfides in this zone could be the result of several processes: mixing of a metal, sulphur and Si-rich hydrothermal fluid with sea water, a drop in temperature and/or a drop in pressure. (Fluid pressures would drop as the solution rose and loss of heat to wallrock.) The higher permeability of this highly fractured zone (before mineralization) could have localized the hydrothermal fluid circulation and facilitated the influx of sea water and the mixing of solutions.

Below 850 meters sub-basement the rocks are generally less extensively altered and contain fewer and thinner veins. From 920 to 1015 meters sub-basement only olivine is completely altered and it shows two stages of replacement: (1) talc plus magnetite and (2) smectite. Other igneous minerals are only very slightly altered. The presence of minor amounts of actinolite replacing clinopyroxene indicates a stage of high but not pervasive temperature alteration (at least 280°C), whereas the occurrence of smectite indicates an additional stage of low temperature (less than 200°C) alteration. Talc plus magnetite intergrowths can be attributes of either stage. The massive nature of the rocks and the scarcity of veins and cracks which would result in low permeability and restrict circulation of fluids may explain the generally low degree of alteration within this interval.

Anhydrite occurs from 907 to 1076 meters and is particularly abundant from 940 to 957 meters (equilibrium temperature, 140°C). It appears to occur alone as veins or in the centers of chlorite veins; we interpret it to be a late alteration product.

Since formation waters in the hole are enriched in calcium and the hole is 150°C near its bottom anhydrite may be forming at present from heated Ca-enriched sea water as predicted by experimental sea-water - basalt reactions. Anhydrite may also have formed by mixing of hydrothermal fluids with sea water, as is occurring at 21°N.

From 1015 to 1048 meters basalts are more extensively altered than those in the overlying interval (920 to 1015 meters). Alteration mineralogy is generally similar to that observed in the interval 614 to 907 meters, although we observed no epidote or prehnite.

In contrast to regionally metamorphosed rocks observed on land, the rocks from throughout Hole 504B are in general only partially recrystallized and have not reached equilibrium. They do not progressivly increase in alteration 'grade' (i.e., temperature of alteration and extent of recrystallization) with depth as predicted by studies of ophiolites. A zone of rocks with a low 'grade' of alteration occurs from 851 to 1015 meters and is over- and underlain by rocks of higher 'grade' of alteration, indicating that alteration grade can vary locally on the scale of 10 to 100 meters. Secondary minerals in veins within the higher grade alteration zones generally form a sequence from higher temperature (>280°C, actinolite present) to lower temperature (<235°C, laumontite present) of formation, and may also reflect changing solution composition with time. Local variations in permeability may control circulation of hydrothermal fluids and, hence, local variations in 'grade' of alteration.

Physical Changes Down the Hole

The Leg 83 team also conducted a most extensive set of geophysical logs and experiments using the wellbore as an *in situ* physical laboratory. We ran packer flow, large-scale resistivity, and borehole televiewer experiments, and conducted multichannel sonic and standard neutron porosity, density, laterolog and induction resistivity logs over the entire thousand meters of upper oceanic crust. These experiments combined with laboratory shipboard measurements of bulk density, magnetic intensity and susceptibility, and thermal conductivity give a remarkably coherent and consistent description of the physical changes occurring with depth at Hole 504B.

The upper oceanic crust sampled at Hole 504B consists of three distinct units defined on the basis of geophysical properties. The upper 100 meters of basement is an aquifer of rubbly pillow basalts, breccia zones and a few massive flows. The entire section is fractured but not as extensively as the section deeper in the hole. Density, thermal conductivity, seismic velocity (both P- and S-waves), and electrical resistivity value are all low. Attenuation of body waves along the wellbore and neutron porosity is high and measured bulk permeability values are as high as those of a good producing oil sand (50 md). An alteration analysis carried out by cross-correlation of hydrogen-ion-sensitive neutron porosity versus porosity-sensitive density logs corroborates the Leg 69 analyses that show only moderate alteration and crack-filling by clays and zeolites. Fractures thus appear to be largely open and filled with sea water. When the drill bit penetrated the chert and sedimentary hydraulic lid capping the formation, underpressures turned the upper crust into an active aquifer system. We interpret this zone to be seismic layer 2A.

We detected an increasing gradient in siesmic P- and S-wave velocities, electrical resistivity and density and a decreasing gradient in porosity from 100 to 650 meters into the basement. Permeability at 200 meters sub-basement dropped to 4 md. Alteration analysis shows a steadily increasing bulk content of hydrated minerals, reaching 50 per cent in a zone at 636 - 654 meters sub-basement which was identified as a highly altered, sulfide-rich stockwork. Borehole televiewer records show a steadily increasing content of fractures and a decreasing wellbore reflectivity as the layer 2A zone of large basalt pillows is apparently replaced by a zone of much more extensively brecciated, smaller diameter pillows containing fewer massive flows. We could not confirm, on the basis of shipboard analysis, that the diameter of the pillows decreased as suggested by the borehole televiewer records. We interpret this zone to be seismic layer 2B. Relatively higher seismic velocity appears to be directly related to alteration products having filled (almost sub-horizontal) fractures and voids in this pillow unit. The first dikes occur toward the bottom of layer 2B. Thermal conductivity, magnetic susceptibility, and intensity remain constant throughout this layer.

Immediately below the stockwork, all the physical properties change. From 600 to 650 meters into basement, electrical resistivity, density, and seismic velocity plot change slope to a steeper gradient. Porosity drops and thermal conductivity increases stepwise 20 per cent. Magnetic intensity and susceptibility drop here as most of the titanomagnetite has altered to sphene. The borehole televiewer shows a drop in the intensity of fracturing and a rise in wallbore reflectivity. The clay analysis also shows a drop in the bulk content of hydrated minerals at this depth. Permeability is 0.01 md throughout the lower 750 meters of the hole: a drop of three orders of magnitude. We interpret this to be the transition from seismic layer 2B to 2C. Below, an increasing number of dikes leads clearly into a sheeted dike complex toward the bottom of the hole. A few pillows, however, are still found in the cores below the Layer 2C boundary and there is little geochemical hint of such an abrupt geophysical boundary at 650 meters sub-basement.

At 800 meters, magnetic intensity and susceptibility increase again as alteration is less and more titanomagnetite remains intact.

Concerning the hydrogeology of the hole, the permeability of the oceanic crust decreases much more abruptly than workers had previously thought; alteration quite clearly has plugged the plumbing below layer 2A. We do not now know whether or not layer 2A is "disappearing" upward as alteration progressively replaces sea water with clays and zeolites in fractures and pore spaces of the upper crust. If the former is this case, then much shallower, more horizontally vigorous hydrothermal convection occurs on the flanks of ridges than was previously thought.

Basement Geochemistry

The basaltic rocks recovered from Hole 504B are remarkably uniform in their major oxide composition. Moreover, no chemical distinction can be made amongst the various lithological types. Within the 1075 meters of basement drilled only two lithologic units, units 5 and 36 of Legs 69 and 70 (14 and 18 m thick, respectively), differ significantly from all other units identified at Hole 504B. The basalts of major element chemical units 5 and 36 are distinguished by higher concentrations of TiO_2 and P_2O_5 (1.2 to 14% and 0.14 to 0.20%, respectively). Their trace element chemistry is characterized by an enrichment of LIL-elements, whereas the majority of the basalt recovered during Legs 69 and 70 is strongly LIL-element depleted.

A general characteristic of the basalt cored during Leg 83 is its high MgO (up to 9.78%) and its very low K_2O content, which is less than 0.02 per cent. There is a systematic but slight MgO increase and an associated K_2O decrease with depth as a result of hydrothermal alteration. The alteration indicates H_2O^+ and CO_2 also varies systematically with depth. H_2O^+ which is mostly less than 1.0 per cent in the part of the hole cored during Legs 69 and 70 shows a maximum (up to 3.4%) at a sub-bottom depth between 980 and 1070 meters (Cores 88 through 97) coinciding with a zone of extensive mineralogical alteration, then drops again toward the bottom of the hole. Carbon dioxide decreases from the top (0.1 to 0.4%) to the bottom of the hole, where it is less than 0.02 per cent in most samples.

We saw no systematic downhole variation for all the other oxides. We relate some minor but irregular variations with depth, to specific lithological units and these variations indicate that limited shallow-depth fractionation processes were operative. The mean-oxide data obtained on the Leg 83 rocks are almost identical to those found in Legs 69 and 70 basalts and their confidence limits in all cases overlap. On a dry weight normalized basis, most rocks analyzed vary within the following limits: SiO_2, 49.9% ±0.9; TiO_2, 0.92% ±0.1; Al_2O_3, 15.7% ±0.8; FeO, 9.05% ±0.5; MgO 8.60% ±0.6; and CaO 12.9% ±0.3; K_2O, 0.20% ±0.1 (Leg 69 section), 0.07% ±0.04 (Leg 70 section) and 0.02 (Leg 83 sectiion); P_2O_5, 0.08% ±0.02.

Similar ranges of variation were also obtained on fresh basaltic glass from the upper part of the hole drilled during Legs 69 and 70. These results suggest that the whole rock analyses (with the possible exception of MgO and K_2O) reflect the primary composition of the rocks and might represent magma compositions. Accordingly, high mg values, which range from 0.62 to 0.70 and average at 0.67, suggest that these magmas were rathter primitive, i.e., unevolved, and had experienced only a small degree of crystal fractionation prior to their eruption or intrusion, respectively. This either indicates a short residence time within the magma chamber and/or the existence of a large magma chamber which was steadily replenished with new hot magmas.

From the trace-element composition of Legs 69 and 70 basalts, we can conclude that the magmas were derived from a LIL-element depleted mantle source. As a working hypothesis we assume that the unit 5 and 36 basalts were generated within very small pockets of less depleted mantle material residing below the magma chamber.

Formation-Water Geochemistry

We collected seven water samples from Hole 504B on Leg 83 from 176 to 1011 meters into basement, both before and after renewed drilling. These samples clarify the interpretation of the six samples taken from the hole on Legs 69 and 70. Samples taken within a few days of drilling indicate that surface sea water introduced into basement reacts rapidly with crustal basalts at temperatures of 70°-130°C, losing magnesium to secondary minerals and gaining calcium by leaching from the rocks. The sample from the greatest depth is the only one which has lost magnesium without gaining calcium. This suggests that anhydrite may have precipitated during water-rock interaction beginning at 130°-150°C, compatible with the depth at which anhydrite becomes common in the Leg 83 cores (907 m sub-basement). At least some of this anhydrite may have precipitated within the current thermal regime at the site. Samples taken at 80 and 115°C one month to two years after drilling, which may be true formation water, differ from the briefly reacted sea water in showing a calcium gain in excess of the magnesium loss, implying loss of an additional cation, probably mainly sodium, to the altered rocks. The two-year sample from 115°C has only half the magnesium content of sea water. Both short-term and long-term reacted sea water varies significantly in composition with depth and temperature in the hole.

PLANNED CHALLENGER DRILLING

Leg 84, Middle America Trench

Balboa, Panama to Manzanillo, Mexico, 9 January to 24 February 1982. Co-chief scientists: Jean Aubouin and Roland von Huene.

Background

We will devote drilling during Leg 84 primarily to a study of the Middle America Trench off Guatemala. This area has been targeted for concentrated study ever since the classical report of Seely and others (1974) which combined the results from a deep test well on a convergent margin with those of the first multichannel seismic reflection studies. The authors made a strong case for imbricated thrusting as a mode of tectonic development of convergent margins. This model is widely accepted today and is often referred to in the scientific literature. Investigators from the University of Texas have since conducted seismic surveys in the area and initial analysis of their geophysical and conventional sampling data has indicated that the tectonic history off Guatemala can be explained by the imbricate thrust model. Drilling during DSDP Leg 67, however, indicated that, although the landward slope of the trench may comprise imbricate slices of oceanic crust, the slices were probably emplaced during the Paleocene. Moreover, little evidence exists to suggest net accretion associated with subduction since early Miocene time. The Leg 67 party drilled Cretaceous through Oligocene rocks under a cover of Neogene slope sedimens at Site 494 (near the foot of the slope). Unfortunately, the detection of gas hydrates at three of the Leg 67 sites halted drilling on the landward slope of the trench for reasons of safety. We have, however, learned much about the Guatemalan margin and hydrate occurrences since the time of Leg 67, and the Safety Panel now deem drilling to the original targets safe (with certain restrictions).

Objectives

Our broad objective during Leg 84 is to establish the age and tectonostratigraphy of the continental framework that forms the landward slope of the Middle America Trench. This will require penetration of the overlying apron of Neogene slope sediments which contain gas hydrates. Another more specific objective is to study the origin and occurrence of these hydrates. Our other objectives are to investigate (a) the seemingly passive subduction of large ridges and troughs on the underthrusted ocean floor, (b) the Tertiary history of vertical tectonism along the margin, and (c) possible differences in the assembled terranes that comprise the margin.

Ridges and troughs with 300 to 500 meters relief enter and have been subducted into the Middle America Trench. The trend of these features diverge by 35° from the regional trend parallel to the trench axis. The deformation resulting as the thin leading edge of the continental or upper plate rides over a ridge or trough on the lower plate should be clearly defined — as features with a similar divergent trend — on a detailed topographic map. SEABEAM maps made recently of the area, however, show no deformational trend parallel to the ridges; the ridges and troughs end at the steep straight front of the slope paralleling the trench axis. During Leg 84, we will attempt to drill through the upper plate in order to study the state of stress in the initial stages of subduction under the foot of the trench landward slope. Here sea floor features can be subducted without deformation of the overlying plate.

The Guatemalan drill holes are located along two transects in a deep canyon cut into the upper slope (Fig. 84-1). Here we will be able to reach lower Tertiary rock with *Glomar Challenger*'s drill string. Unpublished data from an industry well, at the edge of the shelf, indicates that the margin was subjected to a major uplift during Paleocene time. The Paleocene can be sampled in the canyon, and thus we can study the early history of vertical motion at the edge of the shelf in greater detail. The history of vertical motion at the shelf edge differs greatly from that along the base of the slope which appears to have only subsided.

We can recognize three separate terranes across the Guatemalan margin- shelf and upper slope (GUA-9D), mid-slope (GUA-2B, -8A, -8B, -11, and -12), and lower slope and trench (GUA-1B, -1C, -4A, -4C, -5A, -5C, and -7B). The shelf and upper slope are underlain by a thick Quaternary to middle or Upper Cretaceous clastic sedimentary sequence. Although not yet sampled, the adjacent mid-slope terrane has and magnetic anomalies a rough basement topography appears to be composed of slices of ocean crust. The lower slope and trench are very smooth topograpically, and where sampled comprise Cretaceous and lower Tertiary rocks deposited near a continent but in the open ocean. Understanding the original environments and mode in which these terranes were assembled and juxtaposed is a key to understanding the dynamic history of the Guatemalan margin, as well as the history of the Caribbean region.

In addition to the sites proposed off Guatemala, we plan to drill a single site (CR-1C) on the lower slope in similar terrane off the Nicoya Peninsula of Costa Rica. Our objectives here are to determine the age and deformational history of the slope deposits, the history of vertical tectonism in the area, and the age of accretion of the basement.

Table 84-1 summarizes the information about the proposed drill sites.

Downhole Experiments

In addition to drilling, we will conduct a series of four interrelated downhole experiments to study the nature and *in situ* properties of the clathrates occurring along the Guatemalan margin.

Von Herzen Temperature Probe

We will conduct the first operational test of the von Herzen temperature probe which consists of a temperature sensor and recording package

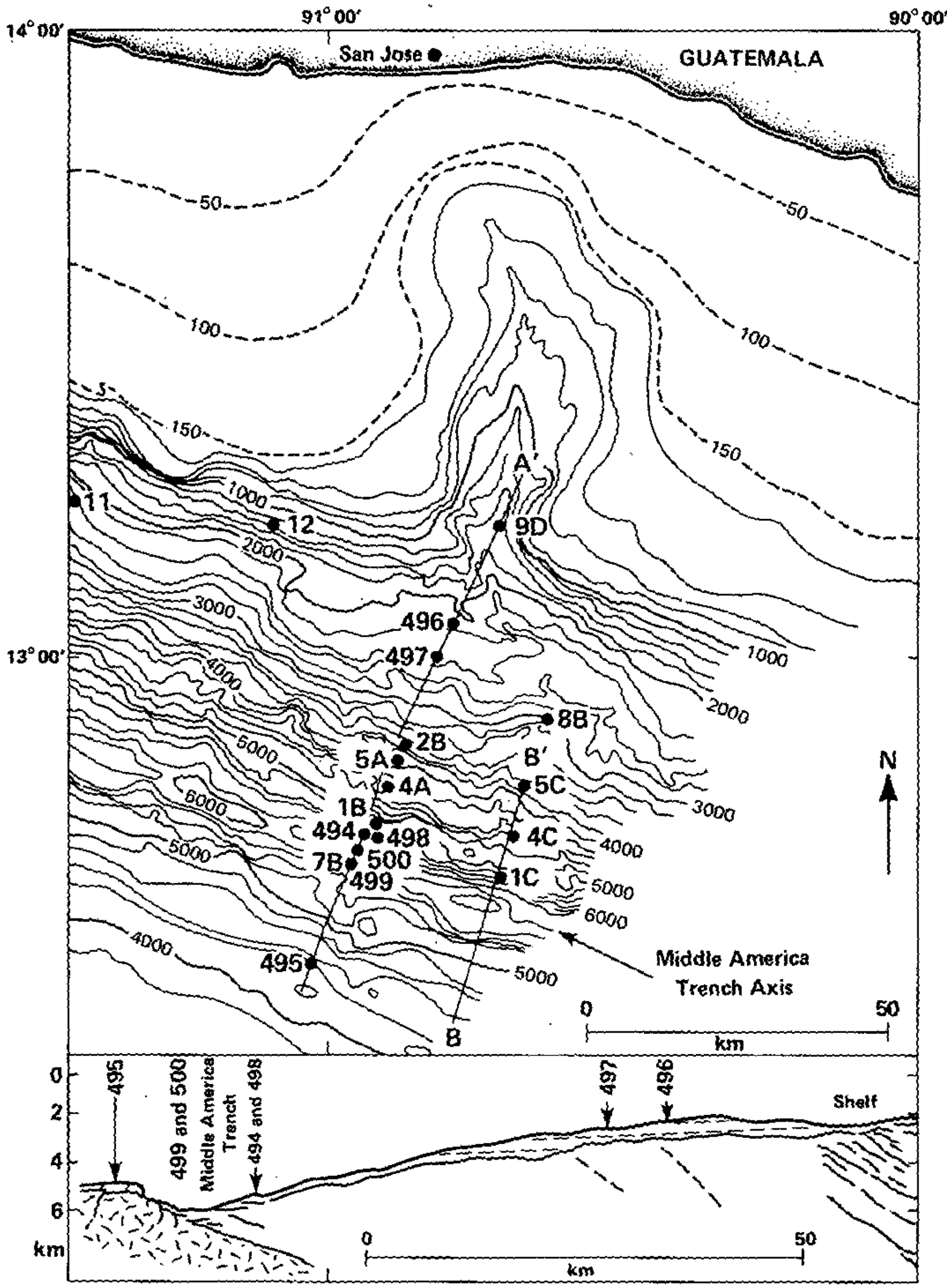


Figure 84-1. Leg 67, and proposed Leg 84 sites.

Table 84-1. Proposed Leg 84 Sites

Site	Priority	Coordinates	Water Deptth (m)	Distance From Land (n.mi)	Nearest Land	Maximum Penetration (m)	Objectives
Top Priority Sites[1]							
CR-1C	1	9°52′N 86°05′W	3075	25	Costa Rica	800	Recover sample of basement. Date slope deposits.
GUA-1B (Site 494)	1	12°44′N 90°56′W	5470	78	Guatemala	1300	Recover acoustic basement. Determine tectonic history of lower slope. Penettrate subduction zone.
GUA-4C	1	12°43′N 90°43.5′W	4500	64	Guatemala	400	Recover acoustic basement. Determine tectonic history of lower slope.
GUA-5C	1	12°48′N 90°41.5′W	3650	61	Guaemala	400	Same as site GUA-4C
Alternative Sites							
GUA-1C	1	12°39′N 90°45′W	5200	78	Guatemala	1300	Same as site GUA-1B
GUA-2B	2	12°52′N 90°58′W	3300	31	Guatemala	1300	Determine mid-slope tectonic history and basement rock composition.
GUA-4A	1	12°48′N 90°55′W	4500	34	Guatemala	400	Same as site GUA-4C
GUA-5A	1	12°50′N 90°54′W	4028	32	Guatemala	400	Same as site GUA-4C
GUA-7B	2	12°39′N[2] 90°58′W	6050	75	Guatemala	600	Determine nature of trench sedimentsu.
GUA-8A (Site 496)	1	13°08.3′N 90°47.5′W	2063	50	Guatemala	450	Study clathrates. Study tephrachronology of Guatemalan margin.
GUA-8B	1	12°54.4′N 90°38′W	3000	62	Guatemala	650	Determine tectonic hitory and composition of basement of mid-slope region.
GUA-9D	1	13°13′N 90°44′W	1620	40	Guatemala	1000	Determine uplift history of margin in Paleogene.
GUA-11	2	13°16′N 91°25′W	1800	40	Guatemala	1300	Determine mid-slope tectonic history and basement rock composition.
GUA-12	2	13°13′N 91°05′W	1300	40	Guatemala	1300	Same as GUA-11

[1]If drilling is terminated early owing to clathrate or drilling problem, the shipboard party will drill one or more of the first priority alternative sites.

[2]Approximate location.

imbedded in the wall of the hydraulic piston corer. This tool will allow us to take semi-continuous temperature measurements while coring. It should prove invaluable in establishing the geothermal gradient along the margin, in predicting the depth to the bottom-simulating reflector (BSR), and in checking the limits of the clathrate P-T stability field.

Pressure Core Barrel

Through periodic deployment of the pressure core barrel, we plan to recover clathrate samples at various depths above the BSR. As during Leg 76, geochemists onboard ship will study the concentration and composition of the clathrates by monitoring the temperature and pressure of the samples during degassing and by other geochemical means.

Barnes-Uyeda Probe

We will use the Barnes-Uyeda probe intermittently during drilling to measure temperatures and collect *in situ* pore water samples ahead of the bit. The temperature measurements will provide a check on the values obtained by logging and with the von Herzen tool. We will also monitor the chlorinity of the sediments as an indicator of the pressure of gas hydrates from the pore water samples.

Logging

Perhaps the most important element of the Leg 84 clathrate program will be the acquisition of continuous, high-quality logs in each of the holes drilled. Because clathrates have higher sonic velocities and resistivities than non-hydrated sediments of equivalent composition, they should be easy to detect using the suite of tools available on the *Glomar Challenger* (full-wave sonic, natural gamma, neutron porosity, density, laterolog, caliper and temperature tools). In particular, the salt-water/ice transition involves a compressional wave velocity increase from 1.5 to about 3.5 km/sec for a relatively small change in density whereas the shear wave should be undetectable in the liquid phase (it is not transmitted) and range from 1.6 to 2.0 km/sec in the solid phase. Similarly, inasmuch as the clathrate boundary is presumably marked by a transition from salt water to fresh-water ice, the resistivity of clathrate-bearing sediments should be markedly higher than that of barren sediments of equivalent hydrogen content as read by the neutron porosity log.

Clearly clathrate-bearing sediments should be characterized by anomalously high compressional wave velocities and resistivities, when compared to barren zones of comparable density and porosity, and should be able to transmit shear waves. The gas-hydrate-bearing strata in the MacKenzie Delta possess the characteristics described above, but relatively little logging information is available from clathrate zones on land and no logs have been run in marine clathrates. Thus Leg 84 provides a unique opportunity to determine the abundance and *in situ* physical properties of gas hydrates in the marine environment. (*Abridged from the Leg 84 Prospectus prepared by Roland von Huene and Jean Aubouin, 30 December 1981.*)

Leg 85 — Central Pacific Transect

Manzanillo, Mexico to Honolulu, Hawaii, 1 March to 23 April 1982. Co-chief scientists: Larry Mayer and Fritz Theyer.

Primary Objectives

The central equatorial Pacific has been a long-standing target for drilling by DSDP-IPOD. Materials recovered there in the past by DSDP (as well as by numerous other programs) have been instrumental in establishing global Tertiary tropical biostratigraphy and chronology, in shaping our ideas about past oceanographic events, and in aiding us to develop tectonic models for the Pacific plate. A host of studies have demonstrated that equatorial sediments are very sensitive to the complex circulation patterns and fluctuating productivity of the Pacific water masses. Study of the fine-scale sedimentary structures, however, had previously been hampered by drilling-related disturbances. The drill-disturbed sediments are especially troublesome in the upper, unconsoliated 100-300 meters sub-bottom, which often comprise much of the Neogene. Proponents have therefore planned Leg 85 as a stratigraphic/paleoenvironmental transect using the hydraulic piston corer (and some rotary drilling) to recover undisturbed, tropical Cenozoic section. We will particularly address research into:

- high-resolution bio-, magneto-, seismic and stable-isotope stratigraphy,
- oceanographic and biological (evolutionary) changes associated with the Eocene/Oligocene boundary,
- termination of Atlantic-Pacific circulation across the Central American isthmus and evolution of modern Pacific circulation,
- low-latitude response to Miocene Antarctic glaciation and to Pliocene glaciation of the Northern Hemisphere,
- origin of fine-scale cyclicity seen in Pacific Oligocene to Quaternary sediments,
- diagenesis of carbonate and silica in thick biogenic sections.

Secondary Objectives

Among the secondary objectives of Leg 85, we find deriving Neogene apparent polar-wander paths for the Pacific plate from sedimentary paleomagnetic data particularly relevant. Providing that the magnetic intensity of the highly calcareous sediments is sufficiently strong, the newly developed azimuthal-orientation capability of the HPC (which is also essential for the magnetostratigraphy at these low latitudes) would permit such research as well as detailed analyses of magnetic polarity transitions. The general dearth of polar-wander data, especially data concerning the late Tertiary has been one of the factors limiting detailed tectonic reconstructions of the region.

Another secondary objective — still the subject of some discussion — stems from a proposal by the Hydrogeology Working Group to conduct *in situ* heat flow and chemical measurements in a region of unusually low heat flow in the vicinity of one of the original Leg 85 sites, EQ-1. The purpose of their downhole experiments is to verify advection of sediment pore-waters. The Ocean Paleoenvironment Panel approval for this ancillary project is pending at the time of this writing. (The specific heat flow site (EQ-1B) would compete with that panel's preferred target, EQ-1A).

Proposed Sites

Over the years, identified eleven possible proponents of the central-eastern equatorial Pacific transect have target sites (Table 85-1, Fig. 85-1) to address the primary objectives. Excepting for the EQ-1 series, they selected these targets along a North-South transect across the equatorial high-productivity zone, allowing an evaluation of the primary objectives within a latitudinal framework. Scheduling constrains for Leg 85 — fifty-two total days, of which only about 29 are available for operations — have, however, forced the Ocean Paleoenvironment Panel to select five priority targets (marked by superscript in Table 85-1). Although the latitudinal character of the transect is preserved in this scaled-down program, the Leg 85 team must now almost exclusively use the hydraulic piston corer. Each hole will be piston-cored twice and then briefly rotary drilled below the HPC's reach. EQ-4 is the only site at which we plan some basement drilling. Even under these constraints, we will find it difficult to meet the 29-day schedule as is evident from the estimates in Table 85-1.

We expect to recover very detailed and undisturbed (reference standards) Neogene sections containing nannofossils, foraminifers, radiolarians, and diatoms as the dominant components at all five priority sites. Beyond that, with the exception of EQ-1A (or EQ-1B, should it be chosen), which would terminate in the uppermost Miocene, we expect uppermost Eocene at all other sites. A particular achievement would be to recover complete, or near complete, records of the Eocene/Oligocene boundary at some (or all?) of the sites. EQ-3, which would duplicate Site 77, and EQ-4 are particularly important in this respect we estimate basement age there at 39-40 million years, which is just below, or at, the "Eocene terminal event."

Conclusion

In conclusion, we expect that Leg 85 will recover the data and materials necessary to provide the standard source for fine-scale (Eocene to Quaternary) sedimentary research in of (the central equatorial Pacific. The tremendous impact that earlier, pre-hydraulic piston core drilling, operations in the area had on equatorial Pacific marine geology and geophysics, makes the overall goal of Leg 85 both challenging and ambitious. (*F. Theyer and L. Mayer, 11 January 1982*)

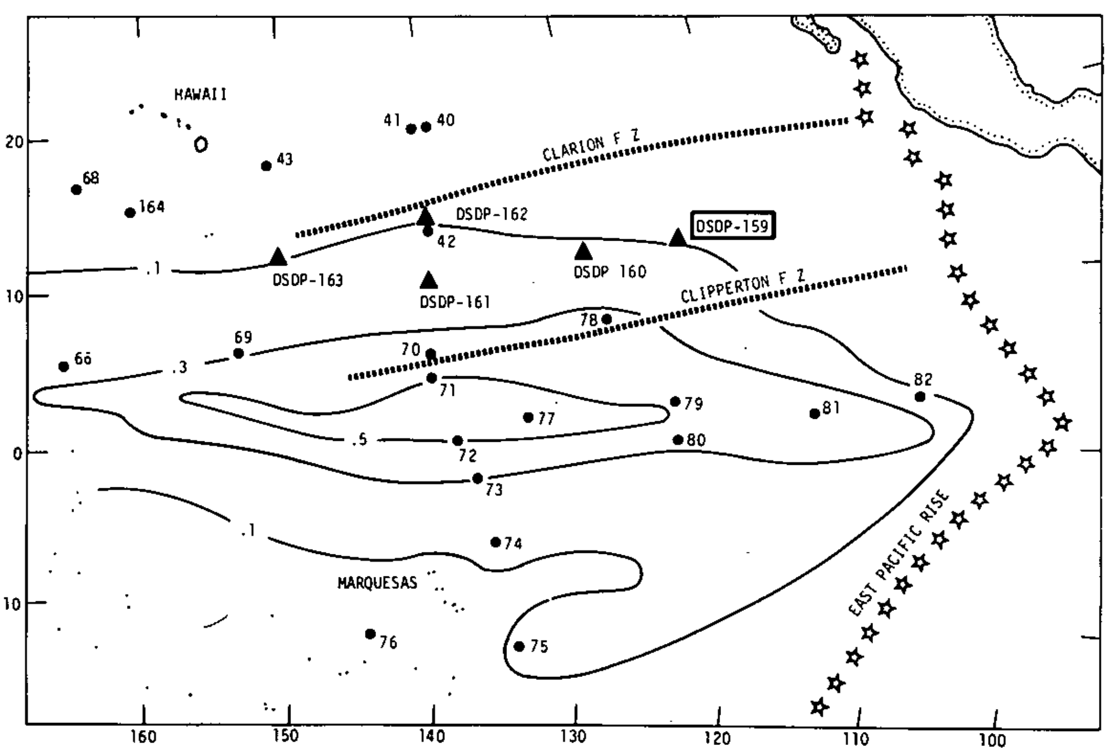


Figure 85-1. Location of proposed Leg 85 sites in relation to DSDP sites (open circles). See Table 85-1 for priorities, water depth and sediment thicknesses.

Table 85-1. Proposed Sites for Leg 85

Site	Coordinates (m)	Water Depth (m)	Est. Sed. Thickness	Proposed Operational Days	Objectives
EQ-1	4.5°N 115.5°W	3900	410	4 (2x HPC)	Latest Miocene-Quaternary sedimentation and climatic history
EQ-1A[1]	1°26.5'N 113°49'W	3800	410	4-6 (2x HPC + rotary)	Latest Miocene-Quaternary sedimentation and climatic history; location of DSDP Site 81
EQ-1B	4°01'N 114°8'W	3900	300	4 (2x HPC + rotary)	Latest Miocene-Quaternary sedimentation and climatic history; site for hydrogeology heat-flow experiment
EQ-2	2.5°S 136°W	4300	300	4-6 (2x HPC + rotary)	Late Paleogene-Neogene sedimentation and climatic history
EQ-2A	1°55'N 137°28'W	4390	310	6 (2x HPC + rotary)	Upper Eocene-Quaternary sedimentation and climatic history, location of DSDP Site 73
EQ-3[1]	0°29'N 133°13.7'W	4300	470	5 (2x HPC + rotary)	Upper Eocene-Quaternary sedimentation and climatic history; recover Eocene/-Oligocene broundary; location of DSDP Site 77
EQ-4[1]	4°15'N 133°'W	4300	500	8 (2x HPC + rotary)	Same as EQ-3; also basement age
EQ-5[1]	6°N 135.5°W	4300	570	6 (2x HPC + rotary)	Same as EQ-3
EQ-6[1]	7.5°N 138°W	4600	300	7 (2x HPC + rotary)	Same as EQ-3
EQ-7	2°N 125°W	4300	410	6 (2x HPC + rotary)	Same as EQ-1
EQ-8	10°N 136.5°W	4600	250	5-6 (2x HPC + rotary)	Same as EQ-3 and EQ-1

[1]Marks program recommended during November 1981 Ocean Paleoenvironment Panel meeting, considering operational phase of about 29 days. The maximum basement age to be expected at above sites is about 50 million years (EQ-2A); more typical is Late Eocene.

Leg 86 — Northwest Pacific

Honolulu to Hakotade, 27 April to 17 June 1982. Co-chief scientists: G. Lloyd H. Burckle and G. Ross Heath.

Our primary goal in drilling the sites in the western North Pacific (Fig. 86-1) is to assess the Neogene subarctic to subtropical paleoceanography of this dynamic region, thereby complementing the southwestern sites to be drilled during Leg 90. Four sites lying roughly along 154°E form the coring program. The most northerly site, NW-6, lies north of the modern subarctic front. Its predicted sedimentation rate of about 15 cm per 1000 years will allow events in the Milankovich frequency band (10^4 to 10^5 years) to be resolved. Here we hope to hydraulic piston core down through the Pliocene, then to rotary core through the upper Miocene sequence of increased siliceous productivity.

Site NW-5 lies close to the subarctic front and the sequence here should record past fluctuations of the front's location. We hope to hydraulic piston core to the upper Miocene, then to rotary core to basement, time permitting.

Site NW-7 is near the southern margin of the transition zone between the subtropical and subarctic gyres. Here we plan to hydraulic piston core the siliceous clays back to the middle to upper Miocene to record the most extreme southern glacial excursions of the front.

Site NW-8 lies in the subtropical gyre, and so forms the warm end member of the sequence. Proponents have proposed two locations. NW-8B lies on the Shatsky Rise, tentatively at the location of Site 47. Drilling at this site would recover calcareous microfossils which may allow the siliceous sequences of NW-5 to NW-7 to be correlated with the Neogene oxygen and carbon isotope stratigraphies. Poor preservation of microfossils and probable hiatuses in the section,

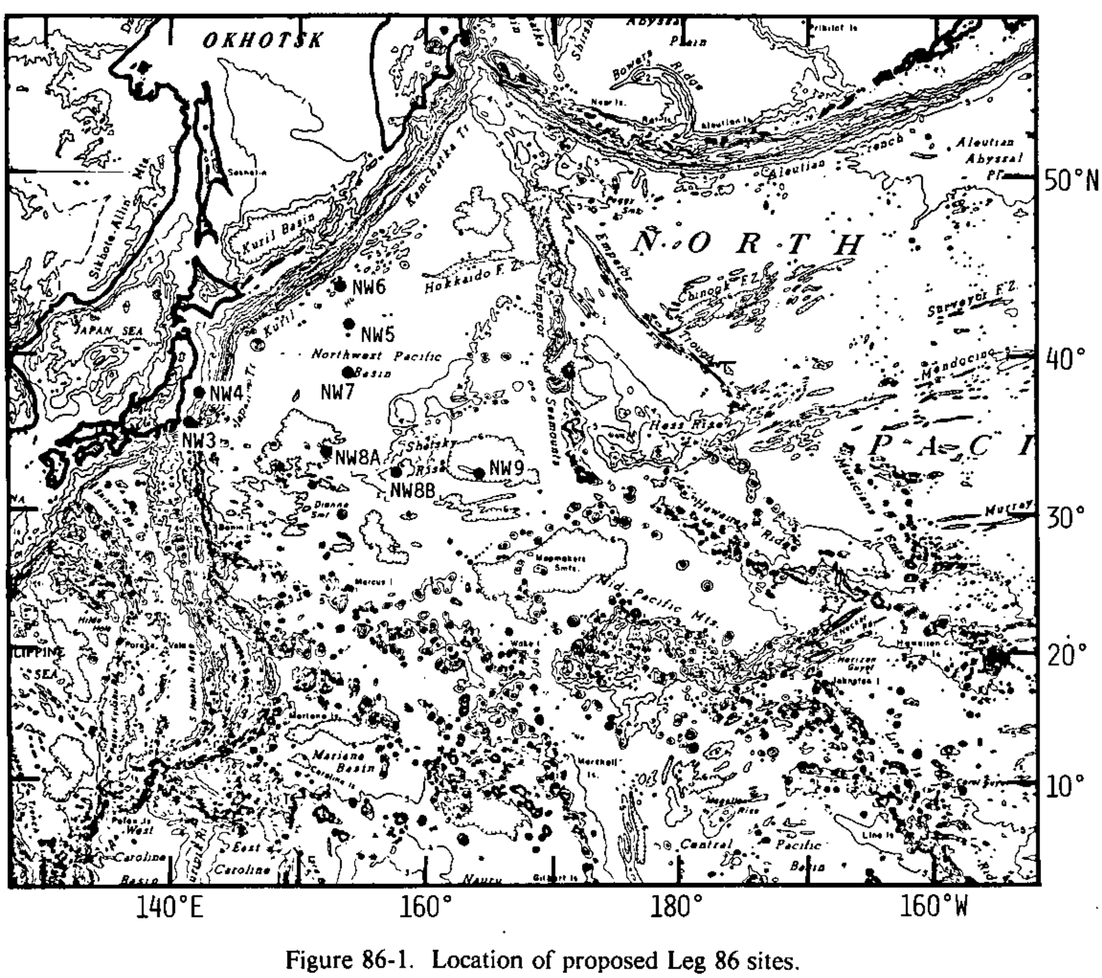


Figure 86-1. Location of proposed Leg 86 sites.

however, would complicate such correlations. We may, however, be able to reach the Cretaceous/Tertiary boundary with the hydraulic piston corer at this site. Site NW-8A, west of Shatsky Rise, lies at the northern edge of the subtropical gyre. The section is more likely to be continuous than the -8B section, but calcareous microfossils will be absent and siliceous tests will be less than perfectly preserved. Site NW-8 would be sampled with the HPC as deeply as possible.

Site NW-9 lies east of Shatsky Rise, and drilling is planned to recover a Cenozoic red clay section comparable to that in the giant piston core LL44-GPC3 collected at 30°N, 158°W. Coring this section will allow us to assess variations in the eolian contribution which here is largely free of local detrital or biogenic components and thereby will allow us to constrain models of past atmospheric circulation. We will also study the Cenozoic history and nature of authigenic and distal hydrothermal chemical sedimentation at NW-9, and thereby test the GPC-3 model. The red clays will be dated by magnetic and ichthyolith stratigraphies.

Proponents have proposed drilling the final one or two sites (NW-3 and -4) along the continental margin off eastern Honshu. In such an environment sedimentation rates are likely to be hundreds of meters per million years. Thus, if coring is limited to HPC depths only the Quaternary and perhaps uppermost Pliocene sections will be penetrated. These sections should record glacial-interglacial fluctuations in the positions of the north Pacific watermass boundaries where they intersect the Japanese margin. We still have not resolved the problem of selecting sites where the paleoceanographic record is not distorted by hiatuses, cross-slope sediment movement, or by lateral mixing owing to contourite deposition. (*R. Heath, 11 January 1982*)

SITE SUMMARIES

Leg 84 — Middle America Trench

Co-chief scientists: Jean Aubouin and Roland von Huene.

Site 565 (CR-1C)

Latitude: 9°43.7′N Longitude: 86°5.4′W
Water Depth: 3111 meters

Site 565 (CR-1C) was drilled on the landward slope of the Middle America Trench off the Nicoya Peninsula of Costa Rica to a depth of 328 meters below the sea floor. The site is about 28 km landward of the trench axis on a small raised intercanyon area. The first 30 cores recovered contain dark olive gray mud and mudstone with only two recognizable ash layers. Two thin beds of sandstone mark a major lithologic change at the depth of Core 30, but hole conditions and recovery suddenly deteriorated and after we drilled three more cores we abandoned the hole.

Microfossils indicate a normal stratigraphic sequence from Quaternary to the top of the Miocene. The benthic foraminifers displaced from upslope are abundant and together with slump features and sediment mixing show that the sequence consists of hemipelagic mudstone considerably reworked by mass movement and density currents. Below Core 29, the nannoflora contains numerous reworked Cretaceous forms; one is restricted to the Maestrichtian period. The majority of the benthic foraminifers are transported from the mid-slope region. Cretaceous rock probably outcropped in the mid-slope area 3-8 million years ago.

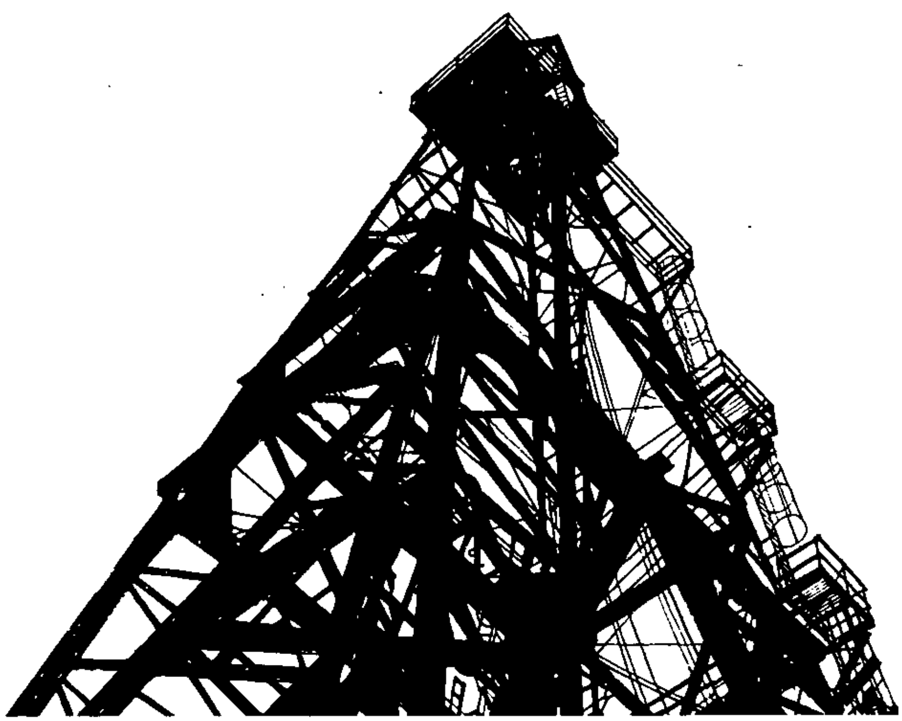
We found very little indication of tectonism at the site. Although we detected several signs of overpressure, we could not convincingly document it. Overpressure may have caused the sudden bad hole conditions.

Three lines of evidence document recovery of gas hydrates: the pressure core barrel sample contained 30 times more methane than can be contained in non-hydrated water, the sample contained a unique gas composition, and the water chemistry is appropriate for hydrate. Just how the hydrate is distributed in the sediment is now the main question. The hydrate at this site does not form massive layers. Although we carefully watched for hydrate as the cores came on deck, only two contained visible hydrate. The hydrate was seen in association with a 10-cm thick sandstone layer, which is part of a zone that may have been somewhat more porous because of fracturing as suggested by poor core recovery and unstable hole conditions. Thus dispersion of the gas hydrate in small concentrations throughout the massive mudstone is possible, but it appears to form 1-3 cm masses in fractures or fills the pores in sandstone. Perhaps free gas and gas hydrate coexist at this site with the gas hydrate being found preferentially in porous sediments.

Site 566 (GUA-5C)

Latitude: 12°48.8′N Longitude: 90°41.5′W
Water Depth: 3675 meters

Site 566 is located 3000 meters above and 22 km upslope from the Middle America Trench floor off Guatemala. We positioned in a canyon to avoid drilling slope deposits sufficiently thick to support any gas hydrates above the basement. The basement, sampled at three holes over 2 km across the strike of the slope, is ultramafic mantle rock consisting of harzburgite and serpentinite. The overlying slope deposits are Miocene to Quaternary massive, pebbly, or laminated mudstones and graded sandstones. The ultramafic body appears to be extensive since geophysical characteristics change little throughout the trench lower slope. This ultrabasic mass at the front of the margin is most easily explained as an exposure of the crustal complex that underlies Central America south of the Montagua-Polochic fault zone. The drilled ultramafic rock may be correlative with the ultrabasic complex on the Santa Elena Peninsula of Costa Rica. If true, the margin off Guatemala may have been truncated between Upper Cretaceous and Miocene time.



DEEP SEA DRILLING PROJECT

LETTER FROM THE CHIEF SCIENTIST

Budget Cuts

Outstanding scientific achievements and administrative difficulties have characterized the last few months of our operations. Despite some meteorological, technical, and political problems, the *Glomar Challenger* has brought back results that have opened totally new doors in our understanding of the nature of the oceanic crust and of the evolution of active margins. But during this period of national fiscal constraint, the National Science Foundation has been subjected to budget cuts and has asked the Project to reduce its FY 1982 spending by about $1.2 million. Because more than one half of the DSDP budgeted funds goes to the subcontractor, Global Marine, for the operation of the vessel, this reduction amounts to about a 20 per cent cut in funds allotted to all other DSDP operations.

Several major expenses such as fuel and logistical support must be covered with the remaining funds and we cannot reduce these costs without losing the operation of the ship. Consequently, we have had to take drastic measures. We have tried to minimize the impact of the budget cut by preserving the operating structure of the Deep Sea Drilling Project. The cuts, however, come following *two years of reduced budgets*; we had already removed all the "fat" from our operations. Thus some of the "muscle" had to go with the most recent $1.2 million cut. We are making every effort to keep the skeleton intact. The major areas affected are the publication of Initial Core Descriptions and Initial Reports and the engineering and the logging programs. Shipboard operations are also affected in that no new scientific equipment will be acquired, with the exception of the shipboard computer. Cruise related salaries for travel and shipboard scientists will be reduced to a minimum, and core and sample shipments from the ship may be delayed.

The most recent blow came early in February when we lost about 5400 meters of drill string while logging Site 567 on the margin off Guatemala. We are taking immediate steps to replace the drill pipe but this will involve both time and money which at present are not in our budget. We hope that if we can acquire new pipe before Leg 89 (oldest Pacific environments) only a minor part of the western Pacific program will be affected. (See also the minutes of the 11-13 November Planning Committee meeting for more detail of the steps we have taken to reduce costs and additional discussion about loss of the drill string, below.)

Ship's Operations

Oceanic Crust — The Two Approaches

Historically two major views have alternatively dominated the deliberations of the Ocean Crust Panel. One advocated deep penetration at a limited number of sites to reach the base of layer 2; the other recommended drilling clusters of shallow-penetration sites to learn more about the nature of layer 2 and its evolution through time, and from study of its chemical composition, the chemical nature and heterogeneity of the mantle.

The recent legs (82 and 83) have demonstrated that both approaches can be successfully addressed from *Glomar Challenger*.

Leg 82 on the western flank of the mid-Atlantic Ridge provided the first detailed account on the variability of the chemical composition of the oceanic crust on a regional scale and will certainly lead to a thorough re-examination of the previous models. A major surprise was the occurrence at several sites of gabbros at depths much shallower than expected.

The **Leg 83** team substantially deepened Hole 504B (drilled earlier during Legs 69 and 70) and for the first time the drill reached a depth of more than a kilometer into the oceanic crust. Drilling the hole allowed the first exploration of the composition of the lower levels of layer 2 (sheeted dike complex). Experimenters conducted a comprehensive suite of downhole experiments that documented, in detail, the circulation of seawater into certain levels of the crust. (See also *Challenger* Operations, elsewhere in this issue.)

Middle America Trench

The first results of the **Leg 84** drilling (off Costa Rica and Guatemala) indicate the presence of massive ophiolite-type bodies in the lower part of the slope of the Middle America Trench. These are very similar to the mid-America basement structures, such as those found along the Pacific coast of Costa Rica, sometimes dated - old as Jurassic and early C that sediments associated with these bodies are indeed much older than those resting on oceanic crust just south of the Trench, we will have confirmed that oceanic materials have not acceted significantly on that margin in recent periods.

Leg 84 scientists are also devoting a major part of their time to studying the nature and origin of gas hydrates (clathrates). Most clathrates encountered so far during the Guatemala transect appear to be dispersed within the fine-grained sediments and are rarely concentrated in more permeable layers. Surprisingly low concentrations of gas have been detected in the layers just above a pronounced bottom-simulating reflector (BSR). The shipboard party has successfully implemented a very comprehensive program involving repeated use of the pressure core barrel. The first reports from the ship contain a wealth of new and detailed data on the composition of the hydrates. A complete logging program is being conducted at the major clathrate site.

Drill-Pipe Failure

While logging Hole 567A, located in the mid-slope area of the Guatemala transect, the drill pipe parted at about 150 meters beneath the hull of Challenger. At the time, the pipe was hanging freely beneath the ship and the crew was retrieving a suite of logging tools. The pipe joint that broke was new — it had been used for only about one hour. Preliminary investigations suggest it parted as a result of a manufacturing flaw. The loss of 579 joints (5380 meters) — 139 new and 440 used — of drill pipe, the associated bottom-hole assembly, and wireline and logging equipment amounts to a $1,460,046 loss and seriously affects the drilling capability of *Challenger.* The maximum capability at present is a 3500-meter string and the remainder of Leg 84 drilling will concentrate on the upper slope off Guatemala.

At the forthcoming port call (now moved from Manzanillo to Los Angeles), the ship will be outfitted with all the usable pipe now available of the Project. The length of the usable drill string will be approximately 6050 meters until such time as we can purchase and take delivery of new pipe. Very preliminary contacts with manufacturer suggest that new pipe could be delivered within approximately nine months.

Future Plans

The drilling program outlined in the last issue of the JOIDES Journal has not undergone major modifications despite the budget cuts and the loss of drill pipe. Some consequences of these unfortunate events, however, are unavoidable.

We have had to cancel part of the logging program for FY 1982. Logging will be concentrated on margin and crust drilling (Leg 84 off Guatemala; Leg 87 off Japan; Leg 88 in the Northwest Pacific — DARPA experiment). The outlook for FY 1983 is at present unclear but first indications from NSF regarding the FY 1983 budget are not very encouraging.

The reduced drill string will not affect operations in the equatorial and northwest Pacific, except possibly for the deepest site off Japan. If, however, we are unable to acquire new drill pipe we may have to alter the program for Leg 89 (older Pacific environments and crust). Of course the lack of any backup drill string would also increase the risk of sudden termination of the entire program in case another failure should occur. Consequently, deep-water sites in areas of rough weather will be subjected to very careful evaluation.

Publications

ICDs and Initial Reports

The budget reduction has directly affected the publication of ICDs and Initial Reports. Starting with Leg 76 the ICDs will be available only in a microfiche. This will help us realize substantial savings in both printing and postage costs.

The production of Initial Reports may suffer some delays. The National Science Foundation had notified DSDP that funds had been budgeted to produce only four Initial Report volumes during FY 1982 (in addition to Volumes 60 and 66 that had been delayed voluntarily during FY 1981 for budgetary reasons). We thus reduced the DSDP production staff to correspondingly lower level. NSF has more recently indicated that now five new volumes, instead of four, could be printed during FY 1982, and we will make every effort to keep our production in stride with the NSF's ability to print the volumes. We expect to produce volumes, 64, 65, 68, 69 and possibly 70 this year. Production of the Site Survey volume and the Sedimentary Petrology manual may be delayed until FY 1983.

Scientific Articles

Following a recommendation of the Planning Committee, we have arranged for the shipboard scientists to prepare an article for *Nature* to be submitted within two weeks after the end of each cruise. (The *Nature* articles began with Leg 83.) Appearing in the "News and Views" section of *Nature*, this article will not duplicate the *Geotimes* article. It will, instead, essentially present the highlights of each cruise and may focus on one particularly important aspect of the results.

The *Geotimes* article will continue to present a more general and complete summary for each cruise.

GSA will no longer automatically accept cruise reports for publication in its Bulletin. GSA editors will examine and review articles submitted by the shipboard parties in the same manner as they review all other material submitted for publication. Consequently, publication in the *GSA Bulletin* article is not guaranteed. We still encourage shipboard parties to submit articles to *GSA*, but do not exclude the possibility of their submitting papers to other major journals. Certainly at least one extensive scientific report of the style and scope of those recently published in the *GSA Bulletin* should be submitted to a major journal shortly after each cruise. (*Yves Lancelot, DSDP Chief Scientist, 10 February 1982*)

CORE REPOSITORIES

Samples Available

Samples from DSDP Legs 1-76 are available to investigators for study to result in published papers. We encourage potential investigators who desire samples to first obtain a statement of the DSDP/NSF sample distribution policy and sample request form from the DSDP curator. (The sample distribution policy also appears in the Initial Report volumes and in the Initial Core Descriptions.) We ask that requests for samples be made as specifically as possible, i.e., note hole, core, section, interval within a section, and volume required. Refer to the graphic core descriptions appearing in the Initial Reports and/or Initial Core Descriptions (ICDs) for core details. In order to ensure that all requests for highly desirable but limited samples can be considered, we will not approve requests and/or distribute samples until two months after publication of the appropriate Initial Core Descriptions.

The DSDP curator can approve many standard requests in office, but requests for material of particularly high interest (e.g., certain hydraulic piston cores, key stratigraphic boundaries) or those for large volumes of material will be reviewed by the NSF Sample Distribution Panel. We urge potential investigators to be judicious in making their sample selection.

Cores from the Pacific and Indian oceans and the Red Sea (Legs 5-9, 16-27, 30-34, 54-70, 83) are at the West Coast Repository at Scripps Institution of Oceanography. Those from the Atlantic and Southern oceans and the Mediterranean and Caribbean seas are at the East Coast Repository at Lamont-Doherty Geological Observatory. All frozen cores (collected specifically for geochemical analyses, interstitial water, and gas samples) are maintained at the West Coast Repository. Interested scientists may view the cores, core photographs, or other associated data at either repository upon making prior arrangements with the appropriate curatorial staff.

Please address your questions or sample requests to:

The Curator, A-031
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
Tel: (714) 452-3528

PERSONNEL BRIEFS

Miriam Baltuck joined DSDP as a **staff scientist** on 1 January 1982. She recently received a Ph.D. from Scripps Institution of Oceanography specializing in Mesozoic sedimentology and oceanography. She is currently on board *Glomar Challenger* as the DSDP staff representative for Leg 84.

Ellen Thomas joined the DSDP **scientific staff** on 15 February 1982. She received a Ph.D. from the University at Utrecht in micropaleontology and comes to DSDP from Arizona State University at Tempe, where she held a position in the Department of Chemistry. She is the DSDP staff representative for Leg 85 which leaves shortly for equatorial Pacific.

DSDP is seeking a science editor to replace **Larry Stout**, who recently left the Project.

DSDP INFORMATION HANDLING GROUP

Introduction

The DSDP data bank is a dynamic library of information. As the Project has expanded so have the areas of responsibility of the DSDP Information Handling Group (IHG). Not only has the volume of data increased (and continues to increase) but the kinds of data and information handled has also increased. The development of tools and technology onboard *Glomar Challenger* has required development of new software to integrate the resulting data in a harmonious fashion with the existing data files. The Information Handling Group also works actively with other DSDP departments, creating programs to enhance their operations with greater efficiency and reliability. We have three primary goals in this work: (1) to preserve the data collected by DSDP operations for future use, (2) to make data readily available to qualified scientists upon request, and (3) to provide advice and assistance by means of computer reduction and display of data to contributors to the Initial Reports.

Data Availability

The DSDP Sample Distribution Policy restricts the release of scientific data gathered aboard *Glomar Challenger* to those immediate members of the respective shipboard scientific party for a 12-month period following completion of the cruise. This policy excludes the *Preliminary Report on underway data*, containing track charts and data indexes; these data have immediate unlimited distribution. DSDP may require reimbursement for expenses if a data request costs more than $50.

Table DSDP-1 summarizes and categorizes the data. With the exception of the seismic data, which are available only on microfilm or hardcopy, all data are stored (and are available) on magnetic tape and microfilm. Investigators can also obtain copies of the original data (shipboard forms) on microfilm (or they can view them at DSDP headquarters at Scripps Institution of Oceanography or at Lamont-Doherty Geological Observatory).

Logging data were collected on selected legs. These data are available on magnetic tape or analog strip charts for Legs 60, 61, 63-65, 67, 68, 70-76, and 78; analog records only are available for Legs 66 and 69; magnetic tapes are available for selected sites from Legs 46, 48, 50, 51, 52, and 57.

We have also established paleomagnetic data bases for both sediments and hard rocks. Intensity, declination, and inclination, as well as other selected features, have been (and continue to be) measured from the sediments taken with the hydraulic piston corer.

Data Handling and Retrieval Tools

The special reference files (Sitesummary, Guide, Ageprofile, and Coredepth, see Table DSDP-2) are used independently and in coordination with other files in (a) multi-step searches, and (b) generation of standard files with assigned ages (from Ageprofile) and/or sub-bottom depths (from Coredepth).

The Sitesummary files contain key data for each hole including drilling statistics, site location, age of sediments, presence of basement sediment and hard rock descriptions. The file is continually updated from data reported in *DSDP Initial Reports, Hole Summaries, and Initial Core Descriptions.*

The Guide (to DSDP cores) also summarizes data published in the Initial Reports (Legs 1-34)[1], but in a different format than in the Sitesummary file. It comprises thirty categories of data which summarize the characteristics of each core. The Guides are available on microfiche and magnetic tape. All of these files can be accessed by DATAWINDOW — DSDP's principal program for the retrieval and display of data.

DATAWINDOW transfers data between tape and disk, updates tapes, corrects records, and monitors the tape status within a tape series (storage unit for our data base files). Access is accomplished through independent, easily modifiable data dictionaries which the program references in both its interactive and batch modes of operation. Individual requests can easily be constructed utilizing DATAWINDOW's versatile (and powerful) search commands. Through DATAWINDOW, investigators can search the data bases by leg(s), site(s), ocean area(s), and age(s), in addition (or linked) to specific elements stored in the database.

Areas of Support and Endeavor

Advanced Engineering Studies

The DSDP programming staff provides the engineering group with mathematical and computer support for advanced engineering studies

[1]DSDP is no longer encoding data for the Guides.

Table DSDP-1. Data-Base Status (Data Available)

Data File	Legs	Comments
Physical Properties, Quantitative and Analytical Core Data		
Carbon-carbonate (shore lab.)	1-79	No data for Legs 46, 72.
Grain-size (sand-silt-clay) (shore lab.)	1-76	No data for Leg 16. Legs 64 and 65 not yet available.
GRAPE (gamma-ray-attenuation-porosity evaluator) (shipboard measurements, processed and edited onshore)	1-74	No data collected on Leg 46. Leg 45 GRAPE is not complete.
Hard rock major-element chemical analyses (shipboard and onshore labs)	13-19, 22-30, 32-39, 41, 42A, 45-46, 49, 51-62	No data for Legs 2-12, 20-21, 31, 40, 43, 47-48 56-57, 63. Includes igneous and metamorphic rock and sediment composed of volcanic material.
Hard rock minor-element chemical analyses (shipboard and onshore labs)	13-19, 22-26, 28-34, 36-39, 41-42A, 45-46, 49, 51-55, 58-60, 62, 65	No data for Legs 2-12, 20-21, 27, 35, 40, 43, 47-48, 50, 56, 63. Same set of data source as major-element file.
Hard rock paleomagnetics	14-16, 19, 23, 25-29, 32-34, 37-38, 41, 42A, 45-46, 49, 51-55, 59-66	KEYPUNCHED ONLY TO DATE (12/81). No data for Legs 2-12, 17-18, 20-22, 24, 30-31.
Sonic velocity (shipboard, Hamilton frame)	3-81	
Water content (shipboard lab.)	1-80	No data for Leg 41.
Long-core spinner magnetometer sediment paleomagnetics	68, 70-72, 75	From hydraulic piston cores. This is a CLOSED data base owing to rust contamination of cores and sediment disturbance.
Discrete sample magnetics, sediment	71-73, 75	From hydraulic piston cores.
Alternating field demagnetization	72, 73	From hydraulic piston cores.
Lithological and Stratigraphic Core Data		
Paleontology (onshore labs)	1-44	From *Initial Reports.* Includes 10,000 species from 24 fossil groups.
SCREEN	1-44	Output from JOIDESSCREEN. Computer-generated lithological classifications. Includes basic composition data, average density, and age of layer.
Smear-slide descriptions	1-44	Shipboard observations.
Thin sections	49 only	Legs 37, 45, 46, 51-56, 57-64 keypunched.
Visual core descriptions	1-44	Shipboard observations.

Table DSDP-2. Data-Base Status (Data Handling/Retrieval)

Data File	Legs	Comments
	Underway Data	
Bathymetry	7-9, 13-56, 61-80	
Magnetics	7-9, 12-80	
Navigation	3-80	
Seismic	1-80	Seismic data available only in hardcopy or MICROFILM.
Merged format files (MDG77)	1-80	
	Special Reference Files	
Sitesummary	1-80	Hole oriented. Regularly updated.
DSDP GUIDE	1-34	Core oriented. MICROFICHE or tape.
Ageprofile	1-79	Hole, core, section. From biostratigraphy.
Coredepth	1-82	Hole-core. Primary reference tool.
	Aids to Research	
Datawindow		Search and retrieval program, data base maintenance.
MUDPAK		Plotting program, handles multiple parameters.
MAPS		
DASI/INQUIRY		DSDP affiliated scientists and institutions — searchable.
Keyword Index—Search		Constructed from bibliography and sample request files — MICROFICHE.
Sample Records		Point data inventory
DATA DATA		Series of informal specific memoranda containing detailed descriptions of procedures and capabilities of the Information Handling Group.

and engineering data collection (shipboard), reduction, and analysis.

Shipboard Computer

DSDP recently purchased a Hewlett-Packard 1000 System for use onboard *Glomar Challenger*. The unit will be installed later this year when the ship goes into drydock. The computer will greatly improve data collection and data handling activities at sea, as well as help ensure drilling safety. Initially the shipboard scientists will use the computer to (1) acquire and process gas chromatograph data, (2) direct digital collection of seismic data, and to (3) collect heat flow data. The DSDP programming group will develop all the software required for the system. Shipboard operations will be shared by the marine technicians and electronics staff.

Non-U.S. DSDP-IPOD Data Centers

The U.S.S.R. and France have established Data centers for DSDP data. U.S.S.R. data bank is located at the Computer Center of the Geological Institute of U.S.S.R. Academy of Science (Moscow), under the direction of Dr. D. A. Kazimirov. The Information Handling Group has now transferred all its prime data files to the Soviet center.

The French data center, housed at Centre Oceanologique de Bretagne in Brest (a branch of the Bureau National des Donnees Oceaniques) is directed by Dr. Marthe Melguen. To date the DSDP-IPOD data sent to France are carbon-carbonate, coredepth, sitesummary, hard rock major- and minor-chemical analyses, paleontology, visual core descriptions, smear slide descriptions, and SCREEN files.

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We encourage researchers to use all these extensive data systems described above. Address your requests for information or data to:

Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3526

(*Nancy Freelander, DSDP Information Handling Group, January 1982*)

TENTATIVE DSDP POST-CRUISE MEETING SCHEDULE

Leg 80 — 15-19 March 1982 at the Deep Sea Drilling Project in La Jolla, California.

JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

OCEAN MARGIN DRILLING PROGRAM

As reported in the last issue of the *JOIDES Journal*, an important OMD planning activity has been a series of workshops held during August and September (1981). The workshops were generally successful in capturing a spectrum of viewpoints concerning the outstanding scientific problems which might be addressed through ocean margin drilling. The workshops were attended by a total of 124 scientists, of whom 72 were from outside the OMD advisory committees or regional synthesis groups.

At their meeting in Boulder, Colorado, September 23-25, 1981, the OMD Science Advisory Committee (SAC) heard a series of presentations covering the results of the regional workshops. These provided the SAC with a framework in which to develop a revised model drilling plan. This model plan, and the workshop reports, forms the basis for the OMD *Initial Science Plan*, prepared by JOI immediately following the SAC meeting. The *Initial Science Plan* serves to document the conclusions reached following one year of intensive planning. It sets forth objectives and recommends drilling targets. In view of the uncertainties surrounding the future of the program, SAC has made no attempt to develop the operational and budgetary aspects of the plan. In addition to those copies supplied to the SAC and planning advisory committee (PAC) members, we supplied copies of the draft *Initial Science Plan* to the COSOD Steering Committee as background material prior to the COSOD meeting and will provide copies to members of the JOIDES Planning Committee as soon as additional copies can be printed. Further copies will be available upon request from JOI, Inc.

Looking ahead to FY 1982, OMD-related activities will be considerably different from those outlined in the June and October issues of the *JOIDES Journal*. On October 6, 1981, the contributing companies advised the National Science Foundation that they would no longer be able to participate in the Ocean Margin Drilling Program. One of the main reasons for this decision appears to have been the failure of additional companies to come forward to participate in the program. The withdrawal of industry support effectively means the indefinite postponement of costly and time-consuming riser drilling. Following the companies' decision, the SAC determined that the primary task for FY '82 will be the orderly completion of the regional synthesis projects, by 30 June 1982, with publication to follow as soon thereafter as feasible. With this goal in mind, the SAC, at their December 10 meeting, adopted a budget for FY '82 which allocates the remaining comingled NSF/industry funds for OMD science, accordingly. The SAC will not meet again until September 1982, at which time it will review the final products of the synthesis projects and conclude its business by determining the disposition of any remaining funds. The OMD Scientific Advisory Committee will then be dissolved.

With regard to engineering, the National Science Foundation has asked a consortium headed by Lockheed to do the preliminary design and cost analysis for converting the *Explore* to an advanced scientific ocean drilling platform. The results of this analysis will be one of the factors determining the future course of scientific ocean drilling. (*Thomas A. Davies, 21 December 1981*)

JOI SITE-SURVEY NEWS BRIEF

The JOI Site Survey Planning Committee met 12 December 1981 in San Francisco to review progress on current field programs and to plan U.S. surveys needed to support future *Challenger* drilling. On the basis of decisions of the JOIDES SSP meeting 3-4 December, the JOI SSPC determined that a survey of the Mississippi Fan was of highest priority. JOI will issue a request for proposal for the work by February 1, 1982 and make an award for the work by mid-year.

Noting availability of GLORIA in the Gulf of Mexico early in 1982 under contract to the U.S. Geological Survey, the SSPC urged that JOI develop arrangements for coverage of the Mississippi Fan areas of interest to Leg 92 proponents. (*John Clotworthy, 23 December 1981*)

JOI SITE-SURVEY PLANNING COMMITTEE

LeRoy M. Dorman, Chairman

The JOI Site Survey Planning Committee (SSPC) last met 12 December 1981 in San Francisco, California.

In preparation for developing request for proposals at the current meeting, the Site Survey Planning Committee (SSPC) discussed and adopted several modifications to the draft site-survey-proposal-evaluation procedure.

The committee also reviewed the drilling schedule and site survey status for the 1981-1983 drilling program leg by leg and clearly established that the Gulf of Mexico-Mississippi fan leg (Leg 92) posed the most pressing problem. The committee gave highest priority for the current contract cycle to survey this region.

The SSPC next reviewed the needs of the post-1983 program using the scientific narrative developed by the JOIDES Planning Committee as a preliminary planning document. The SSPC's goal is to increase the lead times — which are now extremely short — between the site survey and drilling operations. In the case of the hydrogeology leg (Leg 91), less than a month will remain between the end of the survey and the beginning of the drilling program. The committee concluded that it should include in the 1982 requests for proposals, surveys in support of drilling in the Peru-Chile region, and off the northwest African margin. It also recommended requesting proposals for the improvement of surveying technology and techniques.

The SSPC estimated that the funding currently available will allow support of two field programs. Members anticipate, then, supporting the Mississippi fan work and one proposal from the group of three given above. This is a departure from previous practice in which the committee requested proposals only for surveys for which funding was nearly certain. It reflects the the committee's efforts to ensure site survey are planned and conducted well in advance of the drilling operations.

The committee discussed requesting proposals for problem definition but decided against this in the light of several factors. One factor is that issuance of a great many requests would discourage proposers the overall probability of success for an individual proposal would be lessened.

J. Clotworthy (JOI, Inc.) relayed a request from the Lockheed planning group concerning recommended survey capabilities for *Explorer.* The committee recommended a water gun sound source with a digital recording system — the same as it recommended for *Challenger.* Presumably the same equipment currently being purchased for *Challenger* would suffice.

A. Bouma, a proponent for the Mississippi fan work, has requested a GLORIA survey as part of the survey package. L. Garrison had told the JOIDES Site Survey Panel which met a week before the SSPC meeting that the USGS was contracting with NIO for GLORIA work in shallower water closeby. Additional ship time is available and could be applied to the Mississippi fan if money for the survey were found. Buying this ship's time would allow the work to be done at a bargain price inasmuch as no special mobilization costs would be incurred. The committee thus recommended that two to three days of GLORIA time be made available for the Mississippi Fan surveys, preferably as a U.K. site survey contribution.

IPOD SITE-SURVEY DATA BANK

The IPOD Site-Survey Data Bank at Lamont-Doherty Geological Observatory has recently (October-December 1981) received the following data.

- Multichannel seismic profiles for lines GUA-2A and GUA-2B (Middle America Trench) and SF-26, SF-27A, SF-27B, and SF-28B (Straits of Florida), from the University of Texas Marine Science Institute.

- Summary of multichannel work in the area of the Blake Plateau by S/V *Prospekta* and R/V *Fred Moore,* from W. Weigel, the Federal Republic of Germany.

- Summary report of R/V *Sonne* lines SO-16A, SO-16B, and SO-16C (Coral Sea, Arafura Sea, Makassar Strait), from W. Weigel, Federal Republic of Germany.

- Xerox copy of multichannel seismic profile from R/V *Sonne* line SO-7-012 (Lord Howe Rise), from W. Weigel, the Federal Republic of Germany.

- Track charts of the Bundesanstalt für Geoweissenschaften und Rohstoffe multichannel data from the Norwegian Sea area, from W. Weigel, Federal Republic of Germany.

FOCUS

LETTER FROM THE PLANNING COMMITTEE CHAIRMAN

Successful Scientific Ocean Drilling During 1981

1981 was a great year for scientific ocean drilling, and I see bright prospects for 1982 and for the decade ahead. The results from the drilling ship this year have been sensational; it is like being back in the heady days of the beginning of the project. On the political scene, the climate for long-term support for scientific drilling has continued to improve: the main results of the COSOD meeting were very positive and the National Science Foundation administration appears strongly committed to helping us find the necessary funding. All the signs are that we should receive a strong endorsement of our plans from the special committee of the National Academy of Sciences. During the coming spring, the National Science Board will make its recommendations on the program, and at the same time the various engineering and cost studies comparing *Glomar Explorer* with *Glomar Challenger* should be completed. By the month of May (1982) the scientific community, the U.S. funding agencies, and the actual and potential IPOD partner countries should be at a decision point.

Scientific achievements during the year included

- sampling of early Paleozoic gneissic basement cut by younger diabasic dikes ("transition crust"?), beneath Cretaceous shallow-water sediments at a site along the deep southern margin of the Gulf of Mexico;
- penetration into the actual region of shear between lithospheric plates in the subduction zone of the Antilles Arc, and the documenting of abnormally high fluid pressures in the shear zone;
- obtaining an excellent set of downhole logs from the upper 500 meters of young oceanic crust by re-entering, 5 years later, a hole drilled near the mid-Atlantic Ridge;
- deploying successfully a downhole seismometer and conducting a series of oblique seismic experiments at this same site;
- recovery of Rhaetic halite and potash salts and early Jurassic pelagic sediments on the deep continental margin off Morocco;
- documenting of an extraordinarily complete history of rifting and sedimentation on the continental margin of the Bay of Biscay;
- discovery that off Rockall Bank the enigmatic "dipping reflectors" so common beneath many passive margins here comprise interbedded shallow-water sedimentary and volcanoclastic rocks;
- documenting complex patterns of compositional heterogeneity in the oceanic crust (and inferentially in the mantle) of the central North Atlantic, where simpler patterns had been anticipated;
- penetration (to 1080 meters), sampling and successful logging of the basaltic dike complex in the deeper parts of oceanic layer 2 beneath the pillowed flows.

This last achievement, which included documentation of the very low permeability of the deeper levels, shattered the myth that we could not explore deeply into oceanic crust. When the Leg 83 scientific party abandoned this site (504B, in the Costa Rica Rift), the hole was in good condition, ready for us to deepen still further if we so choose.

Future Planning

In the less exhilarating world of practical politics and paper work, the Executive Committee set the Planning Committee the task of completing the scientific narrative that will accompany any proposal(s) for drilling after October 1983, and of making sure that the narrative is consonant with the scientific goals set out in the COSOD meeting. The EXCOM also asked that two model drilling programs, each of eight years duration, be added to the narrative, one using *Challenger*, one using *Explorer*. These documents will be distributed to Planning Committee before its February meeting.

To help coordinate the efforts of NSF, JOIDES and the Lockheed Corporation, (the company which has a contract from NSF to prepare plans to convert and operate *Explorer* as a drilling vessel to carry out JOIDES programs), there is now a so-called Interface Working Group (IWG). The group recently held its first of what are to be regular meetings, with the PCOM chairman representing JOIDES. Lockheed must know the JOIDES plans (e.g., laboratory requirements, base-rock drilling, etc.) to plan the conversion, logistics and JOIDES needs to know what the ship will be like (e.g., endurance, draft, ice strengthening, etc.) to plan a feasible drilling program. An intensive interchange between science and engineering must take place over the next few months to make sure the ship, the program and the logistics all match.

Meanwhile, NSF has asked the Deep Sea Drilling Project, in La Jolla, to submit, by early March, 1983, its formal proposal for drilling with *Glomar Challenger* beyond October, 1983, with detailed budgets for the first three years (of the 8-year program) of operations. This proposal will allow NSF to start up their machinery for the formal review process. The DSDP proposals will use the scientific narrative supplied by JOIDES.

A theme repeated many times in the COSOD meeting was that the drilling itself is generally only one part — often an indispensable part — of a set of larger, long-term experiments in geology, geophysics and geochemistry, and that drilling must therefore be integrated, not only conceptually but also logistically and budgetarily, into these experiments. The planning for the Ocean Margin Drilling Program was based on this principle and the OMD budgets, for example, for regional geophysical work (problem definition) and for downhole experiments, reflected this commitment. Because the OMDP was to be funded entirely from U.S. sources, the funding was easier to organize (but ultimately impossible to realize) than it is for an international program such as JOIDES. Within the U.S., JOI, Inc. is now formulating plans for the U.S. contributions to the non-drilling parts of the integrated experiments, but we all need to think of practical schemes to organize and fund the larger experiments at the international level.

We certainly have inspiration and reason enough to work hard in 1982. (*E. L. Winterer, 4 January 1982*)

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The JOIDES Office will move to the University of Miami 1 July 1982.

CONFERENCE ON SCIENTIFIC OCEAN DRILLING

The Conference on Scientific Ocean Drilling (COSOD) was held 16-18 November 1981 at the Thompson Conference Center, University of Texas in Austin, Texas. Roger Larson, Chairman of the COSOD Steering Committee has prepared this preliminary report.

Discussions

The COSOD Steering Committee organized the meeting and developed working groups around the following five topics.

- Origin and evolution of oceanic crust
- Origin and evolution of marine sedimentary sequences
- Tectonic evolution of continental margins and oceanic crust
- Causes of long-term changes in the atmosphere, oceans, cryosphere, biosphere, and magnetic field
- Tools, techniques and associated studies

The first day of the conference was spent listening to the working group chairmen present the essentials of the white papers that their respective working groups had prepared. These were followed by shorter presentations by the chairmen of the Ocean Margin Drilling (OMD) Planning Advisory Committees and the JOIDES subject panels. About mid-morning on the second day the conference broke down into working groups and attendees outside the formal COSOD, OMD, or JOIDES structures contributed ideas and otherwise added to the discussions. The working group chairman and a Steering Committee liaison member co-chaired these working group discussions. "Wild card" participants, whom the Steering Committee invited specifically to provide special expertise, made key contributions at this time. The "wild card" contributors were Michael Arthur (deep-sea sedimentology), Kevin Burke (Cretaceous climate modeling), Garrett Brass (Cretaceous climate modeling), Bernd Simoneit (organic geochemistry), Conrad Newman (carbonate sedimentology), Frederic Duennebier (downhole instrumentation), Robert Detrick (tectonics and marine geophysics) and John Malpas (igneous petrology).

Priorities

Larson asked the working groups to use the white papers as their working documents and to reach a consensus on the most important scientific programs that can be attacked with ocean drilling. On the afternoon of the third day, the working-group chairmen presented summary statements that contained a prioritized scientific program. The **top priority** scientific problems identified by the working groups (with the exception of the tools and techniques group) are as follows:

Group 1: Ocean Crust
- Processes of magma generation and crustal construction at mid-ocean ridges
- Configuration, chemistry, and dynamics of hydrothermal systems

Group 2: Marine Sediments
- Response of marine sedimentation to fluctuations of sea level
- Sedimentation in oxygen-deficient oceans
- Global mass balancing of sediments
-

Group 3: Tectonic Evolution of Continental Margins
- Early rifting history of passive continental margins
- Dynamics of fore-arc evolution
- Fore-arc to back-arc structure and magmatic history

Group 4: Paleoenvironments
- History of ocean circulation
- Response of the atmosphere and oceans to orbital variations
- History of the earth's magnetic field
- Processes and mechanisms of evolution in marine organisms

Group 5: Tools and Techniques

Working group five primarily discussed characteristics of a refitted *Glomar Challenger* versus *Glomar Explorer* as converted for riserless drilling. The Group outlined the most important advantages and disadvantages of *Explorer* as follows:

Explorer Advantages

- Can tolerate higher sea states because *Explorer* is much larger — *Explorer* displacement = 60,000 tons; *Challenger* displacement = 11,000 tons.
- Much more lab and living space: *Explorer* — 66 crew + 84 scientific party = 150 total; *Challenger* — 45 crew + 35 scientific party = 80 total.
- Ice strengthening to Norway class 1A is possible.
- Larger mud capacity, 5000 bbls liquid storage.
- Longer drill string, *Explorer* — 33,000 feet, all steel; *Challenger* — 28,000 feet with 11,000 feet of aluminum.
- Longer anticipated vessel life, *Explorer* — ~20 years; *Challenger* — ~ 10 years.
- Abillity to convert to riser/blowout preventer at a later date.

Explorer Disadvantages

- Cannot transit Panama Canal and probably can only transit Suez Canal as one-way traffic.
- Limited port access and dry-docking facilities; nine U.S. ports, however, can handle *Explorer.*
- Larger conversion and subsequent operating costs.

After characteristics of the vessels were outlined and the scientific programs had been presented, Larson moderated an open discussion in the general assembly that lasted about an hour. The various speakers all expressed essentially the same view; they recognized that many of the top priority scientific objectives could be accomplished with the *Challenger*, but that a large number of other scientific objectives would require *Explorer* capabilities. Thus, the assembly chose the *Glomar Explorer* (initially configured for riserless drilling) a long-term, world-wide program of scientific ocean drilling. Attendees also recognized that the final choice of vessel would rest on a yet-to-be-conducted cost analysis. Larson summarized this for the group and called specifically for dissenting opinions. There were none, and thus the steering committee established this preference of drilling platform as the unanmous consensus of the general assembly.

General Recommendations

The following day the Steering Committee met and rewrote much of the working group summary statements. In addition, the Steering Committee made the following general recommendations, stated here in preliminary draft form:

- A world-wide program of long-term drilling is an essential component of research in the earth sciences. The programs described here will require at least a decade to complete and will require drilling in the Atlantic, Pacific, Indian and polar oceans.
- Future drilling must be part of a larger scientific program that includes adequate support for planning, site surveying, geophysical experimentation, and sample analysis. Longer lead times are required for predrilling activities and more financial support is required for post drilling scientific analysis.
- The integration of continental geology and

marine geology should progress through scientific drilling programs. The oceans are the modern laboratories in which scientists can observe geologic processes that have occurred over the past 200 x 10^6 years. Understanding these processes is one of the keys to understanding ancient continental geology.

- International cooperation should continue and expand. The international research programs that have centered on *Glomar Challenger* drilling have been essential to the success of the program. This international cooperation should be expanded, especially if the *Glomar Explorer* is used in the future. The JOIDES/IPOD structure appears to be a good organizational framework for future drilling programs.

The COSOD Steering Committee is currently working to assemble the final conference report. It plans to have it available in early spring 1982. Copies will be automatically distributed to recipients of the *JOIDES Journal*. Request additional copies from:

Joint Oceanographic Institutions, Inc.
2600 Virginia Avenue, NW
Suite 512
Washington, DC 20037

(*Roger L. Larson, December 1981*)

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NEWS BRIEFS

Deepest Hole Yet Drilled Into Oceanic Crust

The Leg 83 shipboard team has deepened Hole 504B on the Costa Rica Rift to a depth of 1080 meters sub-basement. They also completed an extensive series of downhole experiments in the basement section. Hole 504B is now, by far, the deepest ever drilled in the oceanic crust and has reached nearly two thirds of the way to layer 3. The drilling encountered lithologies seen previously only in ophiolites and in dredge samples from fracture zones, and included a mineralized stockwork zone and dike swarms partially altered to zeolite and greenschist facies. Dike swarms at about the same stratigraphic level as in the ophiolites provide the first direct evidence in support of the ophiolite hypothesis.

Magnetic studies indicate at least an order of magnitude decrease in magnetic susceptibility and NRM intensity below about 600 meters. This fundamentally important discovery suggests that the thickness of the magnetic layer is only slightly greater than half a kilometer, and that it appears to be the result of replacement of titanomagnetite by sphene with depth.

The successful downhole experiments, included borehole temperature measurements, large-volume water sampling, packer tests, a large-scale resistivity experiment and logging (using conventional industrial tools, a borehole televiewer supplied by the U.S. Geological Survey and a long-spaced sonic tool modified for multichannel recording).

The shipboard party obtained several large samples of formation water, and through packer tests learned that the permeability of the lower 750 meters of the hole is extremely low (about 10^{-5} darcies). The resistivity experiment indicated a sharp decrease in porosity below 900 meters. The logging program was also extremely successful yielding numerous new results. Among these were the first shear wave log from the oceanic crust, the first multichannel sonic data from the ocean basins and borehole televiewer records for the entire hole. The latter show an excellent correlation between the sonic log results and the presence of fractures and voids. (See also the Leg 83 report under Cruise Summaries, this issue.) (*DSDP Science Operations, 8 January 1982*)

AT THE NATIONAL SCIENCE FOUNDATION

Office of Scientific Ocean Drilling

The Director of the National Science Foundation (NSF) has removed the Division of Ocean Drilling Programs (ODP) from the Directorate for Astronomical, Atmospheric, Earth and Ocean Sciences (AAEO) and created the Office of Scientific Ocean Drilling (OSOD) within the Office of the Director. After nearly fourteen years of very successful operations, the future direction of scientific ocean drilling is at a critical crossroads Within the new configuration the NSF Director and OSOD staff are in a better position to give proper attention and direction to the scientific ocean drilling program. **Dr. Allen M. Shinn, Jr.** is the Director of the Office of Scientific Ocean Drilling. He has followed the program closely over several years from his position as Senior Science Associate in the Office Director of the

The Office of Scientific Ocean Drilling comprises three sections: (1) Engineering and Operations, (2) Planning and Management and

(3) Science. **Alexander L. Sutherland** is the acting head of the Engineering and Operations section. This section was formerly headed by Wilbur G. Sherwood who recently left to take a position in industry. **Fredric A. Agdern**, Design and Construction Manager is the other member of the section. Both are newcomers to the Office, having joined in the second half of 1981.

Sandra D. Toye who joined the office in August, 1981, heads the Planning and Management Section. She brings to her job a good deal of valuable experience from the Oceanographic Facilities and Support Section. **Herman Harvey, Thomas N. Cooley** and **Jennieve D. Gillooly** complete that section.

Ian D. MacGregor, who joined OSOD in October, 1981, heads the Science Section. While at the University of California at Davis, he was involved in ocean drilling both as a participant onboard the *Glomar Challenger* and as chairman of the JOIDES Igneous Petrology Panel. Prior to that, while on the faculty of the Southwest Center for Advanced Studies (now the University of Texas at Dallas), he participated in the lunar program. **Anton L. Inderbitzen** who came from the Office of Applied Research has been with the ocean drilling programs offices since 1980. Prior to that he was on the staff of the University of Delaware. He also worked for several years in the Lockheed Ocean Laboratories in San Diego. **Stefan Gartner** joined OSOD in September 1981; he is on a one year leave of absence from Texas A&M University.

Judith Underwood, Jackie Ross, Lisa Banks, Myra Banks and **Liz Huey** complete the staff of OSOD in Washington.

Archie McLerran is the field representative of NSF at the Deep Sea Drilling Project Headquarters in La Jolla, a post he has occupied since the very beginning of the Project. He is aided by **Teressa Taylor**.

New Direction

The second half of 1981 saw a major shift in direction in planning for future scientific ocean drilling. This shift was brought about on the one hand by the withdrawal of the petroleum companies from the Ocean Margin Drilling Program and on the other hand by an expression of a broadly based desire on the part of the academic marine geoscience community to pursue a wider spectrum of scientific goals and objectives than was embodied in the initial plans of the Ocean Margin Drilling Program. In response to this, and taking into account the aspirations of the international partners in the Deep Sea Drilling program, the Office of Scientific Ocean Drilling has largely redirected its efforts to coincide closely with the objectives formulated at the Conference on Scientific Ocean Drilling (COSOD). The new program that is taking shape — the Advanced Ocean Drilling Program — is in response to the deliberations and recommendations of the Conference on Scientific Ocean Drilling.

The COSOD attendees reached a general consensus that the added capabilities gained from a larger drilling ship such as *Explorer* are highly desirable in order to achieve many of the most important objectives that should be addressed during the next decade. In order to pursue this goal three critical issues must be resolved.

1. What would it cost to convert *Explorer* (compared to the cost to upgrade *Challenger*?
2. What would it cost to operate *Explorer* (again compared to the costs to operate *Challenger*)?
3. What would be the level of international participation in an advanced ocean drilling program?

The Office of Scientific Ocean Drilling is currently engaged in finding answers to these questions and to developing a strong case for future scientific ocean drilling.

(*Stefan Gartner, January 1982*)

PUBLICATIONS

The DSDP Curator has supplied this list of recent publications. If you have published a paper using data or samples collected by, or in conjunction with, the Deep Sea Drilling Project, please send five reprints of it to the Curator, Deep Sea Drilling Project, A-031, La Jolla, CA 92093.

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APPROVED JOIDES PANEL MEETINGS

	COMMITTEE / PANEL	Nov 1981	Dec 1981	Jan 1982	Feb 1982	Mar 1982	Apr 1982	May 1982	Jun 1982	Jul 1982	Aug 1982	Sep 1982	Oct 1982
	Executive Committee (EXCOM)		2-3 San Francisco					21-22 Wash.,DC				1-2 Kyoto, Japan	
	Planning Committee (PCOM)	11-13 Corvallis			23-26 Miami					7-9 Japan			
SUBJECT / AREA	Ocean Crust Panel (OCP)			18-20 WHOI									
SUBJECT / AREA	Ocean Margin (Active) Panel (AMP)	9-10 SIO	(Sub-com.)			4-5 SIO							
SUBJECT / AREA	Ocean Margin (Passive) Panel (PMP)												
SUBJECT / AREA	Ocean Paleoenvironment Panel (OPP)	30 - 1 USC											
DISCIPLINE	Inorganic Geochemistry Panel (IGP)	23-24 SIO											
DISCIPLINE	Organic Geochemistry Panel (OGP)						28-30 Oregon						
DISCIPLINE	Sedimentary Petrology & Physical Properties Panel (SP^4)		3-5 SIO										
DISCIPLINE	Stratigraphic Correlations Panel (SCP)												
OPERATIONS	Downhole Measurements Panel (DMP)							25-26 L-DGO					
OPERATIONS	Industrial Liaison Panel (ILP)												
OPERATIONS	Information Handling Panel (IHP)				4-5 SIO								
OPERATIONS	Pollution Prevention & Safety Panel (PPSP)	5-6 SIO				11-12 SIO							
OPERATIONS	Site Surveying Panel (SSP)		3-4 SIO										
	Ad hoc Panel				18-19 SIO	OPP *ad hoc*							
	Working Group												

JOIDES COMMITTEE AND PANEL REPORTS

In this section, we have extracted items from either the draft minutes of recent JOIDES committee and panel meetings or from summaries provided by panel chairmen. We have omitted items reported elsewhere in the JOIDES Journal. P. W.

EXECUTIVE COMMITTEE

William A. Nierenberg, Chairman

The Executive Committee met 2-3 December 1981 at the Hotel Sutter in San Francisco. The following include items abridged from the draft minutes of that meeting. We have not duplicated many items reported elsewhere in this issue or included the complete Planning Committee report to the Executive Committee as this appears under a separate heading, below. P. W.

National Science Foundation Report

Allen Shinn reported for the National Science Foundation.

Future Planning

Update - Ocean Margin Drilling Program. A. Shinn reviewed events since the last Executive Committee meeting. During the August EXCOM meeting Shinn had reported on a plan which NSF presented to industry in July. The plan called for operating one scientific drilling ship (*Explorer*) in non-riser and riser modes within a partnership in which countries outside the U.S. could participate in the non-riser operations.

The plan required oil company support, but on 6 October 1981 the ten contributing companies elected to terminate financial support to OMDP beyond FY 1981. Although the plan apparently had support among some industry scientists, it failed to gain adequate support at higher management levels, owing partly to delayed development of riser technology and delayed passive margin drilling and to the inability of NSF to bring enough other companies into the agreement. Industry will continue to advance its own riser development. Shinn expressed the hope that if NSF goes ahead with ship development the groups could perhaps get together again at some (distant) future date.

Some carry-over funds are available to complete synthesis work currently underway and to maintain a mechanism (i.e., the OMD Scientific Advisory Committee) to continue scientific and technical cooperation with industry.

U.S. Budgetary Problems. The U.S. Government is also reducing financial support for ocean drilling. It has reduced an earlier commitment of $26 million to scientific ocean drilling to about $20 million; somewhat more than $14 million is allocated to the *Challenger* program and somewhat less than $6 million is budgeted for *Explorer* design work.

A recent budget crisis closed parts of the U.S. Government between 1 and 5 PM on November 16. Although Congress adopted a "continuing resolution", it will need to pass a regular appropriations bill for the FY 1982 budget before 15 December 1981.

NSF has submitted a $975 million budget; the President has requested this be reduced to $909 million dollars. Although this reduction would not necessarily directly impact the drilling program, the NSF must nonetheless contend with a political environment of fiscal constraint and possible reduced support.

Alternative Plans. In view of the present situation NSF considers four general options as possibilities for future planning:

1. Terminate scientific ocean drilling at the end of FY 1983, when *Challenger* completes its current phase of drilling.

2. Extend *Challenger* drilling for up to five years beyond the current phase.

3. Convert *Glomar Explorer* for non-riser drilling and operate her in lieu of *Challenger* for an undetermined time.

4. Convert *Explorer* to a full riser capability and to operate her on both riser and riserless modes.

Because the community is unified in its support of a continued scientific ocean drilling program, option 1, though a possibility, has little support. Option 4 is financially impossible without the support of industry. NSF is thus prepared to focus on options 2 and 3 and hopes to make some decision with regard to platform and type of program by late spring 1982.

NSF will assess the responses from the scientific community in general and also consider those from (a) the Conference on Scientific Ocean Drilling, (b) the Academy of Sciences, (c) JOIDES — in particular among the IPOD member countries and potential new members — and will (d) evaluate the relative costs of operating *Challenger* and *Explorer.*

Glomar Challenger versus Glomar Explorer Operational Cost Comparison.

To help assess the relative operational costs of *Explorer* and *Challenger* A. Shinn prepared a preliminary cost comparison schedule as follows. Costs include operating costs only; the figures do not include capital investment charges — those to convert *Explorer* to a riserless drilling vessel.

Comparative Operating Costs (Daily Rate) for
Glomar Challenger and *Glomar Explorer*
in a Riserless Mode
(Costs are estimated in 1981 dollars)

	Challenger	*Explorer*
Crew	12,748 (assuming a 45-man crew)	17,900[a] (assuming a (53-man crew)
Fuel	3,524	12,422[b]
Return on Investment	9,981	0[c]
G&A	3,509	0
Maintenance	2,000	6,401
Overhead (HQ)	2,789	2,789
Logging	2,540	2,540
Bits	1,110	2,220
Mud and Casing	532	2,660
Total	38,773	46,941

[a]The 17 per cent increase in crew has a 40 per cent increase in cost partly because higher personnel costs are assumed.

[b]A 300 per cent increase in fuel costs with *Explorer* is on the basis of increased horsepower required.

[c]Because *Explorer* is owned by the Federal Government, costs for return on investment or general administration are carried elsewhere.

Shinn calculated the operating cost differential as about 20 per cent greater for *Glomar Explorer* and he estimated that the operating costs shown would comprise about 2/3 of the total program; other costs (as a working assumption) would increase about 50 per cent.

Shinn noted that a 12- to 18-month hiatus in drilling would be necessary to convert *Explorer* for riserless drilling. NSF would hope the cooperative scientific activities among the IPOD partners would extend across this hiatus. A $3 million per year contribution still appears to be a reasonable figure, but NSF would encourage participation of **seven** full-time equivalent non-U.S. members.

According to Shinn, the choice between ships is influenced by a "now or never" situation. If the community and NSF select *Challenger,* the opportunity to acquire *Explorer* will probably be lost. NSF is working to get clear title to *Explorer* this winter, but the title transfer is in part contingent upon having a funded program.

Discussion. The Executive Committee discussed the program options and Shinn's comparative operating cost estimates at length. Discussion centered around (a) bases for relative cost figures (b) total costs of an *Explorer* program, recognizing that the operating costs do not include conversion or management costs, (c) relative capabilities of *Explorer* and *Challenger* and (d) better means to fund U.S. science in support of the program. Comments included:

- The NSF table shows operational costs of *Explorer* developed on the basis of a **53-man crew**. This would provide a **bare minimum** comparison. If scientific operations were expanded to the fullest capabilities possible using *Explorer,* then costs would increase significantly.
- Although the NSF figures were in a general sense consistent with those developed by DSDP, DSDP estimates a higher relative increase in operation costs of *Explorer* compared with *Challenger.*
- Any plan to convert and use *Explorer* must be done within the context of scientific planning. The community must first determine its goals, then determine its tools. The necessity for a longer drill string is not yet completely clear; the Active Margin Panel is not demanding more than 8500 meters and oceanic layer three can probably be reached with a 5000 to 6000-meter drill string. Moreover, many "deep" passive margin riserless objectives can be reached

by location of drill sites on thinly sedimented or eroded margins. On the other hand, compared to *Challenger*, *Explorer* not only can handle a longer drill string and carry more casings and mud, but could also drill nearer ice in high latitudes and better hold position. *Explorer* could therefore operate better in high latitude under heavy weather conditions.

- Use of the *Explorer* might provide the possibility for a totally different mode of operation — one not confined to 8-week cycles. Assuming significantly less fuel consumption while drilling as compared to steaming, the ship could remain on site or in a region for long periods of time, thus reducing both fuel and salary costs (specialists would be on board only when needed), and increasing the proportion of drilling time. (Inasmuch as real costs of transfering equipment and people at sea were not known, and some members questioned the degree to which this would be possible or desirable.)
- The *Explorer* has the capacity for a very large on-board laboratory. Although during the OMD discussions, planning evolved from including a full suite of facilities and equipment on board ship to including a more limited facility and creating on-shore research centers, many possibilities exist.

E. Winterer will represent the JOIDES Planning Committee on an Interface Working Group comprising Lockheed, NSF, and JOI people. The group will coordinate the scientific planning with development of an *Explorer* design. The Working Group will meet later in December at a Lockheed facility in San Jose, California.

Deep Sea Drilling Project Report

M. Peterson reported for the Deep Sea Drilling Project.

Fiscal 1982 Budget Concerns

DSDP's FY 1982 budget has been cut by $1.2 million to $21 million. The Project is attempting to make budget adjustments without cutting so deeply as to impair its ability to recover to full operational capabilities. Logging, production of cruise reports, and developmental engineering are likely to be hurt by budget cuts.

Logging. DSDP is making every attempt to keep the logging program together as prioritized by the Planning Committee (November 1981 meeting). Leg 84 (Guatemalan active margin) will be logged at a cost of about $150 thousand. DSDP has taken funds from development engineering to ensure this. The U.S. Geological survey, owing to its interest in gas hydrate zones, may agree to pay for the Leg 84 logging. In this case, DSDP would want to put funds immediately back into the development engineering.

Leg 87 (Japan active margin) logging would cost about $300 thousand — a higher cost owing to mobilization and demobilization costs.

Publications. Although the Government Printing Office is funded to publish only four Initial Report volumes this fiscal year, DSDP will maintain production efforts in order to expedite volume publication at such time as funds do become available.

The Project will discontinue production and distribution of the Initial Core Descriptions after the Leg 75 issue — a savings of about $15 thousand per year. It has determined that scientists requesting samples generally use documents other than the ICDs and DSDP is investigating other ways to dessiminate drilling information. One possibility is to use microfilmed Hole Summaries (the Hole Summaries are prepared onboard ship and are fairly comprehensive preliminary reports.) They are at present distributed only to the shipboard party and other contributors to the Initial Reports. (*See also the Planning Committee minutes, given below for a more detailed discussion of DSDP budget cuts.*)

Engineering Developments

DSDP is moving ahead with development of the **extended core barrel**. It plans to test the tool during Leg 84 or possibly during Leg 85.

The Project has modified the **hydraulic piston corer** to accept a **heat probe** designed by R. von Herzen (WHOI). The tool will be tested during Leg 84.

The **wire-line re-entry** system may be tested during Leg 88.

The project has been conducting a series of drill-string motion studies, the results of which are not yet available.

Special Problem — Ad Valorem Tax

Unless the *ad valorem* tax is waived per interpretation of current legislation or by special legislation enacted to exclude scientific ocean drilling program, DSDP will be assessed taxes amounting to several hundred thousand dollars at such time as *Challenger* returns to a U.S. port. The Project has prepared a brief, setting forth arguments for special legislation. A Shinn, however, noted that if means to waive the tax were found within the current policy, the chances to do so would be greater. Congress would be less likely to pass a bill to set up a new precedent which could ultimately result in loss of many dollars to the government.

Planning Committee Report

E. Winterer reported on the Planning Committee meeting held 11-13 November 1981 in Gleneden Beach, Oregon. *(See also Planning Committee minutes, below.)*

DARPA Site

In conjunction with the Planning Committee report, N. Bogdanov expressed concern over the process of selecting the DARPA site noting that he had only recently had learned of the site's location and that Soviet scientists, who have considerable data from the area, were not directly consulted. Inasmuch as the site appears to be located so as best to monitor Soviet nuclear tests in addition to natural seismic events, he found its selection difficult to justify to his government on a purely scientific basis.

The Executive Committee discussed the problem at length expressing a sympathetic view toward the Soviet position, but also noting that the DARPA experiment had been discussed for a year and a half at meetings to which the Soviets were represented. Members agreed that the DARPA seismic experiment is a unique case — the planning of which has developed differently from that of other legs. The Downhole Measurements Panel, Planning Committee and members of the Executive Committee have supported the experiments solely for scientific reasons. The JOIDES community saw this as a unique opportunity to collect valuable data from a very sophisticated downhole instrument, the experiment would otherwise be impossible to organize and fund.

Consensus. The Executive Committee instructed the Planning Committee to carry out more detailed discussions with Japanese, Soviet, and DARPA scientists regarding selecting the best site for the Leg 88 DARPA hole, bearing in mind the scientific objectives. It further recommended that this be done prior to 15 February 1982 or as soon thereafter as is feasible.

Post-1983 Drilling Planning

JOIDES Drilling Proposal. E. Winterer reported on the status of the post-1983 drilling proposal. The Executive Committee had approved a general outline at its last (August 1981) meeting. The PCOM approved the draft proposal in general terms during its recent (November 1981) meeting. At the present meeting, Winterer distributed copies of (a) the draft proposal (compiled from white papers submitted by various JOIDES panels), (b) Supplement No. 1 (which takes into account recent events bearing on the proposal), and (c) a summary outlining major goals and experimental strategies.

In view of the strong recommendation from COSOD for a long-term program, but in keeping with a credible operational life of *Challenger*, Winterer, with the help of the PCOM writing committee, expanded the period of operations to *eight* years. An 8-year proposal will also provide a reasonable basis for comparing science attainable and relative operating costs of the *Challenger* versus the *Explorer.*

Although not making substantive changes in the proposal since the November Planning Committee meeting, Winterer has somewhat altered the emphasis on the basis of conclusions from the Conference on Scientific Ocean Drilling.

In developing the proposal, Winterer

- conceived a global program tracking westward around the world folowing the seasons. Much of the drilling would be done fairly near the continents.
- constructed an 8-year program. The 5-year program discussed by the Planning Committee allowed barely enough time to address major goals and tended to "pull the ship about too much." An 8-year program still cannot attack all the problems defined in the Panel white papers and at COSOD, but seems a reasonable period in terms of planning and ship's life.
- scheduled the ship into high latitudes, recognizing that scientific targets need to be addressed there, but noted that insurance rates for *Challenger* would be very high. Moreover, the *Challenger*'s hull probably could not be modified to highest ice standards.

- emphasized crustal drilling, especially geology and hydrothermal circulation at rapidly spreading centers. (This is a major objective of COSOD.)
- included drilling in the Red Sea, although the Red Sea was not specifically targeted by JOIDES panels.
- decided to structure 8-week legs. Although a somewhat artificial mode, it conveniently allows for 51 operational legs plus a 2-months period in which to modify *Challenger.*
- allowed ample time to plan and support site-survey and related scientific and technical experiments.
- designed the itinerary such that time is built in to develop technology with which to return to previously drilled sites.

OMD-Scientific Advisory Committee. In conjunction with long-term planning, A. Maxwell reported on the OMD Scientific Advisory Committee efforts. He noted that the basic nature of the OMDP required very long periods on station and involved different interests, thus the planning had proceeded differently from that of JOIDES. Specific targets identified very early allowed extensive study of the regions, resulting in review and integration of extensive data from numerous sources. The resulting syntheses will serve as extremely useful documents. Maxwell urged planners to adopt the OMD planning philosophy — that of targeting objectives and planning activities well in advance of drilling to ensure adequate regional study and scientific study in support of the drilling. He also noted that if *Explorer* is used for continued scientific drilling, the mode of planning and operations would probably be somewhere between the JOIDES and OMD approaches. He also urged the community to consider planning for a 10-year program.

A. Maxwell has also distributed (by mail) an Ocean Margin Drilling Program Review to members of the Executive and Planning committees. (Additional copies are available from the JOI, Inc.)

Conference on Scientific Ocean Drilling. Robert Coleman, a member of the COSOD Steering Committee, reported on the results of the recent Conference on Scientific Ocean Drilling, held 16-18 November 1981 in Austin, Texas. (*Most of Coleman's report is contained in Conference on Scientific Ocean Drilling under FOCUS, above, and is not repeated here.*)

Future Planning — EXCOM Consensus. The Executive Committee extensively discussed future planning. It reviewed scientific philosophy, drilling strategy, relative merits of the two platforms, and desirable time frames. Following discussion, **the Executive Committee instructed Winterer to move ahead with development of an 8-year proposal.** (Winterer already has a 5-year proposal in hand.) He will add a section comparing scientific programs and model drilling plans using *Challenger* and *Explorer* and revise the proposal so that it is platform-free. The EXCOM recognizes that such a proposal will serve as a planning document and could be translated into a program using *Explorer*, should that prove economically feasible and desirable.

The EXCOM urges the PCOM to thoroughly review the document and asked that the later draft be mailed to both Planning and Executive Committee members in time for a thorough review at the next Planning Committee meeting.

A. Shinn (NSF) told the committee that the complete "telephone book" proposal need not reach NSF until late spring; NSF is prepared to move very quickly on the proposal once the decision regarding platform is made.

The Committee, nonetheless thought it prudent to submit the scientific narrative of an 8-year program to NSF by late December or early January to provide a planning document and ensure that a proposal is in hand.

Participation in JOIDES/IPOD

Member-Country Reports

W. Nierenberg asked the representatives of member countries to comment on their respective countries' positions.[1]

France. G. Piketty commented that the French view the drilling as a permanent tool and well understand the need for a long-term program. Making a financial commitment for such a period, however, is more difficult. The French would want to review any **financial commitment for the entire period** and have good estimates of the amounts involved at the onset. It might be more difficult to justify the increased costs for using *Explorer* in a riserless mode, that is to do work which could be accomplished with a smaller, less expensive vessel.

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[1]Some comments are paraphrased from general discussion.

EXCOM members noted that both inflation and relative rates of exchange greatly influence costs of any program over the long term and such differentials are impossible to extrapolate for periods of longer than two to three years. Some formula of escalation or otherwise dividing costs is perhaps possible, but not simple. A. Shinn (NSF) will explore solutions to the problem.

West Germany. H. Durbaum reported that he sees no problems with West Germany's joining JOIDES for the 1982-83 period. The Ministry of Research and Technology supports participation and the proposed leg off North Africa is of great interest to many German scientists.

Participation beyond 1983, however, is less well defined and high budget cuts will result in a serious review of future participation. The Germans are watching the results of COSOD, and what emerges will influence future German planning.

The Geocommission of Germany (comprising Federal and state governments and universities) is preparing a scientific plan for the period between 1983 and 1986; such a plan must focus on *new* scientific goals to gain acceptance. The Geocommission will meet toward the end of February 1982 during which a more clear view of future commitment will probably emerge.

United Kingdom. A. Laughton reported that the U.K. clearly intends to continue in the program through 1983. Following some difficulty and delicate negotiations, a draft memorandum of understanding for the 1982-83 program is in hand. (A. Shinn will visit the U.K. in January to complete the negotiations.) The U.K.'s participation, however, is contingent upon a **2-year program**. The U.K. would have great difficulty in contributing funds were the program to be shortened to a single year.

U.K. participation after 1983 is not so clear. No firm view yet exists on choice of drilling platform — *Challenger* or *Explorer* — and clearly the cost of the program will determine whether or not the U.K. joins. The U.K. would be very wary of putting money into the *Explorer* as an U.S. asset and any negotiated agreement would have to assure that the it did not subsidize the U.S. government or industry. The scientific community would welcome a long-term plan, but a long-term (10-year) financial commitment would be very difficult at this time.

U.S.S.R.. N. Bogdanov reported that the Soviet scientific community strongly supports the drilling program and continued participation of the U.S.S.R. in it. Problems remain, however, which are mostly related to the proposed DARPA drilling (discussed above). The new memorandum of understanding encompasses a two year program and A. Shinn will go to the U.S.S.R. in January 1982 to complete the agreement. (*The trip was subsequently postponed.*)

The U.S.S.R. scientists favor long-term planning, but it would be difficult to convince the government to agree to a 10-year commitment at this time — particularly if costs escalate every two years and additional dues are required. The drilling program has a great deal of support at the Academy of Sciences, but, of course, the U.S.S.R. has other programs to fund as well.

Potential New Member Countries

Australia. L. Frakes (Monash University) briefed the Executive Committee on the status of Australian participation. He noted that the consortium on Ocean Geoscientists began in 1975 with its objective to encourage Australian involvement in the marine sciences. The group has produced a publication (Consortium for Ocean Geosciences Publication No. 1, eds. P. J. Cook, K.A.W. Crook and L. A. Frakes, April 1981) outlining the Australian interests. The report comprises three parts: Active Margins, Passive Margins, and Paleoenvironments. (Copies are available from P. J. Cook, Consortium for Ocean Geosciences of Australian Universities, c/o Research School of Earth Sciences, Australian National Uniersity, P. O. Box 4, Canberra, A.C.T. 2600.)

Although the Australians have not actively participated on *Challenger* since IPOD began in 1975, individual Australian scientists have maintained a keen awareness of the geologic problems, and are unified in their support for JOIDES membership. The next step is to secure industry support and cooperation of a government agency (probably the Bureau of Mineral Resources) to represent Australia. Marine science is a stated priority of the new Director of the BMR (Dr. R. Rutland) and he has succeeded recently in acquiring a $2 million budget for its support. That is generally a positive sign, but the marine geologists must recognize that the BMR has priorities in marine sciences in addition to ocean drilling.

Australia is also conducting preliminary discussions with New Zealand concerning a joint membership in JOIDES. New Zealand has a ship available to conduct site surveys.

Next August (1982) COGS will request a charter budget from the BMR for a 5-year period. The Australians hope to continue their informal involvement in JOIDES/IPOD to keep abreast of organizational and planning efforts.

Other Potential Members. Canada and the Netherlands continue their interest in joining IPOD. Brian Bornhold attended the Planning Committee representing Canada, but niether Canadian nor Dutch representatives were able to attend the current Executive Commitee meeting.

Report from "Guidelines Committee"

Options. At its last meeting, the Executive Committee asked Allen Shinn, Jacques Debyser, Hans Durbaum, and Art Maxwell to form an *ad hoc* committee to recommend guidelines for encouraging and accommodating increased membership in JOIDES.

The committee was unable to meet formally, but A. Maxwell, J. Debyser and A. Shinn discussed the matter during COSOD; A. Shinn and A. Maxwell also discussed the matter on various other occasions.

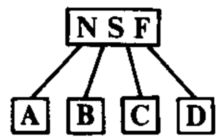
A. Shinn presented the report by the guideline sub-committee to the Executive Committee. (H. Durbaum not having participated in the discussions, asked his name not be attached to the report.) Shinn emphasized the importance of developing a mechanism to involve countries with lesser financial resources in JOIDES to benefit both from their scientific contribution and to gain political and monetary benefits. As international support for scientific ocean drilling programs increases, so will the support it receives within the U.S. government and funding agencies.

A. Maxwell noted that the committee was thus guided by certain principles in developing their suggested plan (Plan D defined below): (1) JOIDES must keep all partners currently in JOIDES as full members at full cost, (2) nations with adequate financial resources and scientific competency could join only as full members, (3) interested nations with lesser resources would be invited to participate at cost levels they can afford.

A. Shinn diagrammed four possible "scenarios" for membership.

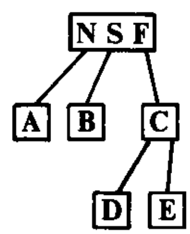
Plan A

Plan A is the current situation in which NSF has a memorandum of understanding with each member nation and each nation is a full IPOD partner.



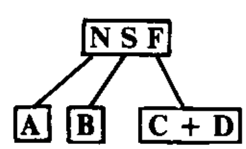
Plan B

In hypothetical Plan B, NSF deals directly with countries A and B as full members. A memorandum of understanding with partner C, however, is with a consortium comprising more than one nation. Partner C acts as a holding company for members of its consortium. Although in this plan NSF would only deal with a single entity (partner C), it is concerned that such an arrangement could lead to an uncontrolled situation involving numerous partners — greatly increasing the complexity of participation.



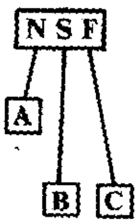
Plan C

In Plan C, nations C and D form a consortium, (C + D), but each country of the consortium has an independent and direct relationship to NSF. A problem here is that if partner C defaults, partner D and NSF are left in an untenable position.



Plan D

In Plan D NSF makes *separate* agreements to each member country. Country A is a full member, but countries B and C are admitted at lower costs and with reduced privileges. The relationship could be reasonably simple, i.e., defined as either full membership, 2/3 membership, or 1/3 membership. NSF and the *ad hoc* committee (except Durbaum) support Plan D. (In past discussions the EXCOM has also termed this "associate or partial or affiliate membership.")



Possible examples of reduced privilege include participation at PCOM and EXCOM meetings, but without voting privilege, and/or participation on board ship proportional to contribution.

Dicussion. Members of the Executive Committee viewed the suggested plan with some reservation. (Historically the Committee has favored full membership in JOIDES, viewing consortia comprising full membership as a possibility, but partial membership less favorably.) Items from the discussion included:

- If some sort of membership involving reduced privileges and reduced costs were allowed, some current non-U.S. members would have some difficulty in convincing their governments to pay full membership dues. H. Durbaum noted that the West Germans would find such an arrangement particularly difficult to support.
- JOIDES membership is predicated on the ability of member institutions to provide scientists who are competent in the appropriate specialties of the earth sciences to serve on advisory panels and as members of the shipboard scientific parties. A consortium could bring together certain strengths and provide depth to the organization, but JOIDES would not want to dilute its scientific capability — that is simply to bring to the table numerous people without ensuring a high competency.
- Certain forces exist within each member country between political and scientific

·ivilege
large
interests. Plans C and D could create ·int of
tion of the scientific thrust as they) con-
create too much leverage for special-in must
groups. is to

- Any arrangement with reduced priv give would have to require a relatively ·ctu- premium for a relatively small amoun privilege in order to motivate nations to cege tinue full membership. All members ming recognize that the purpose of JOIDES is m- define scientific objectives and to gi-e- scientific advise to the contractors that act us ally carry out the work.
- Partial membership, division of privileg could not be made on the basis of "votin rights" alone. Simply participating on a committee ensures introduction of ideas; moreover, many decisions are made by consensus and not by formal vote.

Consensus. The EXCOM agreed to encourage Canada and Australia to join as full members. A. Shinn, A. Durbaum, and J. Debyser will meet during early January (in conjunction with finalizing their respective memoranda of agreement) and will further discuss and develop a plan to increase JOIDES membership.

University of Texas at Austin (Membership)

The University of Texas at Austin (which currently is a member of the JOI Board of Governors) has re-applied for membership to JOIDES. R. Shipman noted that the University originally applied for JOIDES membership at the time JOI was founded (1975), but was asked to await resolution of certain organizational problems. In view of potential expansion of JOIDES membership, the University of Texas reiterates its interest in becoming an equal partner in JOIDES.

Some members noted that the University of Texas membership had already been delayed much too long and recommended it be granted membership. Other members, however, considered possible difficulties in that such membership would increase the U.S. vote to two-thirds (i.e., majority required to pass a motion). Members were uncertain what the exact statement of the Appendix A in the Memorandum of Understanding between the U.S. and non-U.S. partners was, and asked that they have an oppor- tunity to review this befor- Texas ho

Consensus. The Executive Committee postponed resolving the question of membership for the University of Texas until its next meeting to allow present members to review the benefits and ramifications of additional U.S. membership. Members also asked that NSF prepare a statement indicating what, if any, additional cost would be incurred for additional U.S. membership.

Cooperation with the Seabed Working Group

Update. E. Winterer reported that the Seabed Working Group continues its interest in cooperative efforts with JOIDES. The PCOM had encouraged the proponents to submit scientific proposals to various JOIDES panels: i.e., the Sedimentary Petrology, Inorganic and Organic Geochemistry, Passive Margin and Ocean Paleoenvironment panels. Members of the Working Group have now prepared a more concrete proposal focusing on scientific aspects of drilling in the Nares Abyssal Plain. Interests of the Seabed Working Group strongly overlap those of the JOIDES panels and there are some indications that the Working Group could contribute financially to the effort.

Discussion. W. Nierenberg at an earlier meeting had asked EXCOM members to be prepared to discuss any Seabed Working Group liaison as a policy matter at the current meeting.

Some members of the EXCOM commented as follows.

G. Piketty: The French are greatly interested in addressing problems of nuclear waste disposal and would probably support a cooperative effort in the area where the scientific goals.

H. Durbaum: The Germans would be somewhat hesitant to see JOIDES involved with programs concerning deep-sea disposal of nuclear wastes. Such cooperation is difficult politically for West Germany to support as it is actively engaged in research concerning dry-rock waste disposal. In addition, such cooperation is very difficult to control and/or coodinate.

T. Laughton: We can support cooperation with the Seabed Working Group on the basis of learning about the long-term behavior of an area. Although that knowledge is applied to social questions, it is scientific questions which we address — the same scientific questions we ask anyway. But if indeed the science proposed could compete with other proposed JOIDES science, then why would a financial commitment from the Seabed Working Group be necessary or even desirable?

In response, E. Winterer noted that a financial commitment would perhaps encourage JOIDES to conduct the science at a site of particular interest to the Seabed Working Group. A. Shinn also noted that NSF would not want to discourage new ideas and/or new sources of funds.

Consensus. The Executive Committee considers seriously matters of cooperating with special groups such as the Seabed Working Group. It recognizes problems in such arrangements: both political, philosophical and technical. It generally agrees that such arrangements should be treated on a case-by-case basis and evaluated on their scientific merits. The EXCOM does not rule out cooperative efforts between JOIDES and certain special interest groups to address objectives of mutual interest, so long as such programs are developed sufficiently early so that they may be handled through JOIDES panels and the Planning Committee in the usual manner.

"Ownership" of DSDP-Drilled Holes

At its last meeting the Executive Committee had noted that with the realization of wire-line re-entry a question as to "ownership" of the DSDP-drilled hole might arise. J. Knauss prepared an excellent discussion paper regarding legal control and responsibility for the areas surrounding the holes, but as he was not present at the current meeting the EXCOM agreed to postpone further discussion on the subject until a later meeting.

Leg 77 — Potential Safety Problem

In response to a query from A. Shinn, E. Winterer and M. Peterson reported that problems surrounding possible safety violations had been addressed and steps taken to "better tune" the system. The main concern was that the Leg 77 shipboard party did not halt drilling at Site 535 after encountering hydrocarbons. Poor ship-to-shore communications compounded the problem. Y. Lancelot has since written to co-chief scientists of subsequent cruises clarifying and reinforcing safety procedures. DSDP is also taking steps to revise the shipboard handbook containing safety guidelines. The Planning Committee is satisfied that DSDP has taken steps to tighten interpretation of the guidelines and improve ship-to-shore communications. The attention drawn to the situation has diminished the possibility of future problems.

Future Meetings

The Executive Committee had tentatively planned to meet during the week of 25 March 1982 at the Alton-Jones Center, University of Rhode Island. At the suggestion of Allen Shinn (NSF), the EXCOM agreed to hold its next regular meeting in May of 1982. At that time adequate substantive information will be available concerning costs of *Explorer* conversion and positions of current and potential non-U.S. JOIDES partners on post-1983 participation.

The Executive Committee will thus next meet

21-22 May 1982
Washington, D.C.
(JOI BOG will meet 20 May)

The EXCOM held open the possibility of convening a special meeting in the interim, should events so dictate. The Committee recognizes that nearly six months will pass before its next meeting and that it will not have the opportunity to act immediately upon the Planning Committee recommendations (per February 1982 meeting). Consequently, each member is urged to communicate closely with his PCOM counterpart to ensure that the Planning and Executive committees continue to coordinate their efforts.

The EXCOM's summer meeting will be held

1-2 September 1982
Kyoto, Japan
Noriyuki Nasu — Coordinator
(JOI BOG will meet 31 August 1982)

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Panel Chairmen: *Remember to send copies of your panel minutes to the JOIDES Office. Also please submit a summarized or extracted version of the minutes for inclusion in the* JOIDES Journal.

PLANNING COMMITTEE

Edward L. Winterer, Chairman

The Planning Committee met 11-13 November 1981 at the Salishan Lodge in Gleneden Beach, Oregon. We have included here only abridged version of the minutes dealing with future planning and some panel reports. Many other items discussed at the meeting including Challenger operations and certain panel reports appear elsewhere in this issue. P. W.

National Science Foundation Report

Office of Scientific Ocean Drilling

Organization. NSF has created the Office of Scientific Ocean Drilling which reports directly to the Director of the Foundation. It has transferred the functions of the old Division of Ocean Drilling to the new office. The office oversees the operations of the JOIDES/Deep Sea Drilling Project and the Ocean Margin Drilling Program. Key personnel are Allen Shinn, Director of the Office of Scientific Ocean Drilling, Ian MacGregor, Chief Scientist, William Sherwood, Director of Engineering Operations, Sandra Toye, Executive Officer, and Stefan Gartner, Program Associate.

Peter Wilkniss, previously Director of the Office has resigned to take another post within the National Science Foundation.

Drilling Plans. In July of 1981 NSF presented an integrated plan to the oil companies calling for (a) early conversion of *Explorer* for three to five years of riserless drilling, (b) retirement of *Challenger* in 1983, and (c) a joint scientific program addressing both JOIDES and Ocean Margin Drilling objectives. The plan was devised to spread the high costs of converting *Explorer* to a riser and well-control system over a longer period.

On 6 October 1981 the oil companies (previously) contributing to the OMD Program withdrew their financial support after FY 1981. This will delay indefinitely development of ship-borne riser and well-control technology, and thus drilling through continental rise sediments. It will, however, potentially make *Explorer* available to the entire community for drilling in a riserless mode.

Future Planning

Alternative Plans. Members of the Division are encouraged by the strong support scientific ocean drilling receives in the community and within the Foundation. The demise of the Ocean Margin Drilling Program, however, results in a reorientation of future planning. The withdrawal of U.S. industry from participation in scientific ocean drilling opens the door for non-U.S. participation in all aspects of any future programs, and eliminates restrictions on site selection (as defined in the OMDP).

I. McGregor listed four alternative directions the ocean drilling program could take: (a) terminate scientific ocean drilling at the end of the current *Challenger* program (end of FY 1983), (b) continue drilling with *Challenger* until the end of FY 1988 (5-year proposal), (c) develop a program using *Glomar Explorer* (without riser and blow-out prevention systems) for an undefined term, (d) convert *Explorer* to full riser and blowout capability.

He noted that NSF and the community strongly support scientific ocean drilling and thus few would support option "a." Option "d" is too costly without the support of the U.S. oil industry; options "b" and "c" are both possibilities and NSF is eager to learn how the community views them.

MacGregor noted that NSF will support only **one drilling vessel**. Planners must critically evaluate ocean drilling plans and ultimately develop a single program using either *Challenger* or *Explorer*.

NSF has contracted a Systems Integration Contractor (Lockheed) to prepare data on cost estimates to convert and operate *Explorer* for riserless drilling.

Discussion. Items from the ensuing discussion include:

- Although JOIDES has developed a 5-year proposal[1] for *Challenger* drilling, the demise of OMD has considerably changed the boundary conditions. Planners will need to ensure high-priority OMD science is included and also to investigate the availability and suitability of other platforms. A way to proceed is to develop a single, comprehensive, long-term scientific plan recognizing that many JOIDES and OMD objectives overlap (e.g., the early history of the Atlantic Ocean), then develop two programs to accomplish the science. (One program would suppose use of *Challenger*, the other the *Explorer*). The science attain and relative costs using the two platfo could then be compared. Developing the year *Challenger* proposal is one necess step in developing a credible future drilli program.
- If *Challenger* drilling is to be continued withou a hiatus, NSF must have a drilling proposa in hand very soon (December 1981 or January 1982).
- Any hiatus in *Challenger* drilling would result in the loss of the very favorable contract with Global Marine.
- The community and NSF should investigate means by which certain drilling-related science could be funded as part of the long-term program. At present, except for the U.S. site-survey program, NSF does not supply funds in support of science. Certain tasks needed to enhance the science "fall in a crack." An example is the need for detailed descriptions and interpretations of the DSDP igneous rocks. The Ocean Crust Panel strongly recommends that this work be done, not only to provide better descriptions for potential sample requestors, but to aid in future planning. DSDP's charge, however, is not to support individual scientific programs (i.e., a DSDP scientist to conduct interpretive studies beyond what is required for the initial reports). Yet NSF, at present, is not likely to fund such a study as an individual proposal in favor of more creative science.
- If option "c" were exercised and *Challenger* drilling terminated at the end of FY 1983, then an 18-month to 2-year drilling hiatus would be necessary during transitional period and conversion to *Explorer*.

[1]Subsequently embodied in an 8-year proposal.

Deep Sea Drilling Project Report

Fiscal 1982 Budget Cut

Overview. NSF has asked DSDP to cut its FY 1982 budget by $1.2 million. The cut imposes serious operating problems on DSDP. Out of the "bare-bones" budget of $24.6 million submitted to NSF for FY 1982, successive reductions by NSF brought the total down to $22.4 million, and after the recent cut only $21.2 million has been allocated. Of that $21.2 million $16 million are irreducible costs (funds already contractually allocated to Global Marine for *Chall*... tions, plus fuel ...

$1.2 million cut must come from only $5.2 million DSDP operating costs — a cut of more than 20 per cent.

Lancelot noted that through reduced (relative to inflating costs) budgets in earlier years most of the "fat" had previously been trimmed from DSDP organization; the current cut would "cut well into the muscle." DSDP must now ensure that the "skeleton" remains intact — that no permanent damage is done to the Project's ability to fulfill its responsibilities. Owing to the seriousness of the problem, DSDP is obliged to make some hard decisions. It has (or will have):

- eliminated its Information Office and released attached personnel. Preparation of press releases, and handling of public relations affairs will be shared among the entire staff.
- released ten out of 15 student helpers.
- released one illustrator. (Owing to budget cuts the Government Printing Office can only print four volumes in FY 1982.)
- discontinued printing of the Initial Core Descriptions after Leg 75. It also released one person in conjunction with this.
- halted hiring of an additional person in the repository.
- delayed hiring staff scientists. DSDP, however, is severely understaffed in this area. It now has only one staff scientist out of a normal complement of six. DSDP will stagger hiring but still plans to bring in four additional scientists; it will hire one in November (1981), two more January first, and another the first of April. The sixth position will be filled by the return in February 1982 of W. Coulbourn from a one-year leave of absence.
- layed off one cruise manager. DSDP will fill the slot with DSDP engineers and will avail itself of guest cruise operations managers.
- eliminated the shipboard weatherman. GMI seamen will do the weather forecasting.
- cut developmental engineering by about 40 per cent. This may seriously impact developments of specialized coring systems and tools.
- reduced acquisition of new shipboard equipment to zero. DSDP will need to maintain or improve the shipboard equipment in-house. DSDP cannot purchase a mini XRF system.
- halted plans to build an additional core storage facility. The archive halves of the cores will be stored in a more "compacted" fashion and will thus be inaccessible until more space becomes available. Sampling of working halves will not be impaired.
- discontinue the shore-based sediment analysis at DSDP. (Since Leg 1, DSDP has routinely provided grain-size and carbon/carbonate analyses. The LECO (carbon/carbonate analyzer) will go aboard *Challenger* for on-board determinations.
- reduce the shipboard logging program. (Lancelot noted that the budget cut cannot be accomplished without cutting large items. Reducing the logging program would save about $600 thousand. The Planning Committee deems this a very serious matter. It is discussed in more detail under Logging Pacific Legs, below.
- DSDP will maintain travel and logistical support at about their current levels. Shipments, to and from the ship may, however, be grouped to save shipping costs. This could cause delays in core shipments to the respective repositories.

Discussion. The Planning Committee is extremely concerned about the impact the proposed budget cuts will have on DSDP's ability to support the scientific mission.

Members were surprised that DSDP did not protest the cuts immediately with Allen Shinn or the Foundation director. (Peterson, Lancelot and MacTernan do plan to meet with NSF in Washington 23 and 24 November 1981.)

In response to a query, Lancelot noted that DSDP did try to protect the science part of the operation. Engineering and management suffered the greatest cuts. But inasmuch as DSDP is centered on science, any funding reductions will impact scientific activities.

The PCOM noted areas of particular concern.

- Further delay in production of the Initial Reports volumes — If GPO prints only four volumes per year, some volumes could appear up to 50 months after the cruise. The PCOM urges DSDP to maintain a full effort on producing the initial reports volumes.
- Cessation of the Initial Core Description — DSDP opted to discontinue publication of the Initial Core Descriptions, in part on the basis of a study demonstrating that the ICDs were not widely used. In theory the ICDs provide an early view of the results and a basis on which interested scientists can

develop their studies and sample requests. The shipboard hole summaries (even though their distribution is limited), Geotimes, and GSA articles, however, appear to be fulfilling these functions.

The PCOM expressed some reservation about cessation of the ICDs, particularly in view of probable additional delays in Initial Reports production. If ICD's could not be produced, it urged DSDP to examine other ways to more quickly distribute drilling data and information. The Committee also asks the JOIDES Panels to recommend ways to ensure timely availability of data and information.

NSF/DSDP will also need to revise its sample/data distribution policy, inasmuch as the present policy makes samples available two months after publication of the ICDs.

- Curatorial Services — Curatorial services are minimal at present. The PCOM would not like to see further reduction of these services.
- Staff Scientists — Lack of adequate staff scientists creates problems throughout the program, adversely affecting both planning and services. The Planning Committee urges DSDP to hire new staff scientists as quickly as possible and maintain staffing at full levels.
- Logging - The PCOM is very concerned about possible reduction in logging which is discussed below in more detail.

Engineering Developments

Potential Length of Drill String. In response to a PCOM query (July 1981 meeting) Lancelot reported on potential lengths of *Challenger's* drill string. DSDP now has most of the results of the motion versus drill-string fatigue were in hand and can calculate the upper stress limits of the drill pipe. The maximum length of drill string deployable from *Challenger* is, by contract, 25,000 ft (7.62 km). That is only possible, however, under certain conditions. Factors limiting the length of deployable drill string are (a) age of drill pipe, and (b) heave compensation (or lack of heave).

If "old pipe" comprises 90 per cent of the drill string and the heave compensator is not connected the drill string is limited to 21,000 ft (6 km). In "ideal" conditions with the drill string comprising all new pipe and calm weather, or with the heave compensator connected and functioning perfectly, then the string could comprise 25,000 ft (7.6 km) — the contractual limit. (An additional one thousand feet of drill string may be added to drill string if the heave compensator is used.) New pipe may be stressed to 90 per cent of its yield strength; older pipe would lower the yield strength and thus lower stress limits.

The length of drill string currently deployable from Challenger, then ranges between 6 and 7.6 km.

DSDP is investigating the inclusion of aluminum drill pipe to increase the length of the string — perhaps to 28,000 feet. Early tests, however suggests some exfoliation in the pipe; Lancelot can give no conclusive figures as yet.

Pressure Core Barrel. The pressure core barrel is fully operational. Two PCBs will be on board *Challenger* during Leg 84 (Middle America Trench) where plans call for drilling a site off Guatemala in 2060 meters of water to sample the gas hydrates.

Extended Core Barrel. A test conducted on shore of the extended core barrel was very encouraging. DSDP hopes to test the tool at sea during Leg 84.

Wireline Re-entry. DSDP continues to work on a fly-in re-entry system. The system will allow entry into DSDP holes to conduct downhole experiments from any oceanographic research vessels.

Hydraulic Piston Corer. A heat-flow device, designed by R. von Herzen (WHOI), will be incorported in the nose cone of the hydraulic piston corer. DSDP engineers designed the housing and deployment package and will test the system during Leg 85.

DSDP is also working on the development of an atmospheric chamber piston corer which with its more powerful stroke to penetrate more indurated rocks.

Shipboard Procedures and Equipment

Word Processor. A word processor is now aboard *Glomar Challenger*, DSDP will acquire a "sister system" for use at the Project on shore. Preparation of the shipboard hole summaries has become a very large task. The word proceessor will allow faster preparation of the text at sea and its expedient revision on shore for the Initial Reports.

X-Ray Fluorescence. CNEXO loaned their XRF van to DSDP for Leg 82 operations, allowing the shipboard scientists to make onboard trace element analyses. Although problems surrounded the continued use of the XRF during Leg 83 they have now been resolved and the van will remain aboard during re-entry into Hole 504B.

Shipboard Computer. DSDP has purchased a computer for the ship. It is a multi-task system which will handle on-board gas chromatography as well as digitize seismic, and other, data. DSDP, however, cannot hire the two technicians to man it, as planned, and will have to train and utilize its existing staff.

Seismic Systems. Purchase of the shipboard computer was the first step in developing the seismic system. Project people are now working on the digitizing equipment. DSDP has delayed acquiring a source and down-pipe system pending reports on SIO's newly acquired system. Early reports indicate a problem in the mechanics of the water gun source.

Publications

Initial Reports. Initial Report volumes 1-59, 61, and 63 are published. The Government Printing Office is presently printing volumes 60, 62, and 66. DSDP initiated the system whereby site reports are completed shortly after the cruise with Leg 77 and it is working reasonably well. But owing to budget cuts within DSDP and GPO, DSDP may not be able to accelerate volume production as earlier hoped. Volumes 64, 65, 67, and 68 are scheduled for publication in FY '82, but DSDP will also move ahead on volumes 69 and 70.

Initial Core Descriptions. Initial Core Descriptions are available for Legs 27 to 75, but owing to the FY '82 budget cuts, DSDP will discontinue their production after the ICD for Leg 75. (See also discussion above).

Sedimentary Petrology Manual. DSDP has in hand the manuscripts for the Sedimentary Petrology Manual. In view of budget cuts, DSDP cannot ensure its printing during FY 1982. (The Project would, however, be able to complete tables and artwork and otherwise prepare the manual for publication.)

The Planning Committee agreed to investigate other means to publish the Sedimentary Petrology Techniques Manual. W. Bryant agreed to explore publication possibilities and will report to the PCOM at its next meeting.

Seismic-Survey Publication. DSDP will continue to prepare the site-survey volume for publication, but will probably request funds from JOI for its printing. (The data were compiled by the IPOD Site-Survey Office (L-DGO) from surveys run between 1975 and 1978.)

DSDP User's Guide. DSDP still hopes to publish a user's guide — a well illustrated brochure explaining access to DSDP data and services — but will delay its production and printing pending available funds and time.

News Articles. *Nature* has offered to run a "News and Views" article immediately following each cruise of the *Challenger.* It could guarantee publication within four weeks after having received the article, but **would need to receive the report within two weeks of docking**; thus any such article would have to be written on board ship. *Nature* would publish a report focusing on the "creative science" stemming from the cruise; it would not want to simply publish drilling results. The *Nature* article could complement the *Geotimes* article and could also effectively serve as a news release. The report could not exceed 1500 words (± 6 manuscript pages) and normally two figures would be the maximum number accepted. The co-chief scientists would be responsible for preparation of the report (with the approval and/or co-authorship of the cruise participants).

The Planning Committee, while appreciating the many writing duties heaped upon the chief scientists — especially toward the end of a cruise — was attracted by the short turn-around time and greater public exposure the *Nature* article would offer. **It recommended that the DSDP ask the co-chief scientists for each cruise to prepare a short article highlighting the scientific news and discoveries of the mission for publication in Nature. The Planning Committee makes the recommendation with the understanding that the article would be a regular feature of Nature.**

The PCOM understands that the responsibility for writing the *Nature* article rests with the cruise co-chief scientists (not the DSDP staff representative). DSDP will assist with certain mechanical aspects of its production; e.g., typing, preparation of the artwork, transmittal as the article to *Nature.*

Geotimes resumed publication of the DSDP article with Leg 76. The article comprises either one or two pages of text, highlighting the major results of the cruise and normally contains a stratigraphic section and small site location map.

DSDP continues to submit a more comprehensive article to the *GSA Bulletin* which appears later than *Geotimes*. DSDP now has an agreement with GSA to publish DSDP results every two months. GSA, however, has recently assessed a $100 per page charge on a voluntary basis, and DSDP may also want to look for alternative to the *GSA* article.

Committee and Panel Reports to the Planning Committee

Executive Committee

E. Winterer reported on elements from the JOIDES Executive Committee held 12-14 August 1981. He noted that the Executive Committee,

- accepted all the Planning Committee's nominations to JOIDES Panels.
- took up the matter of "ownership" and use of DSDP drilled holes. J. Knauss will propose a discussion paper on the subject for the next EXCOM meeting.
- considers that a cooperative program involving the Seabed Disposal group involves policy decisions. The Executive Commitee will discuss the matter more at its next (December 1981) meeting.
- accepted the PCOM's recommendation that the organization and coordination of the microfossil reference centers be handled by William Riedel and John Saunders.
- resolved that unless the DARPA group produced adequate data to define a site in the northwest Pacific, the DARPA work would be deferred until the next phase of the DSDP program.
- accepted the restoration of the Pacific paleoenvironment leg (sites NW-2 and -8) as fulfillment of its directive to restore a leg in the northwest Pacific. (The PCOM had earlier dropped the leg to ensure that higher priority science would be accomplished.)
- was sympathetic to the U.K.'s particular interest in problems relevant to the northeastern Atlantic continental margins. It asked the Planning Committee to adjust the 1983 northeast Atlantic leg to include drilling relevant to the problems of that area. The notheast Atlantic leg can be planned, for example, to include study of drift and fan deposits, dipping reflectors, etc.
- accepted the outline of the 5-year *Challenger* proposal in principle.
- established a subcommittee to encourage and develop guidelines for dealing with potential new members. (The committee comprising Art Maxwell, Allen Shinn, Jacques Debyser, and Hans Durbaum planned to meet just before the next (December 1981) Executive Committee meeting.)

(See also the October 1981 JOIDES Journal for a more complete Executive Committee report.)

Pollution Prevention and Safety Panel

E. Winterer reported on the Safety Panel meeting held 5 November 1981.

Leg 84. The Panel's main item of business was review of the Leg 84 sites. R. von Huene presented excellent reprocessed multichannel seismic records of region along the Guatemalan margin. The records clearly show bottom-simulating reflectors (BSRs) presumed to mark the base of the clathrate zones. In some cases where the BSRs cannot be detected on the records they are visible in the records of adjacent areas. (Von Huene also demonstrated that the potential base of a BSR can be accurately calculated for areas in which no evidence of a BSR appears on the records. The calculations are made on the basis that (a) hydrates occur in the slope deposits under more than 600 meters of sediment, and (b) their level is depressed by increased temperature and heat flow. Thus the level of a BSR may be projected on the basis of local heat-flow gradients.

The Safety Panel discussed the clathrate problem — that of the clathrates potentially forming a seal below which hydrocarbon could have accumulated and thereby pose hazardous drilling conditions — at length. On the basis of the excellent records and new information allowing better lateral projection to the BSRs, the Panel moved away from an earlier very conservative position regarding drilling in a hydrated zone. The PPSP, in addition to reviewing specific sites, developed general policies regarding the Leg 84 drilling. It approved

- drilling to 100 meters above the base of bottom-simulating reflectors observed on the seismic profiler records, or to 100 meters above the base of the BSR as estimated on the basis of the local geothermal gradient or measured in the hole while drilling. (Downhole logging is essential during Leg 84.)

- drilling sites within a defined *region* thereby allowing the shipboard party flexibility in site selection during the cruise.

The Safety Panel, recognizing the need to learn more about the hydrates and drilling into hydrates, approved a site (GUA-8a) to specifically sample the hydrate zone (above its base).

The Panel also discussed drilling through the base of a hydrate zone under certain circumstances (e.g., if dipping beds traceable through a BSR are sampled above the BSR and are shown to be impermeable and thus not a reservoir for hydrocarbons). The Safety Panel, however, was not prepared to see that attempted at this time, but will build upon the information gathered during Leg 84.

(The SIO Safety Panel met immediately after the JOIDES Safety Panel meeting and concurred on all PPSP recommendations.)

Leg 77 Safety Concerns. During discussion, PCOM members commented that the letter (of July 31, 1981, from L. Garrison to E. Winterer) concerning possible safety violations during Leg 77 was seen to be a fair summary of the problem taking into consideration the views of the scientific party.

Y. Lancelot noted that he is now distributing a rewritten set of guidelines to cruise chief scientists as an interim step, while the Sedimentary Petrology and Physical Properties Panel is revising the shipboard safety manual.

(See also abridged minutes from the Safety Panel meeting, below.)

Panel-Related Business

Paleomagnetists. In response to a letter from C. Harrison, the Planning Committee agreed that paleomagnetists are probably under-represented in the JOIDES planning structure. E. Winterer will ask panel chairmen to review their membership with an eye toward balance among the various disciplines. Paleomagnetists might best fit on the Ocean Paleoenvironment, Stratigraphic Correlations, or Sedimentary Petrology panels.

Hydraulic Piston Coring Working Group. The PCOM noted that the HPC Working Group had performed its mission — that of providing guidance for the development of the hydraulic piston coring system and its use in solving scientific problems and agreed to disband it. The PCOM thanked Ted Moore and the HPC Working Group for the excellent job they had done.

Working Group Members. P. Worstell urged panel chairmen and the PCOM liaison people to keep the Planning Committee and JOIDES Office informed of changes of membership or dissolution of working groups. (Most Working Groups are "children" of panels and thus the PCOM does not act directly in determining membership.)

Planned Challenger Operations

DARPA Site Selection

History. Alan Ballard (NORDA) and Bob Hart (Sierra Geophysics) reported on the status of site selection for the DARPA seismic experiment. In the spring of 1979 DARPA received funds to develop and investigate deployment of a marine seismic system in the ocean floor. The package contains instruments to measure broadband seismic signals, long-term temperature changes, crustal tilt, and hydroacoustic signals. The planners approached NSF and the JOIDES Planning Committee during the spring of 1980 concerning the possibility of deploying the system during the 1982-83 proogram. At their July meeting the JOIDES Planning Committee expressed a "high regard for the scientific merits of the system" and "considered favorably its proposed deployment in the northwest Pacific." It also approved testing the system in Hole 395A. The PCOM understood that that all data would be available to the scientific community and that the northwest drilling would be organized in such a way as to implant the DARPA marine seismic system and address other scientific objectives in the area.

Al Ballard briefed the PCOM on the very successful deployment and oblique seismic experiments conducted during Leg 78B.

DARPA will be prepared to deploy the system in the northwest Pacific during the summer of 1982. The PCOM has asked that the area be adequately surveyed and the site located to ensure best scientific results.

Criteria. In response to the Planning Committee's request for a specific location for the seismic experiment, DARPA has suggested the site be loocated at 45°41'N, 162°08'E. A. Ballard listed the physical criteria DARPA considered for site selection. In order to collect suitable data, and ensure the drilling is technically possible, the site should be located

- out of the seismic shadow zone for events in the region of the Japan Trench.
- in a region of smooth topography to set the drill string.
- in water as shallow as possible in an area with reasonably thin sediment cover to minimize drilling problems.
- north of 45° north in areas where chert beds are thin.
- away from the two major current systems in the area to minimize problems of maintaining position over the hole.
- away from any fracture zones.
- away from fishing areas.

Discussion. The PCOM reiterated its interest in the experiments noting that they had great scientific potential.

Discussion centered about how much flexibility DARPA had in locating the site. Members noted that the DARPA site was only 13 miles from a known seismic line. Moreover, drilling a hole 100 miles south could well satisfy one of the Ocean Paleoenvironment objectives — that of sampling sediments deposited by ancient current regimes.

R. Hart (Sierra Geophysics) expanded upon the reasons for selecting that point noting that it was selected on the basis of statistical analyses of numerous factors. He had viewed hundreds of maps and pin-pointed the site by plotting more and less acceptable areas for each criterion on a set of map overlays. He noted, however, that placing the site 13 miles north may well be equally acceptable.

The PCOM consensus was that the hole for the DARPA marine seismic system be drilled on a known (available) seismic line. It also asked DARPA to establish its range of flexibility regarding site selection and take any proposed sites to the Ocean Paleoenvironment Panel (which meets 30 November-1 December 1981). The PCOM asks the OPP and DARPA to select a site maximizing the potential realizing both OPP and DARPA scientific objectives.

Upcoming Legs

Y. Lancelot reported to the Planning Committee on problems surrounding Leg 83 and planned Legs 84 and 85 drilling. The results of most of these discussions are enbodied in section given elsewhere in this issue under Challenger Operations and Planned Challenger Drilling. The complete text of the Planning Committee minutes is available from the JOIDES Office. P. W.

Logging Pacific Legs

Background and Discussion. DSDP has proposed to limit logging on the FY 1982 Pacific legs to meet NSF's $1.2 million budget reduction mandated by NSF for FY 1982.

Members of the Planning Committee expressed grave concern about reduction in the logging which it views as an integral part of shipboard scientific program. Members noted that the PCOM has been on record over a period of years of strongly supporting logging. Members hope that the non-U.S. governments would not construe the budget cuts as a lack of commitment within NSF to the program.

In addressing the problem the PCOM discussed logging on a leg-by-leg basis. It noted that **the Middle America Trench (Leg 84) must be logged** to ensure safety of the drilling operations and realization of the Leg 84 main scientific objectives. Logging is somewhat lower priority on Equatorial Pacific Leg (85), but temperature measurements must be done. Logging is lower priority on the NW Pacific paleoenvironment leg (86), but is essential in the Japan Trench (Leg 87) to realize the scientific objectives there. Although DARPA has not shown a great interest in logging the north Pacific site of the marine seismic experiment, the PCOM felt that logging here would greatly enhance understanding the geology of the region and complement the DARPA experiments.

Resolution. Following additional and extensive discussion, the Planning Committee adopted the following resolution.

> **The Planning Committee views with alarm the difficulties in obtaining funding for logging during FY 1982. It reaffirms its scientific advice that logging of holes should be a normal continuing operation except as agreed specifically upon on an ad hoc basis, and advises that of the planned legs during FY 1982 only Leg 86 (NW Pacific Paleoenvironments) fully meets its criteria that logging may be omitted, while Leg 85 (equatorial Pacific) approaches those criteria nearly. Logging on Legs 83, 84, and 87 is essential for completing the scientific objectives of those legs.**

Possible other sources for funds to conduct the logging include the U.S. Geological Survey and

JOI. E. Winterer will contact T. Edgar and A. Shinn to discuss the possibilities of U.S.G.S. supporting logging especially in conjunction with the hydrate studies (Leg 84) which closely ties in the survey's interests.

Co-chief Scientists

The Planning Committee expresed concern over the lateness with which cruise co-chief scientists (and scientific parties) are being named. Late designation of co-chief scientists can impair the scientific mission of the cruise. Early designation of at least one co-chief scientist would expedite development of, and result in, more balanced scientific parties. In addition, many people plan their schedule many months in advance; teaching faculty particularly have to make special arrangements to participate. Many excellent candidates cannot participate in a cruise unless invited many months in advance.

The PCOM, thus attempted to recommend at least one potential chief scientist for each cruise through the Pacific part of the program (through Leg 91). The Committee acted on advice received to date from subject panels, but also urges panel chairmen in the future to take the long view toward cruise staffing.

During discussion E. Winterer reiterated the ground rules for selection of the co-chief scientists and scientific parties. At least one co-chief scientist must be employed by a U.S. institution; at least one co-chief scientist must have sailed on *Challenger* previously and at least 50 per cent of the scientific party must be employed at a U.S. institution.

Members emphasized that co-chief scientists should be invited at least a year in advance of the cruise and that the PCOM and DSDP, in selecting co-chief scientists, should take a candidate's flexibility and dedication to the cruise into account.

Some members suggested that a relaxation of agreements pertaining to cruise staffing would allow DSDP create better balanced scientific parties. These condititions, however, are agreed to by memoranda of understanding between participating governments and are not easily changed.

(DSDP subsequently acted on the Planning Committee recommendations. The names of those people who have agreed to serve as co-chief scientists on future legs appear elsewhere in this issue. P. W.)

1982-83 Program

Drilling Schedule, Legs 86, 87, and 88

The previous *Challenger* schedule (of 10 June 1981) showed the sequence of drilling as Leg 86 - DARPA Seismic experiment, Leg 87 - northwest Pacific paleoenvironments, and Leg 88 - Japan Trench. To better utilize time and staff, DSDP now recommends that the sequence be: Leg 86 - northwest Pacific, Leg 87 - Japan Trench, Leg 88 - DARPA seismic experiment, and that the offshore Japan leg be divided into two mini-legs: (a) Japan Trench and (b) Nankai Trough. DSDP had also explored the option of *Challenger* going into Majuro for the Leg 85-86 port call to avoid the U.S. and *ad valorem*[1] tax of about \$250,000. The facilities at Majuro, however, are not adequate to fulfill the *Challenger's* annual drydock requirements. Additional steaming costs would also amount to about \$180 thousand. (DSDP is attempting to get a waiver of the *ad valorem*[1] tax, but the legal ramifications are complex and resolution may be years away.) DSDP has opted to use Honolulu as the Leg 85/86 port.

Lancelot also noted that the DARPA experiment cannot be delayed to much later in the season. Because the DARPA hole requires a long drill string and drilling will be in an area of surface currents, conditions already approach the upper limit of stress which the drill string can tolerate; hence weather conditions must be optimum. He also noted that the creation of two mini-legs off Japan would only require about 24 hours to change shipboard parties.

The Planning Committee agreed to DSDP's proposed schedule change for Legs 86, 87, and 88.

Forward Planning

The PCOM vigorously discussed planning for the remainder of the 1982-83 program. Because insufficient time remains to address all the excellent scientific objectives designated as highest priority at its recent meetings, the PCOM must make difficult decisions. In attempting to set the remainder of the 1982-1983 schedule, it first estalished four legs absolutely critical to the program (two in the Pacific and two in the Atlantic),

[1]The *ad valorem* tax assess 50 per cent of costs for repair completed on a U.S. ship at a non U.S. port, upon return of that ship to a U.S. port.

and then established a minimum number of on-site days required to accomplish the objectives of these four "cornerstone" (and other technically inflexible) legs.

The drilling schedule is further constrained by weather, logistical and political factors. The southwest Pacific (Leg 90) must be drilled in the Austral summer (December-February); the northwest Atlantic must be drilled in the boreal summer. Agreement between DSDP and Global Marine calls for a 56-day cruise cycle and *Challenger* should return to the Atlantic on 1 April 1983 to protect the Atlantic program. Political considerations, i.e., gaining permission to drill the Mississippi Cone or offshore New Jersey could possibly impose further constraints. Working from these fixed points, the PCOM attempted to develop a fair and technically feasible schedule.

Highest Priority Legs — The PCOM recognized (a) southwest Pacific paleoenvironment, (b) hydrogeology, (c) western north Atlantic (ENA-3) and (d) northeast Atlantic paleoenvironment legs as key legs which must be conducted without compromising their scientific programs.

Viewing priorities and constraints, the PCOM fixed the southwest Pacific Leg 90, as beginning in late November, placed the northeast Atlantic leg in July-August 1983 and scheduled the *Challenger* into port at the end of the 1981-83 phase

Table PCOM-1. Sequence of Drilling

Leg	Begin	End	Steaming Port Time	On-Site Time	Total Time	Objective
86	Honolulu	Hakodate	24	32		NW Pacific Paleoenvironment
87	Hakodate	Hakodate		47		Japan Trench
88	Hakodate	Yokohama				DARPA
89	Yokohama	Rabaul	19	[29] 10 & 4		Old Pacific
90	Rabaul	Wellington (8 Jan 83) Papeete (19 Jan 83)	16	32	60	So. Pacific
91	Papeete	Balboa	27	30	57	Hydrogeology
92	Balboa	Ft.Lauderdale	12	44	52	Mississippi Cone
93	Ft.Lauderdale	Azores	17	39	56	NEA-3
94	Azores	Reykjavik	22	34	56	NE Atlantic Paleoenvironments
95	Reykjavik	End Port (23 Oct 83)			51	Northwest Africa or New Jersey Transect or Caribbean

on 23 October 1983. The final leg (95) would address objectives of the northwest African coast, New Jersey or in the Caribbean.

Many PCOM members also agreed that the northwest Pacific leg was, on the basis of scientific potential, lower priority than the others on the schedule. If its driling were not mandated by political considerations, it might be eliminated from this phase of the program.

R. Moberly objected to the cutting of two of the three prime sites from the OPP-proposed Old Pacific leg (89), and insertion of a southwest Pacific hydraulic piston core site. In order to retain the cohesion and objectives of that leg, he recommended the sites be restored at the expense of work in the northwest Pacific or Atlantic that the PCOM had earlir judged to be of lower priority.

The PCOM was not of a single mind with regard to ways to ensure the highest priority science was accomplished. Some members favored eliminating a leg entirely to ensure time to complete objectives on other legs. With the exception of the northwest Pacific leg, which members considered lower priority, members could not agree on what other objectives might be sacrificed. J. Cann noted that the people tended to regard the last leg on the schedule as disposable — the leg which would absorb delays throughout the rest of the schedule. He stressed, however, that the final leg, be it northwest Africa, Caribbean drilling, or the New Jersey transect, addressed scientific priorities equal to, or higher than, other legs and as a matter of principle should not be viewed as a "throw-away" leg. The PCOM should make reasonable choices, not simply allow delays to be passed through to the last leg.

The Planning Committee developed the sequence of drilling shown on Table PCOM-1 which embodies its prime objectives. The Table, however, does not contain the beginning and ending dates of cruises. The PCOM discovered an error in calculation which may add several days to the schedule, however, shortly before it adjourned. It asked Y. Lancelot and E. Winterer to complete the schedule, following PCOM guidelines discussed above and constrained as follows:

- Leg 95 would comprise either (a) northwest Africa, (b) New Jersey Transect, or (c) Caribbean drilling — in no order of priority.
- Maintain 51 operating days for the southwest Pacific Leg (90).
- Maintain 29 operating days for the old Pa leg (89).
- If insufficient time is available, the drill time for the northwest Pacific leg (I and/or Mississippi Cone (Leg 92) can reduced by 7 and 4 days, respectively.

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Site-Survey Plans

Site survey planning and operations are at last keeping abreast of scientific planning and ship's operations. The major problem at present is ensuring an adequate survey of the Mississippi Fan (Leg 91, May 1982). LeRoy Dorman and John Jones are currently working to ensure that JOI will be able to issue a Request for Proposals very soon.

The status of other survey are:

Leg 85 (Equatorial Pacific) - The S.I.O. survey is planned to begin the first week of January 1982.

Leg 89 (Old Pacific) - Hawaii has just completed the resulting survey and is processing the resulting data.

Leg 91 (Hydrogeology) - The survey conducted jointly by Scripps Institution of Oceanography and University of Rhode Island is planned for the spring of 1982 immediately following the Leg 85 survey.

Leg 90 (Southwest Pacific) - Considerable data are already available for the area and the existing data are considered sufficient. Although proponents considered additional survey desirable, no vessels are available in the area to conduct it.

With the exception of the Mississippi Fan, adequate data are available for the Atlantic legs.

Proponents may want to investigate the U.K. sources for data for the northeast Atlantic drilling.

Long-Term Planning

Post-1983 Drilling Proposal

E. Winterer distributed a rough draft of the scientific narrative of a five-year drilling proposal using *Glomar Challenger*. He noted the followi-- guidelines, constraints and f--- of the p---

- The concepts and scientific goals embodied in the proposal are from white papers submitted by the JOIDES panel chairmen. The panel chairmen developed their white papers in the context of a long-term program free of platform constraints. The proposal, however, per charge of the Planning and Executive committees, was written for *Challenger* drilling.

- Winterer followed the topical organization established for the Conference on Scientific Ocean Drilling. In many cases he used the original language of the white paper, writing new material only if items were implicit but not explicit. Some white papers, and topics in the proposal, need to be reworked, especially the passive margin part. Winterer also tried to bring the major topics into a reasonable sequence.

- The proposal is at present very long and the style somewhat uneven. Winterer had earlier planned to include all the white papers as an appendix, but notes this would create a massive document.

- A good summary is required. The proposal is much too long to be easily digested. Winterer will write a summary after receiving general comments and directives from the Planning Committee, and the PCOM Subcommittee following the Conference on Scientific Ocean Drilling to be held soon after the PCOM meeting.

- The downhole measurements part remains intact as a separate section.

- The recommendations of all panels are embodied into a model drilling schedule. Many different solutions are possible and this is only one of them. In developing the schedule, Winterer attempted to (a) route the ship back to previsouly drilled sites to build on pre-existing science, deploy instruments and perhaps even retrieve instruments left in the hole, (b) cluster legs for efficient operations, and (c) consider seasonal constraints.

- The proposal as written does not route *Challenger* south of 50°S. The ship tracks from east to west, beginning in the Atlantic 1 January 1984 and presumes an 8-week cruise duration. The model schedule allows between 7.5 and 8.5 legs to address the objectives of each panel and provides a good general balance of subject matter. It includes a particular emphasis on solving problems of hydrothermal systems and very young crust.

- DSDP is concurrently developing plans cost estimates for management and upg ing of *Challenger*. In addition, DS engineers have developed an extensive of new or improved drilling systems a tools to complement the scientific progra (discussed below). In its final form the pr posal will integrate the science and manag ment plans.

Deep Sea Drilling Planning

DSDP is currently developing its management plan and attending budgets.

The DSDP engineering group has also given considerable thought to the tool development required by the proposed scientific objectives. Project engineers have been working independently, but in parallel with JOIDES planners to conceive new or improved systems and tools.

Y. Lancelot relayed a list of several systems currently being considered.

Coring Systems

- atmospheric-chamber piston corer - to increase penetration rate to core stiffer sediments with good recovery and little disturbance.

- extended core barrel - to recover interbedded soft and hard layers (presently being developed for the 1982-83 drilling).

- controlled-circulation corer - to control the amount of circulation at the cutting shoe of the extended core barrel. The controlled circulation would improve its cutting abillity while decreasing core disturbance.

- surface sensing corer - a modification of the extended core barrel to monitor conditions at the bottom of the hole thus allowing the driller to make appropriate adjustments (e.g., penetration rate, bit weight).

- vented core barrel - to vent fluids from the core barrel.

- large-diameter core barrel - piston corer to collect samples voluminous enough for geotechnical and engineering studies.

- hard-rock pressure core barrel - to collect samples from more indurated rocks without loss of pressure.

- asceptic core barrel - to collect and ... organisms (bacteria) ...

- downhole performance instrument - to sense, and record data about the performance of the coring systems.
- advanced coring systems - to evaluate and respond to data collected by the downhole performance package. (Coring systems include operations involving latching, rotation, core-catcher failure, bit failure, circulation, downhole drilling fluid pressures, and hole conditions.
- high-efficiency coring system - in which the wireline is attached to the core barrel throughout coring, thereby saving trip time to pump down the wire line.
- hard-rock core orientation.

Drilling Systems

- new bits including those (a) to improve or develop cutting shoes for use in very hard rock, (b) to provide "full-face" contact as an alternative to roller-cone bits, and (c) small diameter bits for use in situations where the hole is cased to great depths (i.e., becomes narrower).
- computer analysis of drill string stresses.
- hard-rock spudding systems - to allow spudding of holes in areas with little or no sediment cover.
- slim-line riser system - to return circulated fluids and samples of drilled materials to the ship (the system would not include a blow-out preventor).
- concentric-pipe riser system - to return circulated fluids (in part) to the ship (no well-control system included).
- air-lift riser - to return cuttings (in part) and maintain good hole conditions.
- downhole drilling motor - to improve penetration at the end of long drill strings — especially penetration into hard rocks and to improve spudding into hard rocks overlain with little or no sediment cover.
- geothermal drilling - to improve core bits and pressure-core-barrel seals, and other hardware to tolerate downhole temperatures in excess of 600°C. (Logging tools designed for use in high temperatures are available "off the shelf," but the need is to develop an "ambient drill string" to sample fluids without disturbing their *in situ* environments.)

Borehole Instruments

- seafloor provide system - to support a motion-free system on the seafloor from which to deploy downhole instrument packages.
- wireline re-entry - to deploy downhole instrument packages by wireline from oceanographic vessels. (DSDP is currently developing a wireline re-entry system for the 1982-83 program.)
- heat-flow sensor - to monitor heat flow in conjunction with the hydraulic-piston-coring system. (Woods Hole has developed the prototype; DSDP is designing the mechanical system and housing and plans to test it during Leg 85.)
- low-flow-rate meter - to measure low rates of fluids flowing in bore holes.

The Project also is considering other advanced studies including determining *in situ* shear strengths, bit velocity at time of penetration, pull-out forces, wireline coring techniques, motion-compensated piston coring, and a core-barrel formation tester (to improve upon the packer system, and current-meter systems.)

Planning Committee Discussion and Consensus

The Planning Committee thanked E. Winterer for his efforts in developing a draft of the 5-year proposal. The PCOM accepted the basic document recognizing that although the withdrawal of support to the Ocean Margin Drilling Program could change the perspective of JOIDES planning, a long-term proposal must be submitted to NSF very soon to ensure continuation of scientific ocean drilling. PCOM members made several useful suggestions and comments. They suggested that

- the proposal be brought into better focus — that it be linked into a single encompassing global framework. Newly emerging concepts need special focus to convince reviewers that this is a dynamic scientific program. (Winterer noted that he would wrap the overall scientific goals into a summary of the proposal.
- linking drilling to north of 50°S is a technical (very high insurance costs, possible need for hull modification), not a scientific problem. The southern ocean holds the key to solving global problems and many JOIDES objectives can be addressed there. The proposal (or a version of the proposal) should be

expanded to incorporate high-latitude problems with the caveat that this imposes special cost and logistical problems on the program.

- the drilling ship is a tool basic to geological sciences in the same way that the telescope is basic to astronomy. Only by collecting samles can hypotheses be tested and thus only by continued ocean drilling can the science progress.
- the proposal should emphasize the importance of returning to areas of previous drilling. (Recent legs — e.g., 76, 80 and 82) have clearly demonstrated the value of returning to near old sites with new hypotheses, a better understanding of the area, and improved tools.
- committee members noted that even within a 5-year program large geographic and scientific gaps were left in the model ship's track; new questions are arising at a rate much greater than the drill bit can solve them. Ample scientific targets have been defined to develop a 10-year program.[1]
- regional geophysics must be included as an integral part of the whole scientific plan. Isolated site surveys planned only to locate sites does not provide the potential for regional linkage and interpretation necessary to adequately study the problems.

In conjunction with the discussions, W. Hay noted that little thought had been given to use of *Glomar Explorer* in a riserless mode, inasmuch as most of the planning for the Ocean Margin Drilling Progrm assumed operation with a riser and well-control system. He noted that *Glomar Explorer* (in a riserless mode) as compared to *Challenger* would provide high latitude capability, a greater environmental tolerance (capability to operate into storm seasons), a more stable platform under most conditions, and capability for deeper drilling (owing to capability to carry and deploy a longer drill string and casing). Also, the *Explorer* need not be restricted to an 8-week cycle and greater berthing and laboratory space considerably increases flexibility in program design.

[1]The EXCOM subsequently recommended that the science narrative embody an 8-year program of riserless drilling and contain both *Challenger* and *Explorer* tracks.

Consensus. E. Winterer, acting for JOIDES, and in conjunction with DSDP will continue to develop proposal, and submit it to NSF at the earliest possible date (late December, early January). He will revise the introduction to focus even more upon the drill ship as a necessary tool to geological science ("telescope philosophy") and write a comprehensive summary to focus the proposal, develop a central theme, and provide a road map through the proposal for the readers. He will expand the scientific narrative to address high latitude problems, but noting problems in using *Glomar Challenger* here. Alternative model plans could also include other options such as "renting" another ship for the high latitude work.

The upcoming Conference on Scientific Ocean Drilling will provide additional direction and refinement of scientific objectives. Winterer and a PCOM subcommittee will devise ways to incorporate new ideas or directives stemming from the meetings.

Potential New JOIDES Members

Canada

Brian Bornhold (Geological Survey of Canada) briefed the Planning Committee on the status of Canadian participation. Representatives of the Canadian scientific community, government, and industry met with representative of JOIDES, and JOI in October of 1980. At that time the Canadians understood that non-U.S. institutions would be invited to join the Ocean Margin Drilling Program. Although the Canadians were interested in both the JOIDES and OMD programs, they particularly focused their planning on joining the OMDP. As a result of the meeting, the Canadians received a draft of a "memorandum of understanding" from NSF(?) dealing with participation in the Ocean Margin Drilling Program. Later (March of 1981) the Canadians were informed that non-U.S. partners would not be invited to join the OMDP; consequently they have not actively pursued membership since that time.

Canadian industry (especially Petro Canada and Dome Petroleum) was interested in OMDP participation. Bornhold cannot predict what interest it would have in supporting other ocean drilling programs. Bornhold noted, however, that the opportunity to review the draft of the JOIDES 5-year proposal will greatly help the Canadians to understand JOIDES program.

The Australians (P. Cook) have approached the Canadians concerning possible formation of a consortium and R. Hyndman (Pacific Geoscience Center, British Columbia) will attend the Conference on Scientific Ocean Drilling.

Australia

Larry Frakes (Monash University, Australia) reported on the status of Australian membership.

The Australians are optimistic that means can be found to join IPOD. The Consortium for Ocean Geoscientists (COGS) is seeking an agency to join as the Australian member agency. (This would probably be the Bureau of Mineral Resources.)

Frakes noted that acquiring the $2-3 million per year membership fee takes some persuading. The next step is for the Australian government to seek support perhaps a 50 per cent contribution from industry. Australian oil companies appear to be willing to make a commitment and COGS has already received indications of potential support from the Australian Petroleum Exploration Association.

The Australian geoscientists are trying to gain governmental support for travel to JOIDES panel and committee meetings. They hope to participate as guests, and possibly as panel members, fairly regularly.

Frakes also inquired into the possibility of Australian scientists participating on Leg 90 in the southwest Pacific. He noted that the Australians had participated fairly regularly on *Challenger* cruises before the initiation of IPOD, but because most shipboard berths are now taken by IPOD scientists, the Australians, though interested, have had little opportunity to participate. In view of Australian scientists' special understanding of the area, and ongoing interest in joining JOIDES, the PCOM invited Frakes to encourage interested Australian scientists to apply for inclusion in the SW Pacific shipboard party. Y. Lancelot will also send a letter to Peter Cook (COGS) inviting the Australians to suggest people for the cruise with special expertise in the area. (This is consistent with DSDP's policy to encourage participation of a scientists from, and with special interests, the region of drilling.)

E. Winterer thanked B. Bornhold and L. Frakes for their interest and comments.

Seabed Working Group

E. Winterer briefed the PCOM on the current status of Seabed Working Group (Nuclear Energy Agency) interest.

Les Shepard (Sandia Labs) recently visited Winterer to discuss continued interest by the Working Groups in participating in a cooperative program with JOIDES. The Working Group's area of interest is shifting somewhat from the Sohm Abyssal Plain to the Nares Abyssal Plain — an area well within the region of planned *Challenger* drilling. In fact, during reorganization of the ship's schedule to accommodate the then planned congressional visit in the Virgin Islands, DSDP had considered drilling a hole in this area; the plan, however, did not mature for a variety of logistical reasons.

The Seabed Working Group is in the process of preparing written proposals for submittal to various JOIDES panels (especially SP^4, IGP, OGP, OPP, and PMP). Winterer has alerted NSF and panel chairmen to the Group's interest and hopes they will be responsive to developing coordinated scientific plans.

The Seabed Working Group is realistic about costs and appears willing to contribute funds over a period of time. That is, it does not tie budgeting into a one-year period or visualize a situation in which it would "buy a leg." The group appears to be flexible and is not making demands requiring excessive logistical support, but is looking for ways to integrate programs in the existing framework.

In recognizing the potentially interesting science Winterer has encouraged the group to pursue cooperative programs within the subject panels.

IPOD Data Bank

In response to a query from D. Hayes the PCOM noted that the IPOD Data Bank (at Lamont-Doherty Geological Observatory) serves the JOIDES community. Access to data is primarily on a "need to know" basis; the Data Bank should not be construed as a national archive. Transfer of data by scientists to the IPOD data bank does not satisfy any requirement to provide data for the National Geophysical and Solar Terrestrial Data Center in Boulder, Colorado. Individual scientists and/or institutions, not the IPOD Data Bank, are responsible for transferring appropriate data to the N.G.S.D.C.

Future Meetings

The Planning Committee will next meet

23-26 February 1982
Miami, Florida
(W. Schlager/Jose Honnorez, coordinators)

The meeting will be held at the NOAA facility across the street from Rosenstiel School of Marine and Atmospheric Science. All panel chairmen are invited to attend and report at this meeting.

7-9 July 1982
International Institute for
Mineral Resources Development
Fujinomiya, Japan
(Kazuo Kobayashi - coordinator)

K. Kobayashi has tentatively scheduled a field trip for 10 July following the meeting.

* * *

The Planning Committee plans, over a period of time, to shift its meetings to September, May, and January (rather than October, July, and February) to better take advantage of off-season rates and avoid holiday periods. As a first step, it will schedule the fall 1982 meeting for early October. (Fiscal constraints require meeting in October (FY 1983) rather than in September.)

Dennis Hayes invited the Planning committee to hold its fall 1982 meeting at Lamont-Doherty Geological Observatory; tentative dates are *6-8 October 1982.*

The PCOM did not firmly schedule a winter (January 1983) meeting but suggests that perhaps a southern U.S. site (Texas?) would be a good candidate. W. Bryant agreed (per phone conversation after the PCOM meeting) to investigate possible sites.

Joe Cann invited the Planning Committee to hold its summer (May 1983) meeting in the United Kingdom. He will present a list of possible sites at the next PCOM meeting.

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Panel Chairmen: *Please keep the JOIDES Office apprised of changes in working group membership.*

OCEAN PALEOENVIRONMENT PANEL

Robert G. Douglas, Chairman

The Ocean Paleoenvironment Panel last met 30 November — 1 December 1981 at the University of Southern California in Los Angeles, California. We have extracted the following items from the draft minutes of that meeting. P. W.

DSDP Budget Cuts

Following Y. Lancelot's report concerning cuts in the DSDP FY 1982 budget[1], several panel members expressed concern over delays in publication of the *Initial Report* volumes. The Ocean Paleoenvironment Panel (OPP) unanimously recommended **that all efforts should be made to maintain timely publication of the Initial Reports.**

Proposed Drilling

Equatorial Pacific (Leg 85)

R. Douglas outlined the main objectives of Leg 85 and invited the Hydrogeology Working Group to discuss its objectives for drilling EQ-1B in the "von Herzen study area." D. Epp and J. Gieskes presented the evidence for hydrothermal circulation and the nature of the cells in the area. They also described the sampling procedures which would be required. Y. Lancelot discussed problems of the heat-probe tools. J. Gieskes discussed the Uyeda-Barnes *in situ* pore-water samples for $^3He/^4He$ studies and argued for its use at Site EQ-1B. He also recommended *in situ* sampling at Site EQ-5. J. Gieskes indicated that drilling EQ-1B was the Hydrogeology Working Group's highest priority.

R. Douglas then summarized the choice between EQ-1A and -1B and the possible effects of diagenesis and lower sedimentation rate at EQ-1B. Following considerable discussion, the panel agreed that EQ-1A should have the highest priority. The OPP, however, will consider new site-survey data and agrees to locate EQ-1 in an area suitable for the hydrogeology experiment provided that (1) the experiment does not interfere with the primary OPP objectives, (2) there is reasonable assurance the section has not been diagenetically altered and (3) the sediment thickness is sufficient to maximize the potential for high-resolution stratigraphy and orbital analysis of high-frequency cycles.

[1]See also the Planning Committee report, above, for details of the budget cuts.

The panel estimated the number of days needed on site to accomplish objectives and designated priorities for the equatorial Pacific sites 1-8 as follows.

If EQ-7 and -8 are dropped then only 37 days will be required. If EQ-2A is also dropped, 7.5 days (6 + 1.5 steaming days) are saved so that approximately 30 days would be required — close to the allotted 29 days of operational time.

Tom Shipley outlined plans for the survey of the equatorial pacific sites and requested written permission from JOI to drop EQ-2, -7 and -8 from the survey.

Northwest Pacific (Leg 86)

Coordinates for the proposed sites are as follows.

NW-5A 41°45'N, 154°00'E
NW-5B 41°00'N, 156°04'E
Primarily an HPC site; rotary drill to basement; objective is high latitude oceanography, tephrachronology.

NW-6 45°00'N, 153°00'E
Off Kuril Islands; high-resolution stratigraphy and tephrachronology.

NW-7A 38°40'N, 153°50'E
Study of subarctic front

NW-7B 37°25'N, 149°16'E
Same objective as 7A.

NW-8A 33°50'N, 152°00'E
West of Shatsky Rise; alternative to -8B
NW-8B Same as DSDP 47.
HPC Neogene carbonate record and K/T boundary

NW-9 32°20'N, 164°00'E
Cenozoic history of eolian and chemical red clay sedimentation.

NW-3 and -4 Takayanagi discussed these possibile sites. The panel suggested that bettter sites located in deeper water along the margin should be found where seismic data suggest that the entire Neogene might be within reach of the hydraulic piston corer plus the rotary drill. Takayanagi agreed to review additional seismic lines and suggest new locations to the panel.

The panel agreed that all HPC sites should be cored twice to ensure as complete recovery as possible. It also supported G. Eglinton's suggestion that special cores (left unopened and immediately frozen on board ship) be taken for organic geochemical analyses, but noted the recommendation will require PCOM approval.

In reviewing the operational time required to reach the objectives at each of the northwest Pacific sites, the Panel compiled the following table.

EQ Sites	Operational days	Penetration (m)	Priority	Comments
1A (DSDP 81)	4-6	400	high	core twice
1B	4	300	low	core twice
2A (DSDP 73)	6	310 and basement 100	high	core twice
3	5	470	high	core twice
4	8	500 and basement 100	high	core twice
5	6.5	570	hgh	core twice
6	7	400 and basement 100	high	core twice
7	6	410	low	core twice
8	5.5	250	low	

Approximately 48 days total on site

The panel made several staffing recommendations for the leg. (Ross Heath hand Lloyd Burckle have subsequently agreed to serve as one of the Leg 86 co-chief scientists.)

Old Mesozoic Pacific (Leg 89)

S. Schlanger presented some of the processed seismic lines and reviewed the results of the recent site survey conducted by the Hawaii Institute of Geophysics. He proposed a new site located northwest of DSDP 199 where there appears to be a window in the sill complex. The water depth is about 6200 meters and the section to be drilled is about 1000 meters — a total depth near the maximum length of drill string deployable by the *Glomar Challenger.*

Schlanger will prepare a revised leg prospectus for the panel as soon as all the seismic data have been processed.

Southwest Pacific Paleoenvironments (Leg 90)

The panel reviewed the proposed southwest Pacific sites and earlier drilling completed nearby. Several members emphasized that the HPC sites should be cored twice — especially Sites 289 and 284 which contain classic Neogene sequences.

Operational days needed to complete objectives are:

SW-9: 4 days
SW-8: 3.5 days
SW-7: 3.5-4.5 days
SW-4, -5, -6: 12 days
SW-3: 3 days
SW-2: 2 days
SW-1: 2 days
Total = 32 days of on-site time

The "weather under," requires that the ship complete operations and get to Wellington by January 1.

These time estimtes do not include logging. The panel discussed whether or not to drill to basement at several SW sites, and suggested that the Lord Howe Rise site be drilled to basement. The sites on the Ontong Java and in the Bounty Trough are too thick to completely penetrate. The Panel agreed that the primary southwest Pacific objectives can be realized in 32 days of drilling, provided there is no logging and that some sites are not drilled to basement.

L. Frakes (Australian guest) suggested that the South Tasman Rise be included in Leg 90. The Panel, however, deemed the area as too far off track for the drilling in the present program. Frakes, however, agreed to prepare a proposal adressing objective on the Tasman Rise.

North Atlantic Paleoenvironments (Leg 94)

Leg 94 is planned as a counterpart to the N-S Pacific transects and to study Neogene climatic/oceanic variations.

R. Kidd presented a proposal to move the location of NA-1 or NA-2 (or to develop a new site) to the King Trough. Douglas formed an *ad hoc* North Atlantic review committee comprising J. Hays, R. Kidd, W. Ruddiman, D. Futterer and H. Chamley to review and set priorities for the proposed Leg 94 sites. (Relative priorities for sites need to be established to ensure the program receives an adequate site-survey.)

The *ad hoc* committee, (which conferred, in part by phone) concluded that sites NA-5, -8, and -09 could be dropped and that a minimum program should consist of NA-1, -2, -3 (= King's Trough Site), -4, -6, and -7. The committee will begin to prepare a finalized Leg 94 prospectus.

* * *

In conjunction with the cruise planning the Ocean Paleoenvironment Panel also made several recommendations for staffing of Legs 85, 86, 89, and 90.

Ocean Paleoenvironment Panel White Paper

Following reports from E. Winterer, J. Hays and R. Douglas concerning the Conference on Scientific Ocean Drilling and status of future planning, the Ocean Paleoenvironment Panel discussed modifications to their White Paper.

H. Chamley suggested a section related to the terrestrial or continental influences on climate and the oceans (palynology and aeolian contribution) be added. He agreed to prepare a short section on the topic.

The Panel reviewed the hydraulic-piston-core and deep-drilling sites proposed in the White Paper and Douglas outlined the additional sites proposed by the COSOD working group. The Ocean Paleoenvironment Panel noted that the two White Papers should be combined as they contain nearly the same scientific objectives only presented somewhat differently. The Panel agreed to include the COSOD sites in its finalized White Paper. R. Douglas agreed to oversee this task, together with J. Hays, G. Brass and E. Barrow. Douglas will send a revised document to the Panel members by the end of the year (1981).

Future Meetings

An OPP *ad hoc* Working Group will meet 18-19 February 1982 at Scripps Institution of Oceanography to further refine the Pacific program. The full panel will meet in late May or June 1982. This is with the understanding that the Planning Committee will not address specific planning for the North Atlantic OPP program until its July 1982 meeting[1].

[1]Date of the *ad hoc* Working Group meeting and tentative dates of full OPP meeting were resolved following the actual OPP meeting.

INORGANIC GEOCHEMISTRY PANEL

Joris M. Gieskes, Chairman

The Inorganic Geochemistry Panel last met 23-24 November 1981 at Scripps Institution of Oceanography.

Fiscal 1982-83 Programs (Legs 84-92)

Leg 84 (Middle America Trench)

The Inorganic Geochemistry Panel (IGP) agreed that a strong inorganic geochemistry program, emphasizing both shipboard interstitial water extraction and *in situ* sampling techniques (Barnes-Uyeda tool), is of great importance as an ancillary to the organic geochemistry program. After discussion with Keith Kvenvolden (shipboard organic geochemist Leg 84), J. Gieskes drew up a sampling protocol for inorganic chemistry during Leg 84 which has subsequently been forwarded to the cruise participants.

Leg 85 (Equatorial Pacific)

Interests of the Inorganic Geochemistry Panel center on two aspects:

- The study of diagenesis of carbonate and biogenic silica in thick sections of biogenic sediments. The relationship between interstitial water chemistry and solids geochemistry and mineralogy can be evaluated in great detail in these sediments, particularly when sedimentation has been reasonably continuous. The Panel proposes the participation of Mr. Paul Stout as shipboard geochemist/sedimentologist for this leg.
- The Panel noted the interest of the Hydrogeology Working Group in drilling of Site EQ-1B. R. von Herzen and co-workers found evidence of variable heat flow and non-linear temperature gradients in the area 4°01'N, 114°08'W. Such observations are generally explained in terms of advection of water through the sediment column. A drill hole in this area would serve to check this hypothesis and for this reason R. von Herzen has developed a temperature probe to be used in conjunction with the hydraulic piston corer (HPC). Such a combination of techniques has not yet been used to check possible water advection in thick sediment sections, but relevancy has been proven in the area of the Galapagos hydrothermal mounds (DSDP Leg 70). The Panel strongly favors drilling Site EQ-1B, which it believes would yield important information on resolution of this problem.

Leg 86 (North Pacific)

The Panel supports drilling a site in red clays as proposed by G. R. Heath and is pleased to note that the Ocean Paleoenvironment Panel has in the meantime accepted this site (NW-9). The Inorganic Geochemistry Panel attaches great importance to this site, especially owing to the Panel's continued interest in the study of the origin and diagenetic history of red clay sediments. It recommends John Hower (University of Illinois) as a possible geochemist for the leg.

Leg 87 (Japan Trench; Nankai Trough)

Japan Trench The IGP maintains an ongoing interest in the pore water chemistry and geochemistry of sediments in this area.

Nankai Trough The Panel views studies of interstitial waters and sediments of a downward going sediment section area of great importance. Such studies were initiated during Leg 78A in the Atlantic Ocean; recovery may be even better during Leg 87. It recommends R. E. McDuff (University of Washington) as a candidate for geochemist on the leg.

Leg 89 (Jurassic Superocean)

The IGP is in principle interested in this leg, though it deems routine shipboard inorganic geochemistry programs probably sufficient to yield adequate information.

Leg 90 (South Pacific Transect)

Previous work (Leg 30) has indicated that studies of pore waters and solid phases (volcanic sections; carbonate sections) can be used to yield information on diagenetic reactions occurring in the sediments and/or underlying basalts. The Panel wishes to sponsor a shipboard geochemist for this leg.

Leg 91 (Hydrogeology)

As an original advocate of this leg, the Inoganic Geochemistry Panel stresses its continued interest in a hydrogeological transect along 15°S latitude. Panel member M. Leinen will be a Leg 91 co-chief scientist and the Panel also proposes Ken MacDonald, Marc Langseth, John Orcutt, or Richard von Herzen as the second co-chief scientist. All these persons have a vested interest in geophysics and tectonics of mid-ocean ridges.

The Panel will discuss more precise plans for Leg 91 after the site suvey is completed in the winter/spring of 1982.

Leg 92 (Mississippi Fan)

The panel expressed a special interest in plans to drill holes in the Orca Basin.

DSDP Future Plans

E. L. Winterer informed the panel of present efforts to develop a 5-8 year proposal. The science narrative will focus special attention to

- Hydrogeology — studies of hydrothermal circulation, ore deposits, etc. One of the Panel's future tasks will be a search of suitable *in situ* monitors for hydrothermal fluids, e.g., electrode systems,
- Down-hole experiments — the IGP would especially be interested in a large-scale array of down-hole experiments in the basalts of layer 2, especially because of the relevance of such experiments to the hydrogeology program.

Conference on Scientific Ocean Drilling

Margaret Leinen presented an overview of discussions which took place during Conference on Scientific Ocean Drilling (COSOD). The Panel noted, with some apprehension, that little attention has been given to *diagenesis* in marine sediments in conjunction with discussions concerning the origin and evolution of marine sedimentary sequences. The Panel considers this a most serious omission and emphasizes that many problems of diagenesis remain to be solved; include diagenesis in carbonate sediments, siliceous sediments, red clay sequences, as well as those in hydrothermal deposits. The IGP thus will rewrite its White Paper on problems of interest to the field of the inorganic chemistry of marine sediments and will make it available to all JOIDES panel chairmen before February 1982.

The IGP emphasizes that diagenetic processes occurring in marine sediments must be treated in any consideration of the evolution of sedimentary sequences. Similarly, diagenetic processes will affect physical properties of sediments, and can have serious influence on paleoenvironmental studies of marine sediments.

The Panel noted that discussions of crustal processes during COSOD did include hydrothermal processes and submarine hydrogeology.

Hydrothermal Processes

The Inorganic Geochemistry Panel reiterated its interest in the study of hydrothermal processes near ridge crests and in areas of tectonic activity. Because of its strong interest in the Hydrogeology leg (91) the panel discussed important points which did not necessarily feature strongly in the hydrogeology White Paper. The IGP in particular emphasizes the importance of the following:

- **Studies of isotopes** — In basalt sequences, particularly when hydrothermal alteration is detected, not only should oxygen and hydrogen isotopes, but also strontium and sulfur isotopes be studied. These studies, in conjunction with mineralogical studies of altered and unaltered phases should set important constraints on the nature of hydrothermal processes, as well as on temperature conditions, rock-to-water ratios, and possibly on the duration of the hydrothermal interaction.
- **Rare earth distributions** — Data on various DSDP sites suggest that rare earth elements are generally depleted in alteration products. Hence the Panel considers study of the rare-earth distributions in fresh basalts, altered basalts, various alteration products, and in the connate fluid phases highly interesting.
- **Recovery of basalts especially of alteration products (high or low temperature)** — The IGP continues to be concerned about the poor recovery and the possible loss of aleration products during the drilling process. It encourages any development of drilling techniques that are designed to reduce this problem.
- **Recovery of formation waters in layer 2** — First attempts to recover formation waters in layer 2 of the oceanic crust using R. Anderson's packer technique have been moderately successful. The panel strongly encourages further development of such techniques and development of suitable tracers to determine possible contamination of samples with drilling fluids (usually surface sea waters). It suggests testing with spiked sea water, e.g., with D/H, nitrogen, or perhaps ^{36}Cl. Tracers should be as unreactive as possible and of such a nature that no vital information on rock-water interactions is lost. Various panel members have promised to study this problem further.
- **Hydrogeology study sites** — The IGP strongly supports drilling in various parts of the oceanic crust (c.f., the Hydrogeology Working Group White Paper)
  - on rise crests with no sediment cover, but in zones in which hydrothermal vents are known to be active,
  - on rise crest slopes with sediment cover in which low temperature alteration of layer 2 seems prevalent,
  - in areas of known anomalies in thermal gradients (e.g., Site EQ-1B proposed for Leg 85). The panel deems drilling such sites of great importance to check on theories of advective circulation of waters through sediment sections of considerable thickness,
  - sites away from areas of anomalous heat flow, but in which sediments have various thicknesses.

In all these sites of basalts should be penetrated to such depths that meaningful down-hole experiments relating to the possible circulation of fluids through layer 2 can be conducted. Shipboard parties should take special care to recover alteration phases and, whenever possible, formation waters.

With the information gained from such studies one should be able to investigate rates and lifetimes of geothermal systems on rise crests and on continued circulation of fluids through layer 2.

Major- and Minor-Element Analyses

Major- and minor-element analyses for igneous rocks are now available as listings or for computer searches. Both shipboard and shore laboratory data are included for DSDP Legs 13-62 and Legs 64-65. For information contact:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093

SEDIMENTARY PETROLOGY AND PHYSICAL PROPERTIES PANEL

Adrian F. Richards, Chairman

The Sedimentary Petrology and Physical Properties Panel (SP^4) last met 4-5 December 1981 at Scripps Institution of Oceanography. We have extracted the following items from the draft minutes of that meeting. P. W.

DSDP Budget Cuts

Y. Lancelot reported on the extent and probable results of cuts to the DSDP FY 1982 budget. (*These are reported in some detail in Planning Committee minutes above; we include here only the SP^4 responses and recommendations pertaining to the budget cuts.*)

Logging

The SP^4 is extremely concerned over the possibility that, because of funding cutbacks imposed on DSDP by NSF, essential geophysical logging may not be accomplished on some future legs. The panel agrees that logging is not a necessity on certain legs, particularly those HPC legs, which involve largely shallow penetration in poorly consolidated sediments. In many proposed legs, however, the scientific objectives are such that adequate geophysical logs would contribute significantly to the achievement of these goals. We emphasize those legs for which we consider it necessary to have downhole logging with brief scientific justifications for downhole logging follows. **The SP^4 strongly recommends that funds be restored or additional funds be sought to fully support the logging effort.**

Engineering

The SP^4 is dismayed that the budgetary reduction imposed by NSF on DSDP has impacted so severely on logging and developmental engineering. In the case of engineering, if funds are partially restored or new funds found, we recommend that DSDP give particular attention to projects that will improve recovery of core and the determination of *in situ* physical properties within the current 1981-1983 program. The SP^4 Long-Range Plans Working Group report (below) contains a list of recommended tools and systems.

The SP^4 applauds the effort of the DSDP technical engineering staff in its innovative development of effective tools and instruments with very limited funds and at the sacrifice of their personal time. The SP^4 views with alarn the large budget cuts and the potential harm tha these reductions will have on future development.

Color-Microfilming

SP^4 strongly endorses continuation of the procedure to color-microfilm the cores. Because photos represent the only way to preserve the original color-stage of the cores, information of primordial importance would be lost if the procedure is to be discontinued. In addition, the panel stresses that archive core halves will not be readily accessible (owing to commercial storage of archive halves) and thus color photos will represent the only information about undisturbed core material.

Technical Manual

The panel discussed alternative ways to publish the technical manual. If published by a third party an announcement could be made by DSDP of its availability. Authors, however, may have to change the format of their illustrations and substantial effort by DSDP to control format could still be required. The manual is about 800 pages and approximate production cost is $40,000.

The SP^4 strongly recommends that the Technical Manual be published as soon as possible and prefers a format similar to that of the Initial Reports. Financial support should be solicited by members of the panel or any other person related to drilling program.

Initial Core Descriptions/Microfiche

The SP^4 recommends replacing the ICDs with microfiche copies of the shipboard hole summaries, provided copies of the shipboard biostratigraphy and section-by-section sediment description forms are included. This will allow DSDP to distribute more information more rapidly and at lower costs than is presently possible.

The panel further recommended that this change in policy be widely announced (as in *Geotimes, JOIDES Journal*, etc.) and that the present distribution lists for ICDs be followed in distribution of this mi-

Leg	Location	Justification
83	Costa Rica	Logging will be done.
84	Middle America Margin	Logging probable — re-emphasize that logging is a primary consideration for geotechnical properties.
85	E. equatorial Pacific (HPC)	No recommendation.
86	Northwest Pacific (HPC)	Because of importance to radioactive waste disposal, and the penetration of red clay, we suggest this as a second priority logging site.
87	Japan Margin	Absolutely essential — physical properties in stressed forearc margin, possible fractured and overpressured zones, overconsolidation.
88	DARPA	We endorse logging, recommended at the expense of DARPA, second priority to DSDP.
89	Old Pacific	Deep hole, variation of physical properties with age and burial, no previous recovery of basement that old.
90	Southwest Pacific (HPC)	No recommendation.
91	Hydrogeology (HPC)	Definitely need logging with basement penetration and again to look at physical properties variations with hydrothermal diagnoses.
92	Mississippi Fan	Highly recommend logging to supply data on details of downhole lithological variation, considering that core recovery may not be complete (especially coarse-grained facies).
93	ENA-3	Logging highly recommended for physical properties information to plug into seismic modelling, etc.
94	Northwest Atlantic	No recommendation.
95	Caribbean, northwest Africa, or New Jersey	Highly recommend if Barbados; highly recommend if New Jersey Transect; no recommendation if northwest Africa.

Other Funding Sources

The Sedimentary Petrology and Physical Properties Panel discussed approaching other agencies and industry for funds to compensates for the cutback. USGS has already been approached and may provide some support for logging Leg 84. ONR is interested in physical properties and might be willing to support logging and physical property measurements. Industry may be willing to contribute as well; their motivation is owing to tax advantages gained and their concern about the loss of faculty and funds for academia by government agencies. E. Winterer, however, noted it is NSF's responsibility to fund DSDP and he would prefer to maintain pressure on that agency. The SP^4 agreed in general with Winterer, but strongly endorses actively pressuring other sources for funds.

Shipboard Techniques Procedure and Instrumentation

On-board computer

DSDP ordered the on-board computer before subjected to budget cuts. The SP^4 endorses the application of the on-board computer to core descriptions, smear slides, and other relevant studies and offers the chief scientists assistance (by the *ad hoc* panel mechanism) to affect these operations. It also welcomes suggestions for the computer's additional application.

Hydraulic Piston Coring

R. Carlson related his experience during Leg 82 in which the hydraulic piston corer was ineffective in foraminifer sands and only marginally effective in oozes. In clays the tool reportedly compacts the material; densities from the HPC at 150 meters exceeds those of rotary cores at 600 meters. E. Winterer reported very low recovery in clay with 1 kg/cm^2 shear strength. The panel agreed that the quality of physical properties obtained from tests on HPC has not been adequately evaluated. A cursory review of limited data is encouraging, but a more detailed evaluation is needed to demonstrate the value of the HPC and to determine specifications for the testing program. The SP^4 recommends that an SP^4 *ad hoc* committee be formed to evaluate the HPC and to provide a brief written report by June 1, 1982.

The results of this effort should include:

- Evaluation of available HPC data.
- Recommendations for the testing program on HPC cores to optimize the geotechnical information from each core, especially for dedicated geotechnical cores.
- Recommendation for changes to the sampler geometry to improve data quality but meet operational constraints (drawing on the experience of industry and previous recommendations of Walton and Sangrey).

DSDP will summarize and submit to the *ad hoc* committee by 1 February 1982 the available geotechnical information from HPC and companion data on rotary cores.

L. Kraft will chair the *ad hoc* committee and solicit assistance from other panel members as appropriate.

Piezocone

The SP^4 has endorsed the development of a downhole cone penetrometer-piezometer (piezocone) as encouraged by A. Richards. **The SP^4 endorses the cooperative venture between the DSDP and Fugro B.V. to develop the piezocone at Fugro's expense** and recommends that the DSDP Chief Scientist respond favorably to Fugro's request for endorsement of the Fugro effort.

The panel recommended that the piezocone replace the *in situ* vane-shear meter inasmuch as the cone provides a continuous record; it is also a less complex tool.

Committee to Evaluate Tools and Techniques

The Sedimentary Petrology and Physical Properties Panel recommends formation of an *ad hoc* committee to evaluate existing techniques and instrumentation aboard the *Glomar Challenger*. The committee will obtain information and advice from scientists and engineers who have participated aboard the *Challenger* within the past three years and who have been responsible for the physical and mechanical properties investigations. Areas of concern are (1) unconsolidated sediments, (2) semi-indurated sediments, and (3) hard rocks.

The committee will evaluate contributions from the scientific and engineering community and formulate final recommendations to upgrade procedures and instrumentation. The committee should examine the existing shipboard facilities while the *Challenger* is in port. A streamlined version of procedures and techniques should be prepared jointly by the committee and members of DSDP.

M. Salisbury agreed to determine the extent and format of existing documentation of laboratory and *in situ* testing procedures on *Challenger.* If the documentation is brief, clear, and easy to read, then no action is needed by the panel on this sub-item.

The subcommittee will assist in seeing that recommendations are followed and in finding funds to implement recommendations if funds are not already available.

To minimize travel expenses the committee would perhaps visit *Challenger* in port at Manzanillo (late February) or Honolulu (in mid to late April 1982).

Sediment Classification

The SP[4] agreed to establish a board to review the sediment classification system. The system currently used was developed in the early 1970s. G. Klein will coordinate the effort. He will solicit assistance from the panel as necessary and plans to complete the review in six months. The SP[4] will ask up to ten people with wide background and experience to critique the review.

Proposal — Subseabed Disposal Program

In response to proposals submitted by L. Shepard (Sandia National Laboratory) for the Subseabed Disposal Program, the SP[4] noted that that

- Site NW-8 in the northwest Pacific affords an excellent opportunity to obtain geotechnical properties of a profile through slowly and continuously deposited red clays. It will also provide a good suite of samples for geochemical and petrological studies related to aeolian input and accordingly should be given very high priority. The panel endorses the proposal **that the upper red clay section (above chert) be cored twice so that samples of adequate size can be taken for geotechnical testing.**
- The proposed site on Nares Abyssal plain rates a lower priority because the scientific problems outlined, though most interesting, have had some measure of investigation at Sites 417/418 and 386. (These sites are all well cored.) The proposed HPC hole would probably not get much beyond the Neogene turbidites; thus the double cored part of the hole is likely to be only in this rapidly deposited sediment. Nevertheless, study here would provide an interesting contrast with the Pacific red clays if samples free of compression effects were to be obtained.

Membership/Liaison

Adrian Richards resigned from the sedimentary Petrology and Physical Properties Panel. The panel thanked him for his dedicated, persevering, and motivated leadership during these past three years. (George deVries Klein will serve as Acting Panel Chairman until such time as the Planning Committee designates a new chairman.) The SP[4] also recommended replacements of several other members soon to rotate off the panel.

Next Meeting

The Sedimentary Petrology and Physical Properties Panel tentatively plan to meet sometime during the week of 15 November 1982.

See also the SP[4] Long-Range Working Group report, below.

SP[4] WORKING GROUP ON LONG-RANGE PLANS

George deVries Klein, Chairman

The SP[4] Working Group on Long-Range Plans met 3 December 1981 at Scripps Institution of Oceanography. Members of the Working Group (M. Arthur, R. Bennett, G. Klein, I. McCave, and P. Rothe) prepared the following report.

Objectives

Over the past three years, the SP[4] Working Group on Long-Range Plans has developed a rationale for future sedimentological, sedimentary petrologic and physical properties drilling programs. We summarized these as recently as May 1981 in a White Paper prepared for the JOIDES Planning Committee. They were as follows:

Program 1: Gravity-Controlled Sedimentation

- Submarine slides and slumps
- Debris flows
- Turbidites, submarine fans and submarine channels

Program 2: Ocean Current Sedimentation

Contourite drifts (clastic and carbonate)
Mud waves

Program 3: Anoxic Sediments and Mid-water Oxygen-Minimum Zone

Program 4: Petrology and Diagenesis of Sediments

Burial diagenesis of sands, sandstones, clay and claystones
Red clays — mineralogy, chemistry, physical properties

Program 5: Facies

Sedimentary facies in specific tectonic domains
Stratigraphic/mineralogic correlation of seismic-defined units
Sedimentology of hiatuses

Since that time, the COSOD Working on Marine Sedimentary Sequences also proposed drilling targets for 1983-88. These are summarized as follows.

Deep-sea sedimentation and sea level fluctuations
- Sedimentary record of abyssal circulation
- Submarine fans
- Submarine slides, slumps and debris flows
- Carbonate platforms and reefs
- High-latitude marine and glacio-marine sediments
- Marine evaporite giants
- Organic-rich sediments
- Anoxic sediments
- Phosphatic sediments
- Rhythmic sedimentation
- Hiatuses and unconformities
- Carbonate dissolution profiles
- Global sedimentary mass balances
- Post-depositional alteration of sediments

Carbonate minerals
Silica diagenesis
Clays and related phases
Organic matter
Gas hydrates
Hydrothermal sediments
Hydrology
"Early-opening" sediments

During our December 1981 meeting, the SP[4] Working Group evaluated both white papers, then combined and ranked the proposed programs. We grouped the topics into two categories: those that constitute large-scale geological themes requiring global syntheses and those that are rated in terms of where new drilling will solve specific problems and provide critical *new* information. We only established priority ratings for more problems which can be solved only by careful drilling plans.

First Priority drilling targets would require at least one or two specially planned legs of either the *Glomar Challenger* or *Glomar Explorer*. Second and third priority topics include those the Working Group considers important but more pertinent to other panels, or those requiring one or two drill sites. Thus, our priorities combining scientific goals from the SP[4] White Paper and the COSOD Working Group 2 are as follows.

Over-riding Themes Requiring Synthesis of Core and Other Marine Data (Assuming Good Recovery)

Sedimentary record of abyssal circulation[2]
Mass balancing of sedimentation[2]
Unconformities and hiatuses[1,2]
Stratigraphic/mineralogic correlation of seismic-defined units[1]

Record of depositional facies in specific tectonic domains[1]

Specific Priorities Requiring Drilling

First Order Priorities (No Ranking Implied)
- Slides, slumps and debris flows[1,2]
- Turbidite fans[1,2]
- Contourite drifts and mudwaves[1,2]
- Anoxic sediments, oxygen-minimum zones and phosphates[1,2]
- Sea level changes and deep-sea sediments (and carbonate platforms and reefs)[2]
- Sediment hydrology and hydrothermal diagenesis

Second Order Priorities (No Ranking Implied)
- Red clays[1]
- Burial and thermal diagenesis of sands and clays and resulting mechanical, chemical, mineralogical, and physical changes[1]
- Evaporites[2]
- Glacial marine sediments[2]

Third Order Priorities (No Ranking Implied)
- Silica diagenesis[2]
- Early opening sediments[2]
- Carbonate dissolution profiles[2]

[1]Recommended by SP[4] Working Group on Long-Range Plans.

[2]Recommended by COSOD Working Group 2.

Tools and Techniques

In order to successfully solve these problems certain new technical developments are required. We have identified instrument needs and recommended as a highest priority that DSDP develop a new core catcher for the hydraulic piston corer which can recover all types of sediments (such as sand). R. Bennett will establish liaison between the SP[4] Working Group and the DSDP Engineering Department to assist in development, design, and testing of new instruments.

We noted the following is required for general purposes.

Priority 1 — A new core-catcher for the HPC to recover both sand and mud.

Priority 2 — *In situ* pore-pressure meter.

Priority 3 — Miniaturization of dip meter and spectral gamma-ray logging tools.

Specific instruments for specific legs addressing specific problems are as follows.

Priority 1 — *In situ* Piezocone, for legs dealing with slides and dedicated geotechnical sites.

Priority 2 — *In situ* vane shear meter for legs dealing with slides and dedicated geotechnical sites.

POLLUTION PREVENTION AND SAFETY PANEL

Louis E. Garrison

The Pollution Prevention and Safety Panel last met 5-6 November 1981 at Scripps Institution of Oceanography at which time it reviewed Legs 83 and 84 sites.

Safety Review Leg 83
Costa Rica Rift

504B: Previously drilled during Leg 69. Approved for re-entry.

CAR-1A, -1B, -1C, -1D: Approved.

These four "contingency" sites form a grid near Site 504B and would only be drilled should the Leg 83 shipboard party encounters difficulties in deepening Hole 504B.

Safety Review, Leg 84
(Middle America Trench)

The Safety Panel discussed at some length the history of deep-sea drilling off Guatemala. The objectives and proposed drill sites for Leg 84 are essentially the same as those of Leg 67. During Leg 67 unexpected encounters with gas hydrates constrained drilling and prevented realization of the scientific objectives. Although no *new* geophysical data have been acquired in the area since the Leg 67 drilling, the Panel is now confident that safety requirements can be met in a second round of drilling. This is owing to careful analysis of drilling results, further refinement of existing seismic data, and acquisition of additional geologic information from commercial drilling.

The Safety Panel made its recommendations for the Leg 84 sites on the basis of the evidence presented by Roland von Huene and Thomas Shipley showing that gas hydrates probably exist only in the thicker sections of the Neogene slope deposits, and that the base of the hydrate equilibrium zone can be predicted within a few tens of meters. In addition, the evidence suggesting that the underlying Paleogene sediments are barren of hydrocarbons, although admittedly scanty, justifies a cautious penetration of that section. In view of the large elements of uncertainty in these assumptions, the Safety Panel notes that merely its recommendations will not eliminate all of the risk. **The Panel, therefore, urges the shipboard party to take even more than the usual precautions in drilling the Leg 84 sites, and to be conservative in its calculations of hydrate zone boundaries.** The Safety Panel's recommendations are:

GUA-7b: Approved. Drilling at this site in the trench axis should encounter only a few hundred meters of trench deposits and deep-water oozes over oceanic basalts. Since similar conditions should exist everywhere along the axis, the Panel approves selection of a suitable location anywhere within the ponded sediments in the area of the SEABEAM survey, including the short ridge segments that separate individual ponds.

GUA-1b, -4a, and -5a: Approved. Safety considerations appear to be essentially the same for all three lower slope sites, and for everywhere between them. The Panel, therefore, approves any location selected on board ship along Line GUA-13 between Sites GUA-1b and -5a.

Any drilling along this traverse that encounters evidence of gas hydrates should be terminated at least 100 meters above the calculated depth of the base of the hydrate zone.

GUA-1c, -4c, and -5c: Approved. These sites are in the lower slope region about 20 km away from, and on strike with, Sites GUA-1b, -4a, and -5a above. Similar conditions appear to exist, so the panel gives safety approval to drill anywhere along Line GUA-2 between Sites GUA-1c and -5c.

If evidence of gas hydrates is encountered at any location chosen, terminate drilling at least 100 meters above the calculated depth of the base of the hydrate zone.

GUA-2b: Approved. The Neogene/Paleogene unconformity at about 380 meters probably lies within the zone of hydrate equilibrium. The shipboard party should take special care to detect hydrates or abnormally large amounts of gas below the unconformity. If such should occur, terminate drilling at least 100 meters above the calculated base of the hydrate zone.

GUA-2c: Approved. Conditions are similar to those at Site GUA-2b, and the shipboard party should exercise the same safety precautions as for that site.

GUA-8a: Approved. This is the only site that has a clear bottom-simulating reflector (BSR); the Panel understands that the major objective of drilling is to study the hydrates. Terminate drilling at least 100 meters above the BSR or the calculated base of hydrates, whichever should be reached first.

GUA-8b: Approved at a location at the intersection of Lines GUA-2 and GUA-6. If gas hydrates or abnormally large amounts of gas are encountered in the Paleogene section, terminate drilling 100 meters above the calculated base of the hydrate zone. If these conditions are not encountered, drilling may proceed to single-bit destruction.

GUA-9d: Approved at the location proposed. If gas hydrates are detected at any point below the Paleocene unconformity, terminate drilling immediately.

GUA-11: Approved. If gas hydrates are detected below the unconformity, terminate drilling immediately.

GUA-12: Approved. if gas hydrates are encountered at any point, terminate drilling immediately.

CR-1c: Approved as proposed. If gas hydrates are encountered, terminate drilling at least 100 meters above the calculated base of the hydrate zone.

In addition, the Panel reviewed three sites off Mexico which had previously approved, or near to sites it had approved for Leg 66. They are as follows:

M-1a: Approved as proposed.

M-3b: Approved. Terminate drilling at least 100 meters above the BSR or the calculated base of the hydrate zone, whichever is reached first.

M-3e: Approved at proposed location, but only to 300 meters depth. The presence of a BSR approximately 400 meters sub-bottom is noted.

Safety Review

DARPA Site (Northwest Pacific)

The Panel examined the available seismic records from the area of the DARPA Site. Although the site proposed is some distance from the nearest available seismic line, no safety concerns exist in that region of thin pelagic cover over oceanic basement. The Safety Panel has no objection to drilling in that area.

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