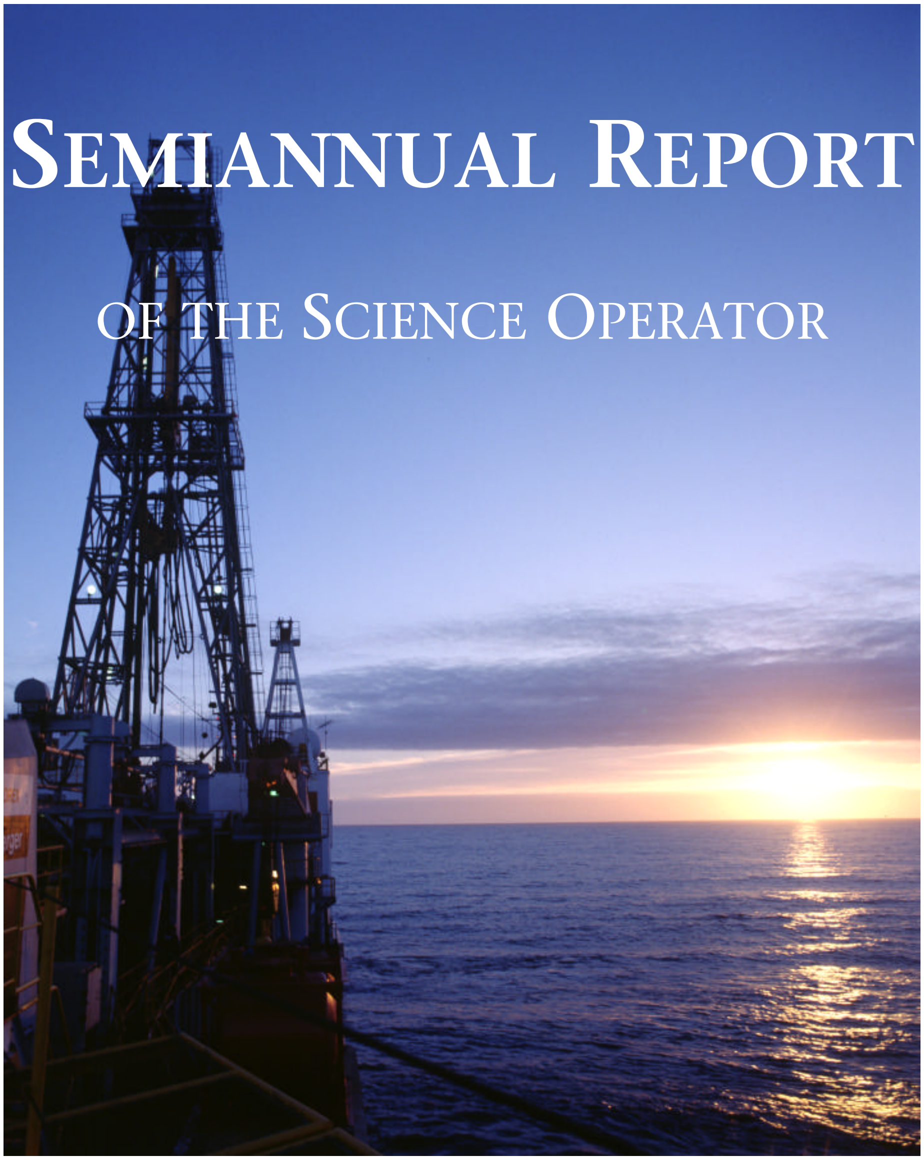


SEMIANNUAL REPORT

OF THE SCIENCE OPERATOR

No. 2—1996
June–November

ODP/TAMU Mission Statement and Objectives

The Ocean Drilling Program at Texas A&M University shall continue to be preeminent in scientific ocean drilling, providing the leadership in science operations management that is necessary to serve the scientific community in its quest to probe this planet's last frontier.

To achieve this mission, ODP/TAMU pursues the following goals:

To provide support for state-of-the-art scientific drilling, sampling, data acquisition, and monitoring beneath the seafloor;

To contribute to the international advisory structure;

To develop and apply new technologies and operational strategies in support of evolving scientific objectives;

To create and maintain a data library of leg-related scientific data and publications, and core archives for use by scientists throughout the world;

To disseminate results from each leg to scientists, governments, industry, and the public worldwide;

To provide the above services in a collegial and constructive fashion.

INTRODUCTION

Dear Colleague:

Just one year ago we distributed our first semiannual report with a goal to present to our customers a clear, accurate, and up-to-date characterization of the service elements that ODP/TAMU is responsible for providing. Based on our first two editions, the response from the community has been very favorable and we intend to continue production.

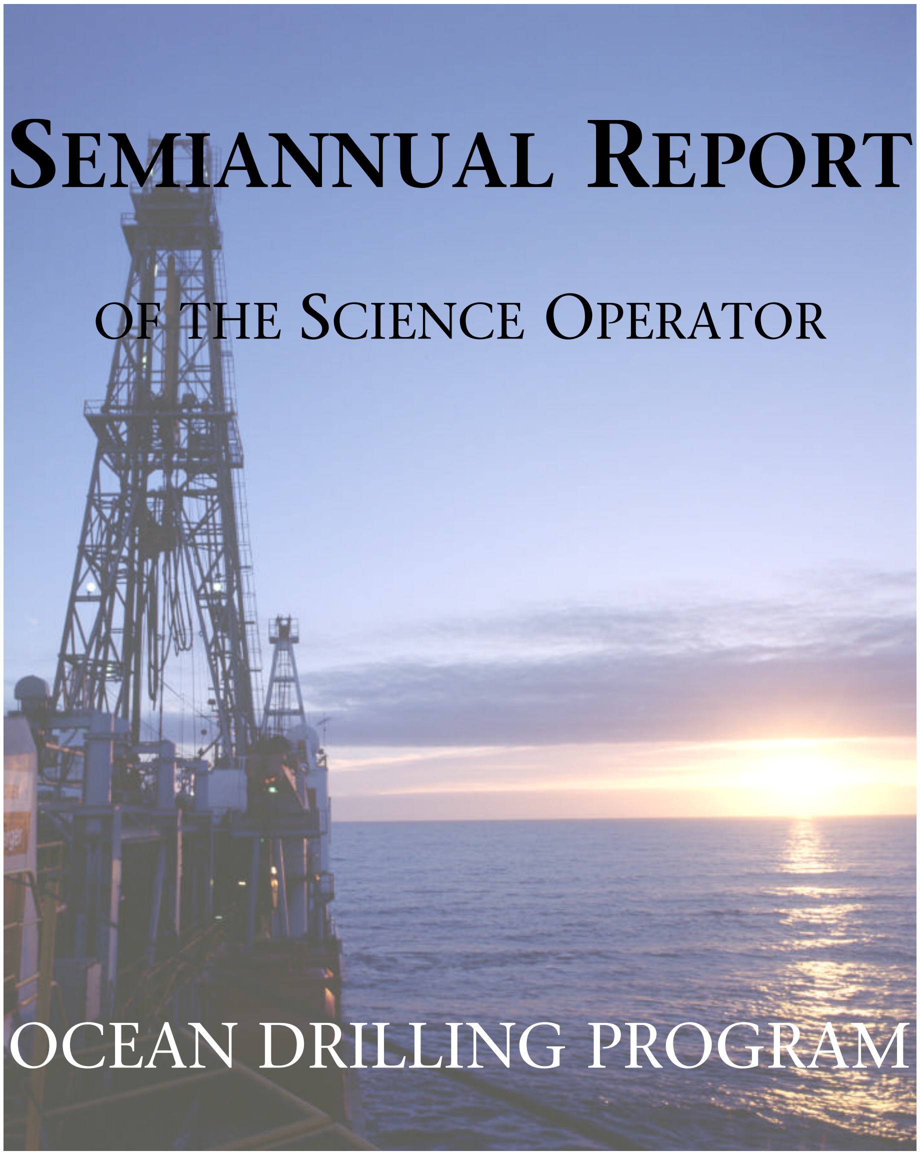
In this edition, readers will find concise summaries of our activities over the last six months; a period that has been characterized by significant achievements in operations aboard the *JOIDES Resolution,* fundamental changes in our organizational structure including a reduction in staff, and important progress made on a number of innovative initiatives designed to improve service delivery across the full scope of our activities.

We are very proud at ODP/TAMU of the high quality of science services we have provided to the community over more than a decade. We are confident that the changes we have recently made in our organizational structure and the way we manage projects optimally positions us to enhance our tradition of high quality science service delivery in a cost effective fashion. We look forward to working with our sponsors, the new JOIDES Advisory Structure, and the rest of the ODP community to insure that the Program is continued into the next century and that the scientific goals of the Long Range Plan are achieved.

Paul J. Fox
Director of Science Operations
Ocean Drilling Program
Texas A&M University
College Station, Texas

SEMIANNUAL REPORT

OF THE SCIENCE OPERATOR



OCEAN DRILLING PROGRAM

No. 2—1996
Report for the period of June–November

Publisher's Notes

This *Semiannual Report* of the Science Operator is part of an initiative to improve communications with the partners of the Ocean Drilling Program, from the member nations to individual scientists. If there is information you would like to read about in future issues, please contact us. Queries or comments can be sent via e-mail to:

semiannual_report@odp.tamu.edu

The entire report is available electronically on the Internet in an Acrobat PDF and HTML formats. Updates are regularly posted to the site. The address is:

http://www-odp.tamu.edu/semiannual_report.html

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Institut Français de Recherche pour l'Exploitation de la Mer (France)

National Science Foundation (United States)

Natural Environment Research Council (United Kingdom)

University of Tokyo, Ocean Research Institute (Japan)

Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), an international group of scientists, provides scientific planning and program advice. Joint Oceanographic Institutions, Inc., a nonprofit consortium of 10 major U.S. oceanographic institutions, manages the program.

Texas A&M University is the science operator. Lamont-Doherty Earth Observatory of Columbia University is responsible for downhole logging and the site survey data bank.

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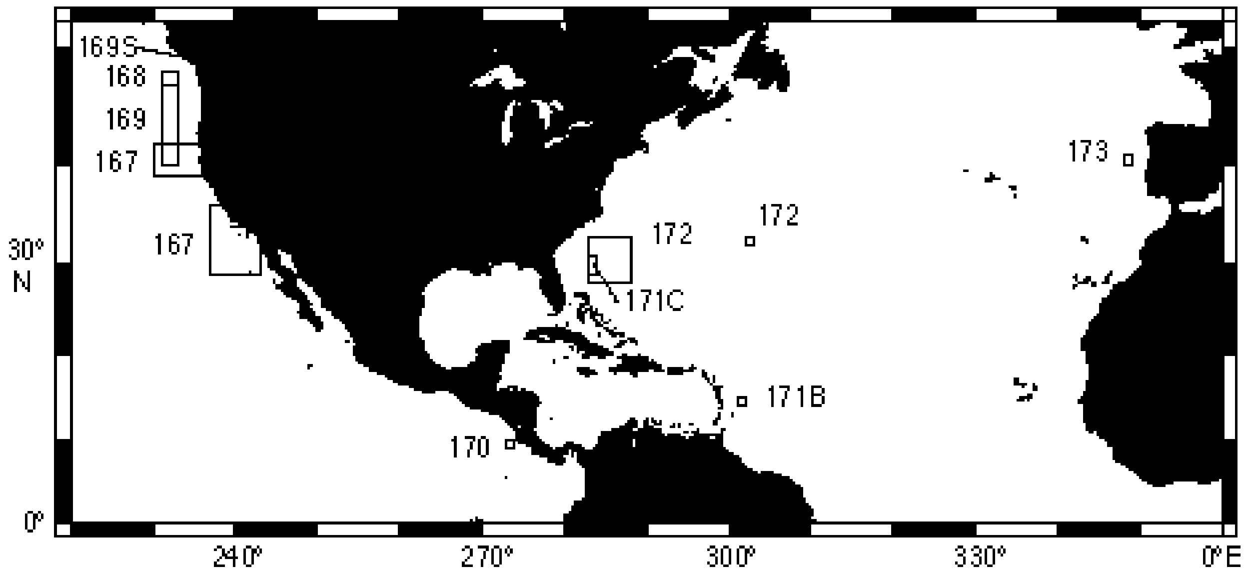


Leg 167—California Margin

Co-Chiefs: Itaru Koizumi and Mitchell Lyle	Cruise Dates: 21 April–16 June 1996
Staff Scientist: Carl Richter	Operations Superintendent: Scott McGrath

The California Current system is probably the best investigated eastern boundary current system in the world, with well-known physical dynamics, chemical structure, biological standing stocks, and biogeochemical fluxes. Nevertheless, the response of the California Current system and associated coastal upwelling systems to climate change is poorly documented. Climate models and available paleoceanographic data indicate that the California Current system changed dramatically with the growth and decay of the North American ice sheets. The paleoceanographic records, however, remain too sketchy to test the models. Leg 167 represents the first time since 1978 that the Pacific margin of North America was drilled to study ocean history.

The leg collected both high-resolution records, appropriate for studying events with durations of a few thousand years or less, within the Pleistocene and Pliocene and lower-resolution records to examine much of the Neogene interval. Sites were drilled to collect sediments needed to study the links between the evolution of North Pacific climate and the development of the California Current system. The same material will also be used to study the climate links between the North Pacific Ocean and North America.

Only three other drilling legs, all part of the Deep Sea Drilling Project (DSDP), have sampled the historical sediment record along the California Margin. A single advanced hydraulic piston core (APC) site in the Santa Barbara Basin (Site 893) represents all of ODP drilling before Leg 167. The last major drilling effort, DSDP Leg 63, occurred immediately before the first deployment of the APC. Recovered core from the DSDP drilling is discontinuous and very disturbed, so it is impossible to use this material for modern, high-resolution, paleoceanographic studies. Reconnaissance studies using DSDP cores have shown, however, that the

Leg 167 drilling region is highly sensitive to climate change and that new ODP drilling would collect a detailed record of this variability.

Significant contrasts in sedimentary environments occur along the California Margin, including the unique tectonic and sedimentary environments of the basins in the California Borderland. Site selection exploited these opportunities, constructing latitudinal, longitudinal, and depth transects. There are three east-west transects, with at least two sites in each transect, one located in the coastal upwelling zone (from 50 to 90 km offshore, 1000 to 2000 m water depth) and one in the core of the California Current proper (from 150 to 360 km offshore, 3500 to 4200 m water depth). The Gorda Transect (~40°N; Sites 1019, 1022, 1020, and 1021) is in a region of strong summer upwelling. The Conception Transect (~35°N; Sites 1017 and 1016) is influenced by year-round upwelling with relatively cool surface waters. The Baja Transect (~30°N; Sites 1011 and 1010) is influenced by year-round upwelling with warmer surface waters. The oldest sediments from the inshore sites are Pleistocene in age, and from the offshore sites middle or late Miocene. Coastal upwelling processes at the margin will be reflected in the nearshore sites, whereas nutrient supply by California Current processes will be reflected in the deeper sites.

The north-south Coastal Transect covers the latitude range from 31° to 42°N (in order from north to south: Sites 1019, 1022, 1018, 1017, 1014, 1013, 1012, and 1011). All sites are within <160 km offshore, in water depths of 1000–2500 m. The oldest sediments from all sites are at least Pleistocene in age, and some range to late Miocene. The coastal transect will detail the history of coastal upwelling and of continent-ocean interaction.

Sites also constitute two depth transects. The Northern Depth Transect (~37° to 42°N, from 60 to 360 km offshore; Sites 1019, 1022, 1018, 1020, and 1021) covers 1000–4200 m water depth. Oldest sediments from Site 1019 are Pleistocene, whereas the sediments from the deepest-water site (Site 1022) range in age from latest middle Miocene to Quaternary in age. The Southern Depth Transect (~30° to 35°N, from 30 to 210 km offshore; Sites 893 [Leg 146], 1015, 1017, 1013, 1014, 1012, 1011, 1010, and 1016) covers 475–3850 m water depth. This transect takes advantage of the different sill depths within the California Borderlands for detailed study of the shallow intermediate water column. The oldest sediments from sites with the shallower water depths are at least late Pleistocene in age, whereas basal sediments from the sites with deeper water depths are typically late Miocene. These depth transects will provide sediments to investigate hypotheses about water-depth control of sedimentation processes and water column structure and its evolution through time.

Objectives

In the following preliminary summary of results, individual interpretations are related to the science objectives listed below.

1. To understand how a major eastern boundary current system and associated upwelling centers respond to growth of Northern Hemisphere glaciers.
2. To assess feedbacks between continental and oceanic climates in the northern Pacific Ocean and North America.
3. To obtain depth transects suitable for the study of variations in northern Pacific Ocean deep-water properties and carbonate deposition.
4. To understand variations in the production, preservation, and burial of organic carbon in a well-studied, highly productive continental margin setting.
5. To sample gas hydrates.

Secondary objectives

1. To study tectonic development of the active continental margin of western North America.
2. To investigate the deformation of the Gorda Plate.
3. To test the response of continental margin sedimentation to Cordilleran uplift.
4. To acquire samples of Franciscan and Gorda Plate basement where possible without compromising primary sedimentary objectives.

Preliminary results

Heavy post-cruise sampling was undertaken for the high-resolution studies necessary to achieve the cruise objectives. This took place at two sampling parties in College Station in mid-August and mid-September 1996. Approximately 20,000 samples were taken during the sampling parties, which lasted one week each.

Preliminary results from shipboard analysis indicate:

- High sedimentation rates (30-200 m/m.y.) make it possible to study climate variability at submillenial scales at most sites. (Objectives 2 and 4)
- High organic carbon burial helps to preserve paleoproductivity indices. (Objectives 3 and 4)
- Four of the drill sites (Sites 1010, 1011, 1014, and 1016) sampled middle to upper Miocene sediments to reconstruct a Neogene history of the California Current. (Objectives 1, 2, 3, and 4)
- Representative samples for igneous petrology and geochemistry of the basaltic basement were obtained at 3 sites (Sites 1010, 1011, and 1020). (Objective 10)
- There were no apparent changes in the interstitial water profiles at the estimated depth of the bottom simulating reflector. Logging data also did not indicate any corresponding increases in sonic velocity or density reductions which typically characterize clathrate occurrences. (Objective 5)
- A relatively expanded mid-Pliocene sedimentary sequence with extremely high $CaCO_3$ mass accumulation rate. Because high carbonate burial is found at shallow and deep drillsites, the cause must be due to carbonate production, not changes in dissolution. A possibility is that sub-tropical gyral wind strength was enhanced in the Pliocene, particularly from 2.5 to 3.5 Ma. (Objectives 3 and 4)
- The productivity events that were observed along the California margin are different in timing than those in either the subarctic or equatorial Pacific. Regional oceanographic circulation patterns seem to last for millions of years, suggesting that stable climate patterns exist or that climate responds strongly to tectonic changes in boundary conditions. (Objectives 1 and 2)

Operations

Leg 167 set a new core recovery record. A total of 13 sites, 52 holes, 840 cores, produced 7501 m of gray-green mud. Operations were predominantly standard APC-XCB coring with typically 3 APC holes per site to ensure complete records.

The MDCB was used twice to tag basaltic basement.

Leg 168—Hydrothermal Circulation in the Oceanic Crust: Eastern Flank of the Juan de Fuca Ridge

Co-Chiefs: Earl Davis and Andrew Fisher	Cruise Dates:21 June–16 August, 1996
Staff Scientist: John Firth	Operations Superintendent: Michael Storms

Leg 168 investigated three hydrothermal regimes located on the sediment-covered eastern flank of the Juan de Fuca Ridge. The three regimes are (1) a transition from very young (<0.8 Ma) unsedimented igneous crust to sediment-buried crust (0.8-1.2 Ma), (2) an older (~3.5 Ma) area with large topographic relief (>300 m) of igneous crust under a thick (250-600 m) sediment cover, and (3) an intermediate age (1.4-2.6 Ma) area of low relief igneous crust buried continuously over tens of kilometers by sediments averaging about 300 m thick. Ten sites were cored and roughly 1500 m of sediment and basalt was recovered. A total of four CORKs were emplaced, with thermistor strings and osmotic water samplers, in Holes 1024C, 1025C, 1026B, and 1027C. Temperature, pressure, and water chemistry data will be recorded from these holes over the next 3 to 5 years. The first direct sampling of basement fluids in Deep Sea Drilling Project/Ocean Drilling Program history was achieved in Hole 1026B, using the Water-Sampling Temperature Probe (WSTP).

In the following preliminary summary of results, individual interpretations are related to the science objectives listed below.

Objectives

1. Determine the thermophysical characteristics of hydrothermal circulation in the upper oceanic crust in off-axis settings as influenced by crustal topography, sediment cover, and permeability;
2. Determine the sensitivity of crustal fluid composition to the age, temperature, and degree of sediment burial of the igneous crust;
3. Examine the nature and fundamental causes of physical consolidation and mineralogical and chemical alteration of the igneous crust as functions of age and degree of sediment burial; and
4. Improve constraints on the fluxes of heat and elements between the permeable igneous crust and the overlying ocean.

Preliminary results

Leg 168 drilling sites were placed along a transect on the eastern flank of the Juan de Fuca Ridge, extending from about 20 km east of the ridge crest, where turbidite sediments begin to continuously blanket the 0.8-Ma igneous crust, to about 100 km from the crest, where the crust is 3.6 Ma in age. Coring and downhole measurements completed along this transect have provided unprecedented documentation of the efficiency with which water transports heat and solutes laterally in the upper oceanic crust and of the consequences of that circulation (Objectives 1, 2, 3, and 4). Additional information from long-term hydrologic observatories (CORKs) established at four of the sites will provide valuable quantitative constraints on the pressures that drive fluid flow, on basement-water composition, and on the details of the thermal structure in the uppermost oceanic crust as it is influenced by hydrothermal circulation (Objectives 1, 2, and 4).

A simple sedimentation history is inferred at each of the sites, with locally carbonate-enriched hemipelagic deposition beginning to accumulate some thousands of years after creation of the igneous crust, followed at the older sites by periods of accumulation of hemipelagic muds and fine turbidites, and finally by a Pleistocene sequence of variably thick silt- and sand-turbidites interbedded with hemipelagic muds. Despite the frequency of sandy layers in the upper part of the sections, this blanket of sediment that buries all primary topography of the igneous crust by up to 600 m is generally impermeable and prevents fluid flow at geochemically significant rates except where the section thins to less than about 100 m over local basement highs (Objective 2). At three such sites (Sites 1025, 1030, and 1031) there is clear evidence in the pore-fluid compositional profiles of discharge, although the seepage velocity is far too low to be thermally significant. The integrated effect of fluid seepage in the form of sediment alteration is virtually undetectable; at all sites, sediment alteration was evident only on a scale of up to a few meters above the basement contact (Objective 3).

Basalts were recovered at nearly all sites, and they represent a wide range of compositions and textures: normal tholeiitic pillows; massive, highly fractionated flows with extremely large (up to 1 cm) vesicles; volcanic breccias cemented with low-temperature hydrothermal mineralization; and a massive diabase unit erupted onto or intruded into the sediment section well off-axis. Alteration of the igneous rock varies in intensity from site to site along the transect, both as a consequence of increasing temperature and increasing degree of basement-water isolation and as a result of variations in texture and lithology (Objectives 1 and 3). Fresh olivines present at Site 1023 indicate that these aphanitic samples, "the youngest, coolest, and closest to a source of fresh seawater (about 3 km from the nearby region of outcropping basement," have undergone the least amount of alteration. In contrast, practically all olivines in the massive, coarser-grained units at Site 1025 are completely replaced by a mixture of clay minerals (primarily saponite with some celadonite), minor carbonate, and rare talc and chlorite/smectite. Samples from sites throughout the transect contain mineral linings or complete mineral fillings of vesicles. At the oldest and hottest sites, 1026 and 1027, the vesicle filling involves two to four sequential layers. The observed distribution of the various vesicle fills is systematic, in detail linked to the proximity of the vesicles to veins and alteration haloes. Rocks at nearly all sites (except from the massive units) exhibit varying degrees of oxidative alteration that required significant open-seawater circulation. A subsequent stage characterized by carbonate, saponite, and sulfide alteration probably represents relatively closed hydrothermal circulation following sediment burial. No alteration, including that represented by vein-filling minerals, was observed that requires temperatures much higher than those prevailing today (Objective 3).

Active and highly efficient local advective heat and chemical transport is evident in the degree of homogenization of crustal fluid temperatures and compositions (Objectives 1 and 3). Sites 1026 and 1027, drilled ~2.2 km apart into a sediment-buried basement ridge and adjacent trough, respectively, encountered basement at virtually identical temperatures (~64°C), despite the large contrast in the thickness of sediment at the ridge and valley sites, 250 and 600 m, respectively (Objective 2). Basement-fluid compositions, inferred from pore waters squeezed from near-basal sediments and sampled directly from the discharging Site 1026, are also to a first order identical at the two sites, and identical to water sampled at a seafloor vent roughly 7 km away where water discharges through the seafloor at an isolated, small basement outcrop.

Some form of regional-scale flow is also inferred on the basis of thermal and geochemical observations made across the full length of the transect (Objectives 1, 2, and 4). A comparison of seafloor heat-flow measurements with the total expected from the cooling lithosphere beneath shows a clear deficit on this sediment-sealed eastern ridge flank out to a distance of at least 20–30 km from the nearest basement outcrop; it has been inferred that this deficit reflects the heat lost advectively from the upper igneous crust in regions of outcropping basement through lateral fluid flow. Observations at the first three sites of the Leg 168 transect substantiate this inference. Clear gradients in basement temperature and basement-water chemistry were documented, with temperatures at the sediment/basement contact increasing systematically with distance from the region of outcropping basement, from approximately 15°C at Hole 1023A, to 22°C at Site 1024, and to 38°C at Site 1025 (Objectives 1, 3, and 4). This trend is opposite to that expected, given the increasing age and decreasing sediment thickness across this part of the drilling transect; it is best explained by rapid fluid flow and heat transport in the upper basement rocks beneath the sediment section, with cool seawater recharge supplied in the area of extensive igneous outcrop near the ridge crest. Basement-water compositions revealed systematic changes with increasing temperature and distance from the outcrop in many elemental concentrations, including magnesium and calcium, which are particularly reactive in basement. Elemental concentrations at Site 1023, situated 3.5 km away from the line of abrupt basement outcrop to the west, were changed only slightly from seawater, whereas water at Site 1025, nearly 16 km away, showed significant reaction with basement (Objective 2). Basement-water chlorinity values also showed clear signs of lateral flow in basement, with the influence of post-Pleistocene seawater, only a few thousand years old, seen beneath the sediment cover also as far away from the basement outcrop as Site 1025.

Perhaps the most remarkable conclusion from the results of the leg concerns the scale over which significant lateral heat and chemical transport must take place (Objectives 1 and 4). Over most of the length of the transect the local average heat flow through the sediment section does not exceed about 80% of the amount expected from the lithosphere beneath. Basement temperatures simply continue to increase systematically with distance from the region of basement outcrop near the ridge to the maximum temperature at Sites 1026 and 1027 noted previously. This disagreement with lithospheric cooling theory may point to a fundamental lack of understanding of lithospheric heat loss, but it is more likely that a significant quantity of heat is lost advectively from beneath the sediment seal over distances of many tens of kilometers. This conclusion is supported by the level of sulfate observed in basement waters, which falls systematically with distance from the region of basement outcrop but to a remarkably elevated minimum of 18 mmol/kg at the most distant Sites 1026 and 1027 (Objectives 3 and 4). At all sites, the sediment section is seen to serve as a very efficient sink of sulfate; the only source for replenishment is seawater supplied via purely-basement pathways. Very large distances of lateral transport (up to 80 km) are implied.

The primary scientific objectives of this phase of ridge-flank drilling focused on lateral thermal and chemical gradients associated with hydrothermal circulation, and they were achieved with highly limited basement penetration. Virtually all observations can probably be accounted for with a hydrothermal system that is dominated by fluid flow in only the upper tens to few hundreds of meters of the igneous oceanic crust. However, some hints of deeper levels of fluid flow are suggested at Sites 1030/31, which penetrated a basement ridge where anomalous basement fluids appear to be present (Objectives 1, 2, and 4). Chlorinity and the concentrations of Mg and Ca in basement water are anomalous with respect to the trends defined by other sites of the transect and suggest reactions at a temperature much higher than that at the top of the crust; basement fluids here may be "contaminated" by water flow locally up a fault zone from a depth where temperatures and fluid residence times are greater.

Although Leg 168 was highly successful in setting strong constraints on the rates of fluid flow through the uppermost igneous crust and in beginning to identify the surprisingly large lateral scale over which hydrothermal circulation can operate, the need for additional work in this area is clear. Determining the routes of flow, including the hydrologic role of normal faults and the depth of penetration of significant circulation, will require deeper sampling and downhole experiments possible only through a second leg of drilling. Effort must also be given to better identifying the locations and details of seawater recharge and crustal water discharge, where very large chemical and heat fluxes must occur.

Operations

Leg 168 operations were characterized by a number of outstanding operational accomplishments:

- A record 4 reentry cone deployments with 16” conductor casing.
- A record 4 10¾” surface casing strings were set and cemented.
- A record 4 CORK installations were made including thermistor strings.
- Packer slug/flow tests successfully conducted at 3 basement penetration sites.
- A total of 93 temperature measurements were taken using the Adara (APC shoe) and the Davis-Villinger (DVTP) tools. (See “Davis/Villinger Temperature Probe” on page 47.)
- The first ever “pristine” basement fluid samples were recovered using the WSTP.

Leg 169S—Saanich Inlet

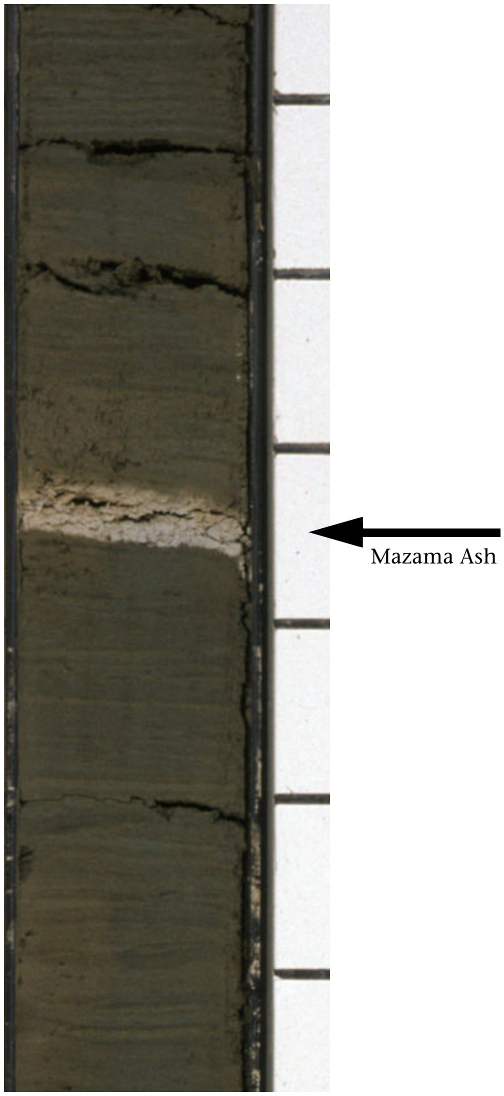
Co-Chief: Brian Bornhold	Cruise Dates: 19–21 August, 1996
Staff Scientist: John Firth	Operations Superintendent: Eugene Pollard

An improved understanding of the climate-ocean system, and in particular the global carbon cycle, require ultra-high resolution studies of rapidly deposited sediments in a variety of geographic settings. Such sites record climatic and oceanographic conditions on an annual or seasonal basis permit calibration and refinement of fully ocean-coupled General Circulation Models, as well as lead to a better appreciation of the links among oceanographic processes, climatic parameters, terrestrial vegetation, and marine biota in coastal areas of the world.

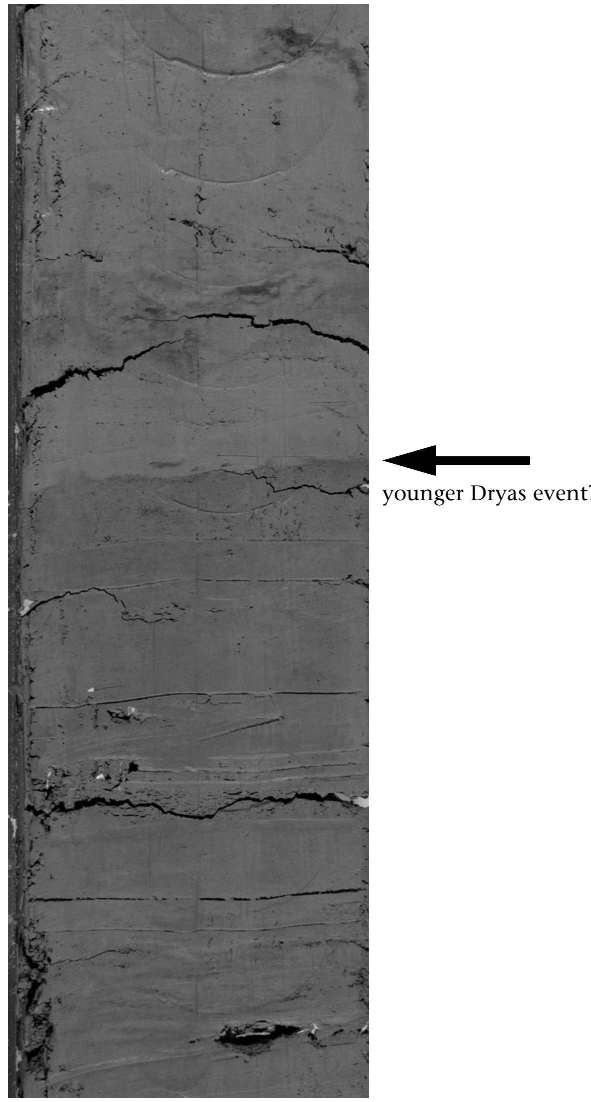
Sediments of Saanich Inlet, British Columbia, contain a virtually continuous record of Holocene climatic and oceanographic change, with seasonal resolution, together with a possible record of paleoseismicity associated with the Cascadia convergent margin. Situated in a fjord near Victoria, British Columbia, the Leg 169S sites record both terrestrial floral change since deglaciation (9,000 to 11,000 years B.P.) as well as marine biological productivity variations in a temperate latitude coastal setting. The Saanich Inlet sites will provide an important complement to the high-resolution record obtained at Site 893 (Leg 146) in the Santa Barbara Basin.

Objectives

1. Obtain an ultra-high resolution record of Holocene climate, oceanography, marine productivity, and ecology and terrestrial vegetation;
2. Attempt to establish the frequency of earthquakes (particularly very large events; greater than magnitude 8) in this region of the Cascadia convergent margin;
3. Advance the understanding of diagenesis in organic-rich sedimentary basins and especially of the role of microbial processes. The predominantly



Photograph shows the Mazama Ash deposit from core Leg 169S -1033D-5H-5, 27–57 cm.



Photograph of Leg 169S-1034B-8H5, 121–136 cm. shows the boundary between green, organic rich sediments in the lowermost Holocene of Saanich Inlet (Hole 1034B), and an overlying gray clay layer which may record the beginning of the younger Dryas cooling event roughly 10,600 years ago. Radiocarbon age dates will determine whether or not this is the younger Dryas event.

finely laminated (varved) sediments which are believed to have accumulated in the inlet since deglaciation will be cored at two sites in the deeper axial region of the fjord; these two sites (at 200 and 225-m water depth) have significantly different organic contents and accumulation rates. Saanich Inlet will provide an important companion to the high-resolution Site 893 drilled in Santa Barbara Basin.

Preliminary results

During the leg, only the A-hole from each site was run through the MST, split and photographed on board. The B and C hole were MST'd during Leg 169 and returned to ODP/TAMU for further work. Sampling and core description occurred at ODP/TAMU from November 11–15, with the Hole Summaries and Preliminary Report due before the 169S post-cruise meeting in February.

The upper 15 m at both sites consist of dark gray to black, very soft, gassy, highly disturbed sediments. Below this, core disturbance was minimal, and preservation of laminated sequences is superb. The laminated sequence extends to a depth of about 55 mbsf at Site 1033 and about 80 mbsf at Site 1034. Varve thickness at Site 1033 averages about 6 mm, and about 8-10 mm at Site 1034. Varves as thick as 1.5 cm occur at Site 1034. The lamina thicknesses will enable very detailed paleoenvironmental investigations to be undertaken. Long intervals of uninterrupted laminations characterize much of this unit. In the lower part of the laminated unit there is evidence of possible river flood events in the occurrence of thin gray silty-clay bands within normal laminae couplets. The laminated sequences are periodically interrupted by intervals with indistinct laminae, grading to massive structureless muds with overall similar composition to the laminae. Thin units of burrowed sediments apparently reflect periods of basin ventilation. Wood and plant fragments, shells, and fish remains are scattered throughout the laminated interval. Color variations within the laminated sequence display a decade to century scale of variability. The Mazama Ash (about 6800 years B.P.; about 1-1.5 cm thick) was detected in all holes; it was encountered at about 50 mbsf at Site 1033 and about 60 mbsf at Site 1034.

Above the base of the laminated sequence (30-40 cm), there is a 30-40 cm thick interval of gray silty clays at both sites, which possibly reflects a sudden cooling, and conditions of landscape instability in the latest Pleistocene/earliest Holocene, followed by a return to anoxic conditions and laminated sediments.

A 4-cm thick carbonate concretion was recovered at Site 1034 at approximately 80 mbsf. This concretion appears to occur at a depth characterized by significantly higher methane contents. This interval of higher methane can be correlated between the two sites.

The laminated sequence is underlain by gray, largely homogeneous, stiff glacio-marine muds. There is evidence of debris flows (tens of cm thick) and silt to medium sand horizons (up to 10 cm thick) in the lower part of this unit at Site 1034. Occasional granule-sized ice-rafted debris was noted at Site 1034.

Gas analyses revealed no higher order hydrocarbons. Extremely low methane contents were detected in the gray glacio-marine unit, possibly reflecting aerobic conditions. Hydrogen sulfide gas was persistent only in the upper 4 m at each site.

Insitu temperature measurements revealed a linear thermal gradient. The maximum temperature recorded was 11°C at about 80 mbsf at Site 1034.

High resolution magnetic susceptibility and color reflectance data will be extremely valuable for correlation purposes and for construction of composite stratigraphic sections.

Operations

Port call activities included a dockside display area, tours for the local media and VIPs, and a luncheon for invited guests on Friday, 16 Aug. On Saturday and Sunday, public tours of the *JOIDES Resolution* were conducted. Approximately 1200 people toured the ship.

Leg 169—Sedimented Ridges II

Co-Chiefs: Yves Fouquet and Robert Zierenberg	Cruise Dates: 22 August–17 October, 1996
Staff Scientist: Jay Miller	Operations Superintendent: Gene Pollard

The goal of Leg 169 was to drill into two active hydrothermal systems to investigate the genesis and evolution of massive sulfide deposits formed at sediment-covered ridges. These two systems, Bent Hill/Dead Dog in Middle Valley on the Juan de Fuca Ridge, and Central Hill in Escanaba Trough on the Gorda Ridge, were recognized to host deposits of variable chemistry and degree of maturity. The preliminary results of this leg, enhanced by those generated in post-cruise research, will shed light on the longevity of these systems and the chemical and temporal variability of fluids and sulfides attending them. Additionally, our successful reinstrumentation of CORKed boreholes will provide in situ monitors of geologic processes in Middle Valley.

The Bent Hill massive sulfide (BHMS) deposit has 3 distinct parts. A 100-m-thick conical mound of massive sulfide formed at the seafloor underlain by a 100-m-thick feeder zone comprised of a sediment host with crosscutting veins filled with Cu-Fe sulfides and pyrrhotite. One of the most spectacular discoveries of this leg, however, is the presence of an intensely silicified horizon at the base of the feeder zone which is underlain by a horizon of intense alteration and replacement of the host sediment by Cu-rich sulfides. This high grade (~16% Cu) stratiform mineralization zone may reflect a high temperature aquifer capped by an impermeable silicification front, and also represents a potential economic target for mineralized deposits on land.

A second mound 350 m south of BHMS was also sampled, and is characterized by multiple, stacked mineralized horizons with significantly higher ore grades (40% Zn and 15% Cu) than was sampled at BHMS. A high grade Cu ore horizon was also intercepted at the same stratigraphic interval as was sampled at BHMS. Another highlight of this expedition was the creation two new vigorous hydrothermal vents in what had been considered an inactive part of the system. The creation of these vents has attracted media attention (Science, Geotimes) and resulted in NSF funding an immediate follow-up expedition with an ROV to observe and monitor these new vents.

Active hydrologic experiments were conducted by removing existing CORKs, sampling high temperature fluids, and reinstrumenting two boreholes. By sealing one hole at an active hydrothermal site first, we expect that the installation of the second in a cold reference hole 2 km away will induce a transient pressure pulse we can monitor in the active system. An OBS array deployed around the our area of operations will detect any induced seismicity resulting from our operation.

Previous investigations recognized distinctive chemical signatures for massive sulfides from Middle Valley and Escanaba Trough. Middle Valley sulfides appear to have basalt as a major source component, whereas Escanaba Trough sulfides indicate only sediment as a metal source. Drilling several holes in deposits exhibiting a range of hydrothermal activity and sulfide deposition demonstrated that the thickness of the sulfides at Central Hill is little more than what is exposed at the seafloor. The lack of any feeder zone indicates these sulfides formed by pervasive diffuse venting of hydrothermal fluid over a short time span, as opposed to the long-lived, focused hydrothermal discharge which is responsible for sulfide deposition at Middle Valley.

Objectives

In the following preliminary summary of results, individual interpretations are related to the science objectives listed below.

1. Mechanism of formation of massive sulfide deposits at sediment covered ridges
   - Size and geometry of sulfide deposits and hydrothermal alteration zones
   - Compositional variations within and between deposits
   - Source of metals in massive sulfides
   - Constraints on fluid temperatures and compositions that deposited massive sulfide
   - Composition of fluids in producing boreholes

- Timing and duration of hydrothermal activity
- Formation of hydrothermal mounds in active vent fields

2. Tectonics of sedimented rifts and controls on fluid flow
   - Controls on igneous activity at sedimented rifts and the importance of sill emplacement
   - Permeability and structural controls on hydrothermal circulation
   - Interrelationship of faulting and fluid flow
   - Constraints for hydrologic modeling
   - Factors controlling fluid flow on the scale of individual vent complexes and the importance of sub-seafloor fluid mixing
3. Sedimentation history and diagenesis at sedimented rifts
   - Source and deposition rate of sediments
   - Diagenetic reactions in high heat flow regimes
   - Organic matter alteration and generation of hydrothermal petroleum
4. Extent and importance of bacterial activity
   - Role of bacteria in oxidation of organic matter, reduction of sulfate, and precipitation of carbonate
   - Activity of thermophilic bacteria in sealed boreholes at known temperatures and fluid compositions
   - Extent of thermophilic and nonthermophilic bacteria in the subsurface and relationship to hydrothermal fluid compositions
   - Comparison of bacterial populations in active and inactive hydrothermal deposits

Preliminary results

- The Bent Hill Massive Sulfide is a conical mound 100 m thick. (objective 1)
- The underlying feeder zone mineralization is 100 m thick. (objective 1, objective 2)
- There exists an intersected stratiform high-grade copper zone below stockwork mineralization. (objective 1)
- Zn/Cu ratio increases upward and outward from the core of BHMS. (objective 1, objective 2)
- ODP/TAMU drilled a stacked sequence of thick, high-grade massive sulfide and feeder mineralization. (objective 1)
- ODP/TAMU operations created two new vigorous hydrothermal vents. (objective 2)
- Achieved CORK objectives at Holes 858G and 857D. (objective 2)
- Demonstrated high temperature phase separation for Escanaba Trough hydrothermal fluid. (objective 2)
- Determined that immature Escanaba Trough deposits are formed by recent, diffuse venting; mature Middle Valley deposits are formed by long-term, recurrent focused flow. (objective 1, objective 2)
- Established extremely high sedimentation rates for sediment fill of the Escanaba Trough. (objective 3)
- Achieved high resolution sampling for thermophilic and hyperthermophilic microorganisms. (objective 4)
- The U.S. National Science Foundation has responded rapidly to scientists' request to revisit this area of the Northeast Pacific. In October 1996, the research vessel *Thompson*, outfitted with a robotic vehicle operated from the ship, began to study the geology, chemistry, and biology of these new hydrothermal vents.

Operations

On Leg 169 two old and broken CORKs had to first be fished out of the re-entry cone. This was not a small task in itself. The hostile environment caused the two Corks to become corroded and thus they pulled apart in pieces while attempting their recovery. Remedial fishing trips were required which resulted in the successful recovery of the remaining portions and allowed the installation of two new CORKs as planned.

Leg 170—Costa Rica Accretionary Wedge

Co-Chiefs: Gaku Kimura and Eli Silver	Cruise Dates: 22 October–17 December, 1996
Staff Scientist: Peter Blum	Operations Superintendent: Michael Storms

To gain a better understanding of the mechanical and chemical behavior of accretion, underplating, and tectonic erosion, and to determine how deformation and dewatering are distributed throughout an accretionary prism, it is essential to establish the flow pattern of materials through subduction systems.

Leg 170 consists of a program of drilling at four primary sites (proposed Sites CR-1 through CR-4) on the Costa Rica convergent margin to investigate mass- and fluid-flow patterns through the accretionary prism and will integrate structural analysis and sediment, fluid, and chemical mass balance calculations. The objectives are to determine (1) the relative importance of frontal accretion, underplating, out-of-sequence thrusting, sediment subduction, and subduction erosion; (2) the timing, rate, and modes of the accretionary prism development; (3) the importance of fluids in both strengthening and weakening the prism, particularly in the presence of underthrust carbonates; and (4) the fate of subcrustally subducted sediments and the associated fluxes.

Drilling on the Costa Rica margin could provide the first good estimates of the total material and chemical fluxes through a subduction system, because of the ideal conditions (the capping sediment apron and the lack of trench turbidites), extensive seismic imaging of the accretionary complex, and the opportunity to constrain the deeper parts of the sediment cycle, which are reflected in the forearc fluids and arc volcanic rocks. Because of the global importance of understanding material and fluid fluxes through subduction zones, it is critical that these systems become well understood.

Essential observations for establishing the mechanisms of accretion and underplating, tectonic erosion, and deformation and dewatering must include (1) the rate (positive and negative) of prism growth as a function of incoming sediment volume and type; (2) the partitioning of frontal offscraping, underplating, internal prism deformation, and subduction erosion; and (3) the effects of fluids. Excellent control is required of material mass-balance and residence time in the prism, in addition to detailed structural geometry of the complex interior regions of forearcs. Such control and imaging is not well established in any convergent margin, despite expending a great amount of effort to understand these margins.

The scarcity of accurate mass-balance estimates is due to the complexity of both sedimentary and structural processes at convergent margins, the poor structural imaging of the deeper parts of forearc regions, and the need for reliable age estimates that generally require drilling. The presence of trench turbidites, varying dramatically in thickness both spatially and temporally, is a major obstacle in estimating material influx. Erosion and redeposition of accreted material are additional complications that can not be taken easily into account. A first step in addressing these problems is to locate an experiment along a convergent margin that lacks trench turbidites, has a slope cover preventing erosion of the accreted material, and has clearly imaged deep and shallow structural control. If the convergence rate is known, the incoming sediment flux can be estimated closely and prism size will reveal the relative importance of sediment accretion or bypassing. The case of subduction erosion may also be documented with additional structural, stratigraphic, or biostratigraphic data to show subsidence or arcward retreat. The final requirement is availability of accurate emplacement dates for the accreted material.

The convergent margin off Costa Rica satisfies all the requirements necessary to determine accurate mass-balance and flow estimates, except for knowledge of the age and residence time of the prism material. The trench is devoid of turbidites here and the convergence rate is known. Recently acquired 2D and 3D seismic reflection data across the margin provide excellent control of the internal structure of the forearc, and they define boundaries between the accretionary prism and the overlying slope cover, as well as between the prism and the subducting plate. These data show that the slope cover extends to within 3–5 km of the trench, so it protects the accreted mass from erosion and conserves its volume. Consequently, the growth rate of this prism can be calculated accurately when the emplacement age of the accreted material is determined by drilling through the basal slope cover and top of the prism.This relatively closed system is also a superior environment in which to investigate the fluid and chemical fluxes in a subduction system. Comparison of physical (i.e., velocity and porosity) and chemical properties of sediments seaward of the trench with sediments that have been subducted or accreted can provide important information on the nature and rate of diagenetic processes in subduction zones. Aided by relatively rapid plate convergence and a stratigraphically consistent subducting sedimentary section, the sediment and pore-water chemistry can also be compared with the constituents of arc volcanic rocks using geochemical tracers. By their presence or absence in the volcanic rocks, tracers such as ^{10}Be and Ba may be used to indicate the amounts of sediment accretion, amounts of sediment recycling to the volcanic arc, and subduction into the mantle.

Prominent lithologic or structural boundaries that produce high-amplitude seismic reflectors in the interior of this moderately accreting prism are within reach through drilling. The existing 3D seismic grid will allow exceptionally good correlation between seismic and borehole data as a result of accurate 3D imaging. Certain coherent intraprism reflectors identified in the seismic data appear to be unrelated to offscraping but are interpreted as faults, which formed during out-of-sequence thrusting and underplating. These and other faults are likely pathways along which fluids escape from the prism. Identifying the physical properties, lithologies, and geologic processes that produce these impedance contrasts will provide essential information for the structural interpretation of this margin and fundamental data about the nature of seismic reflections in accretionary prisms.

The main focus of Leg 170 is to determine mass- and fluid-flow paths through a remarkably well constrained accretionary complex, to calculate mass and fluid balances. Drilling data will facilitate an integrated effort to understand these processes using structural data and the physical and chemical properties of both the sediments and their pore fluids.

The specific objectives of the drilling program are to determine:

- Age and nature of the accretionary wedge beneath the slope apron;
- Rate of accretion of the wedge;
- Nature of the lower part of the apron and time sequence of formation;

- Physical properties of the material above, within, and below the top-prism reflector;
- Relative importance of underplating vs. out-of-sequence faulting;
- Evidence of fluid stratigraphy and flow distribution within the wedge materials; and
- Nature of apron material relative to deep-sea hemipelagic sediment.

Leg 171A—Barbados Accretionary Prism Logging While Drilling (LWD)

Co-Chief: Casey Moore	Cruise Dates: 21 December, 1996–7 January, 1997
Staff Scientist: Adam Klaus	Operations Superintendent: Scott McGrath

Deformation and fluid flow in sedimentary sequences cause changes in physical properties. In situ measurement of physical properties evaluates processes (consolidation, cementation, dilation) operating during deformation, fluid flow, and faulting. Because seismic images are affected by changes in physical properties, their measurement allows for calibration of seismic data as a tool for remotely sensing processes of deformation and fluid flow. Logging-while-drilling (LWD) provides an industry-standard tool for in situ evaluation of physical processes, including transient borehole conditions. Leg 171A will drill a series of LWD holes to measure the physical properties of sediments through a deforming accretionary prism and across plate-boundary faults off Barbados. Extensive drilling and three-dimensional seismic surveys provide a rich framework for log interpretation, seismic calibration, and process evaluation. The results will assist with the interpretation of similar, but less active, systems in sedimentary basins elsewhere, thereby contributing to the analysis of groundwater, hydrocarbon migration, and earthquake processes.

Deformation of accretionary prisms changes the physical properties of sediments, thereby producing fluid, controlling fluid flow, altering rheologic properties, and affecting seismic arrival times and reflection characteristics. Consolidation and chemical diagenesis change the specific physical properties of porosity, density, and sonic velocity. These changes are both distributed (because of the loss of fluids in response to accumulating stresses) and localized along discrete structures (such as faults) in response to overpressuring, fluid migration, or fault collapse. Because consolidation and fluid overpressuring affect seismic arrival times and seismic reflections, seismic data provide direct clues to physical properties evolution and to physical properties changes coupled with deformation.

Physical properties evolution in sedimentary sequences cannot be comprehensively evaluated from recovered cores. Elastic rebound and microcracking of coherent sedimentary samples degrade shipboard physical properties measurements. Fault gouge and other incoherent lithologies are either not recovered or cannot be measured after recovery; therefore, transient properties (e.g., overpressuring) must be measured in situ.

Sediments in tectonically active areas undergo rapid changes in physical properties. Because of this rapid deformation and the shallow burial depth of the deformed features, accretionary prisms are exceptional, natural laboratories to study these changes that can therefore be drilled and imaged seismically. The information discerned at convergent margins about fault geology and overall sedimentary consolidation, in addition to seismic imaging of these processes, will be applicable to other, less active, sedimentary environments, and therefore will impact our understanding of hydrocarbons, groundwater, and aspects of earthquake systems. To better understand the interrelationships of deformation, fluid flow, seismic imaging, and changes in physical properties, an LWD transect of a setting dramatically influenced by pore fluids is proposed: the Barbados accretionary prism.

Objectives

- Overall Prism Consolidation

Porosity is the foundation for a variety of studies about the large-scale, long-term fluid budget of accretionary prisms. Logs can be used to determine a continuous record of density and porosity as a function of depth, as was done during Leg 156. Between-site variation in the porosity-depth relationship provides an estimate of the amount of fluid expulsion (and therefore volumetric strain). Unfortunately, measurements of volume change are usually impossible with standard logs, as they frequently fail because of bad hole conditions in this setting. Even under ideal conditions wireline logs do not obtain data from the top 60–120 m because the drill pipe must extend below the seafloor during logging, nor do they often sense the bottom 60–120 m of the hole because of fill. The shallowest 100 m, where porosity reduction is the greatest, is of particular interest in this study. Only LWD can obtain reliable porosity logs from the entire depth range, including the critical top 100 m. Profiles of porosity vs. depth provide a tantalizing but incomplete view of the fluid expulsion pattern of an accretionary prism. Velocity data, either from multichannel seismic data or ocean-bottom seismograph studies, are powerful tools for studying prism porosity structure. The fundamental limitation in determining porosity from velocity is the conversion between these two parameters. This relationship is well known for normally consolidated, low-porosity sediments, but it is much less certain for high-porosity sediments, where changes in terms of fluid production and volumetric strain are more important. Furthermore, our analysis of logs from the Cascadia accretionary prism indicates that prism deformation dramatically changes the porosity-velocity relationship. In contrast to pelagic sediments, accretionary prism sediments of the same porosity can exhibit a wide range of elastic moduli and, therefore, velocities; this complexity results from variability in cementation, compression-induced modification of intergrain contacts, and fracturing. Theoretical relationships of porosity to velocity are of little utility in this environment; the velocity-porosity relationship must be determined for each prism empirically, and the possibility that this relationship changes laterally within a prism must be investigated. In situ velocity and porosity logs that sample the section completely are the only means of reaching this objective. The overall fluid budget of the Barbados prism requires analysis to evaluate the fluid loss and geochemical budgets. The series of LWD holes planned here, plus existing penetrations, will help constrain this problem. Excellent in situ porosities at all sites is anticipated. The velocity-porosity relationship will be constrained by wireline sonic logs at proposed Site NBR-5A, and from the previously logged Site 948.

- Correlation of physical properties of faults with displacement and fluid flow

An LWD transect across the Barbadian décollement can address the following questions: (1) do faults collapse and strain harden with displacement, (2) does active fluid flow retard this process, and (3) are collapsed faults inactive with respect to fluid flow? Structural, biostratigraphic, and seismic reflection criteria identify faults. Anomalies in pore-water geochemistry and thermal anomalies indicate fluid flow. With the positive identification of faults, LWD can measure their physical properties. These properties then can be correlated to variations in displacement and fluid activity.

- Consolidation state of sediments in and around faults

At Site 948 in the Barbados prism, high-quality density measurements demonstrated under-consolidation around faults, indicating that the faults had recently loaded subjacent sediments. The consolidation state can also be interpreted in terms of effective stress and fluid pressure. Clearly, consolidation varies around faults and should be defined to develop any tectonic-hydrologic model of the fluid expulsion system.

- Polarity and shape of the seismic waveform from fault zones

Seismic reflections are created by changes in physical properties that can in turn be measured in boreholes. In principle, the seismic data provide a proxy for these larger-scale changes in physical properties. The polarity and shape of the seismic waveform were mapped and various models formulated for the waveform across décollement zones beneath accretionary prisms. Negative polarity reflections have been interpreted as resulting from either (1) overthrusting of higher-impedance sediment over lower-impedance sediment in Costa Rica, or (2) the reduction of fault-zone impedance through dilation at Barbados. The modeling, however, is incomplete without ground truthing by the in situ measurement of physical properties across fault zones in areas with high-quality, three-dimensional seismic data. Logging data have only been acquired at one décollement locality. These LWD data from Barbados are in an area of positive reflection polarity, and show impedance increases that reproduce the positive polarity in synthetic seismograms. The LWD results also suggest thin (0.5-1.5 m) hydrofractures within the interval of positive polarity in the décollement zone. The hydrofractures apparently are too thin to be resolved seismically. A major question is whether negative polarities elsewhere in the Barbados décollement consist of thicker zones of hydrofractures.

Leg171B—Blake Nose

Co-Chiefs: Richard Norris and Dick Kroon	Cruise Dates: 9 January–14 February, 1997
Staff Scientist: Adam Klaus	Operations Superintendent: Roland Lawrence

The origin of deep waters is a fundamental control on biogeochemical cycles and global climate. Analysis of time periods in which deep-water formation and global temperature gradients may have been much different from well-known Pleistocene variability offers a test of the models developed to explain climate change.

Oceanic circulation in the Paleogene and Cretaceous was quite different from that of the modern ocean in part because of the greenhouse conditions that existed during part of this time and the apparent absence of major centers for deep-water formation in the northern basins. Many authors have suggested that deep-water circulation was enhanced in the Cretaceous and Paleogene by the production of warm, saline waters by evaporation in marginal seas such as the basins of the Tethys, but there are few observational data to provide unequivocal support for this “Warm Saline Deep Water” hypothesis.

The sediments on the Blake Plateau and Blake Nose in the Western North Atlantic offer an ideal record for reconstructing water-mass chemistry and circulation in the Cretaceous and early Cenozoic. The plateau’s location in the

Northern Hemisphere, proximal to the western end of the Tethys seaway, makes the deposited sediments ideal for determining northern sources of deep and intermediate waters. Leg 171B will drill five sites in a transect from the margin of the Blake Plateau to the edge of the Blake Escarpment. Paleogene and Barremian-Maastrichtian strata crop out or are present at shallow burial depths in present water depths of 1200 m to more than 2700 m across the plateau. Today this depth range spans deep thermocline water to upper North Atlantic Deep Water. The plateau spanned a similar range of depths in the early Cenozoic because margin subsidence was largely complete by the Early Cretaceous, and minor subsidence since then is partly offset by reduced sea level after the Eocene.

The deep waters of the world represent one of the largest reservoirs of nutrients and CO_2 in the biosphere. The history of deep ocean circulation is integrally tied to the CO_2 storage capacity of the oceans and the preservation of carbonate sediments in the deep sea. Aging of deep water by remineralization of sinking organic material makes these waters extremely corrosive and gives them a major role in the inorganic carbon cycle by remineralizing carbonates that would otherwise be stored in sedimentary sequences. Hence, changes in the age and sources of deep waters regulate the alkalinity and CO_2 content of the deep sea.

Studies of Paleogene and Cretaceous deep-water circulation and its impact on low-latitude climate are needed to understand the mechanisms that regulate the formation and geographic distribution of nutrient-rich deep waters in the modern oceans. Examining deep-water history during periods with different boundary conditions will allow us to better appreciate the mechanisms that drive biogeochemical cycles. Leg 171B will drill a transect on the Blake Nose to test current models for the Paleogene and Cretaceous history of intermediate and deep waters in the Atlantic and Tethys. Recovery of well-preserved pelagic microfossils and a detailed history of sediment sources will be used to determine the linkages between climatic and biological evolution and changes in deep-water circulation during the Paleogene and Cretaceous.

Presently, deep waters are formed in the North Atlantic and Southern Ocean, and it is the mixture and aging of these water masses that produces the characteristic chemistries of the deep Indian and Pacific Oceans. The distribution of $\delta^{13}C$ in Paleogene benthic foraminifers suggest that most deep waters of this era have a southern source, but periods of weak latitudinal gradients and short episodes of anomalously warm deep water indicate that deep or intermediate waters may have formed near the equator or in a northern source area. Another theory is that intermittent production of Warm Saline Deep Water may have continued in the Oligocene to middle Miocene in the remnants of the Tethys seaway. Alternatively, northern component waters may have formed throughout this time, most probably in the North Atlantic. The absence of a Paleogene depth transect in the North Atlantic prevents resolution of this debate. The northern subtropical location of the Blake Plateau and its position adjacent to the western opening of the Tethys seaway would place it in the mixing zone between water masses of different origins during the Paleogene and Late Cretaceous.

Most reconstructions of deep-water geometry have focused on the late Neogene to Holocene record. Paleogene sequences have generally been too deeply buried to be recovered either completely or consistently along depth transects. Yet, the three-dimensional structure of Mesozoic and early Cenozoic oceans is of great interest because these oceans record climates and patterns of water-mass development under conditions different from those of modern seas. As such, an understanding of Paleogene and Cretaceous deep-water structure is necessary to provide boundary conditions on global climate models and test the assumptions employed in models of the Quaternary oceans. Likewise, records of surface-water temperatures and variations in biotic assemblages are needed to constrain reconstructions of latitudinal thermal gradients.

Objectives

The objectives of Leg 171B will be to drill five shallow sites (170-600 m penetration) in a transect from the margin of the Blake Plateau to the edge of the Blake Escarpment. The proposed transect of cores will be used to:

- Interpret the vertical structure of the Paleogene oceans and test the Warm Saline Deep Water hypothesis near the proposed source areas, with a related objective to provide critically needed low-latitude sediments for interpreting tropical sea-surface temperature and climate cyclicity in the Paleogene;
- Recover complete Paleocene/Eocene and Cretaceous/Paleogene boundaries along a depth transect to describe the events surrounding the boundaries and water depth-related changes in sedimentation of the boundary beds;
- Interpret the thermocline and intermediate-water structure of the low-latitude Cretaceous oceans and refine the biochronology and magnetochronology of this period;
- Study Cretaceous and Paleogene climate variability by analysis of marine biota and regional sedimentological patterns;
- Study the rate and mode of evolution of marine biota in the Cretaceous and Paleogene oceans; and
- Investigate climate variability and plate motions using the paleomagnetic signal.

Leg 172 —NW Atlantic Sedimented Drifts

Co-Chiefs: Lloyd Keigwin and Dominico Rio	Cruise Dates: 19 February– 16 April, 1997
Staff Scientist: Gary Acton	Operations Superintendent: Ron Grout

The Blake-Bahama Outer Ridge (BBOR) and Carolina Slope (CS) form the western boundary for deep- and surface-water circulation in the North Atlantic. Between the northward-flowing surface waters of the Gulf Stream and the net southerly flow of intermediate and deep waters, most of the climatically important exchanges of heat, salt, and water with other ocean basins occur in the western-most North Atlantic. Leg 172 is designed to monitor changes in these water masses and their fluxes through the late Pliocene and Quaternary. Virtually all water transported by the Gulf Stream to sites of convection in the northern North Atlantic comes from the western subtropical North Atlantic. The CS (~1–2 km depth) underlies the axis of the Gulf Stream, as well as the shallowest component of Labrador Sea water. At depths greater than ~2 to ~4 km, the Blake Outer Ridge monitors changes in North Atlantic Deep Water (NADW), and the Bahama Outer Ridge (~4 to 5 km depth) extends coverage from the deepest components of NADW to Antarctic Bottom Water (AABW). On geological time scales it is known that during cold epochs the North Atlantic switches from today's circulation mode of deep nutrient-depleted water mass production (i.e., NADW) to production of a less dense nutrient-depleted water mass at intermediate depths. A shallow component of Labrador Sea water was identified recently, which interacts with the Gulf Stream and probably controls the distribution of sediment on the CS. This water mass may be the modern equivalent of glacial NADW. According to the "Great Ocean Conveyor" paradigm, knowledge of the history of these surface, intermediate, and deep-water masses is essential to understanding the world ocean's role in climate change. Drilling on Leg 172 will provide paleoenvironmental records for late Neogene hemipelagic sediments that are deposited at accelerated rates on western North Atlantic sediment drifts on the BBOR and CS. These two areas may represent the only sediment drift locations in the world's oceans where it is possible to conduct high-resolution paleoclimate studies through a 3500-m range of water depths. Data obtained from the gyre-center, which will be sampled at the Bermuda Rise (BR) site at a depth of ~4.5 km, will be compared with data from sites located at deep, high-deposition-rate locations on the BBOR and CS to document late Neogene oceanographic changes in the western North Atlantic for millennial, as well as Milankovitch times scales over the entire deep and intermediate water column. In addition to geochemical and micropaleontological studies of climate change, the hemipelagic composition and high deposition rates of BBOR, CS, and BR sites will enable high-resolution studies of magnetic reversals and excursions, and studies of current-controlled sedimentation.

Sediment drifts are widespread in the North Atlantic basin and reflect both the abundant sources of sediment and the focusing of the sediments by deep currents. There is at least one sediment drift associated with every water mass in the North Atlantic, suggesting a potential for tracing the individual components of NADW on geological time scales using geochemical and sedimentological techniques.

Leg 172 will core 11 sites: seven primary and one alternate on the BBOR, two on the CS, and one on the BR. The main purpose of Leg 172 is to provide a latest Neogene depth transect for documenting changes in depth distribution of water masses. The geographic range of sites may also help distinguish between latitudinal changes in the mixing zone between southern and northern-source waters and changes due to vertical migration of a benthic front, especially when considered in the context of other recent ODP legs such as 154 and 162. A North Atlantic depth transect at the BBOR is especially important, because this feature forms a western boundary for deep currents, which follow depth contours. Above ~4000 m depth, these waters mostly have a northern source, whereas, at greater depths there is a greater proportion of recirculated southern-source water.

BBOR coring is essential to document and understand first-order changes in the ocean-climate system such as glacial-interglacial variability in the production and flow of North Atlantic water masses and changes in terrigenous, authigenic, and biogenic fluxes. In addition, coring on sediment drifts with high deposition rates is especially important in order to understand North Atlantic climate on millennial and even centennial time scales.

Objectives

The major objectives of Leg 172 are to obtain a detailed history of late Neogene paleoceanography and paleoclimate in the North Atlantic by investigating 1) millennial scale oscillations of stable isotopes (C and O), faunal and floral abundance, percent carbonate and other lithologic components, and trace metals in drift deposits; 2) the nature of cyclicity of these oscillations; and 3) how these cycles are related to the history of Northern Hemisphere glaciations during the late Neogene.

In addition, scientists on Leg 172 will investigate:

- Sediment wave migration and drift sedimentation processes;
- Detailed variations of the Earth's magnetic field (secular variations and reversals);
- Geotechnical/acoustic properties of deep-sea sediments; and

- Geochemical signals associated with the formation, dissociation, and distribution of gas hydrate.

Leg 173—Return to Iberia

Co-Chiefs: Bob Whitmarsh and Marie-Odile Beslier	Cruise Dates: 21 April–16 June, 1997
Staff Scientist: Paul Wallace	Operations Superintendent: Michael Storms

The Galicia Bank and Iberia Abyssal Plain segments of the west Iberia margin were drilled during Legs 103 and 149 and have been extensively studied geophysically. Leg 149 determined landward and oceanward limits to the ocean-continent transition (OCT) of the crust off western Iberia by drilling an east-west transect of holes. However, only one of these holes penetrated basement between these limits. This site, Site 900, cored 56 m of fine- to coarse-grained gabbro that had experienced synrift dynamic re-crystallization under granulite facies conditions at 136.4 ± 0.3 Ma, according to $^{40}Ar/^{39}Ar$ dating. Geophysical data clearly show that the OCT has magnetic and seismic velocity properties that are in some sense transitional between continental and oceanic crust. Multichannel seismic reflection profiles, one of which has been recently reprocessed, strongly indicate that, although the eastern (landward) part of the OCT is dissected by deeply penetrating normal faults and low-angle detachments, these die out westward (oceanward) into a region of smoother basement that lacks significant intrabasement reflectors and is of uncertain origin. Leg 173 will drill a small number of holes to basement, on basement highs mainly within the OCT, to complete the Leg 149 transect. These holes will characterize the OCT, test models of lithospheric (crustal) extension, determine the extent of synrift magmatism, and examine the nature of the oldest oceanic crust.

In the Iberian Abyssal Plain Leg 149 defined landward and oceanward limits to the crustal OCT, where the transition zone is defined as the region between a margin-parallel peridotite ridge marking the landward edge of ocean crust and the most seaward tilted fault block of continental crust. However, only one hole (Hole 900A) penetrated basement in the 130-km-wide region between these limits. Leg 173 is a sequel to Leg 149, and it will enable (1) drilling and coring of a well-imaged major detachment fault (an analogue to the S-reflector), (2) recovery of more rift-related igneous material (e.g., gabbro) and its host rock (mantle), continental crust or slow spreading oceanic crust, (3) testing of the nature of the topographic high between Site 900 and the most landward known serpentinite basement outcrop, and, finally, (4) sampling of the oldest oceanic crust. These observations, together with the improved quality and quantity of seismic images, will allow the addressing of the modes of breakup of the lithosphere, the timing and nature of melt generation from the mantle during the final stages of rifting and, the nature and age of early-formed "normal" oceanic crust. The planned drilling will also add to knowledge of the early sedimentary history of the rifted margin.

Objectives

- Sample acoustic basement, principally within the OCT, to characterize the tectonic and magmatic processes that dominate the transition from continental to oceanic crust in space and time.
- Determine the role of detachment tectonics in the evolution of the margin. This will be done by drilling through a seismic reflector, interpreted as a major tectonic contact or detachment, on the east side of the high on which Site 900 has already been drilled. This new site will also enable determination of the kinematics of deformation and tectono-

metamorphic evolution of deep lithospheric levels during a rifting episode and will help to assess the lateral extent of the Site 900 mafic rocks. Another site will be drilled on the western-most basement high associated with a westward-dipping normal fault, to test the prediction that simple-shear, as a thinning mechanism of the lithosphere, led to the exposure of low-level continental crust (or even uppermost mantle) at this point of the OCT.

- Determine the role and extent of synrift magmatism in the OCT crust, which is inferred to exist from the new magnetic anomaly chart and other data. Use isotope data to determine the petrogenetic origin and dates of original crystallization and subsequent metamorphism of igneous rocks and to characterize synrift underplated material.
- Sample acoustic basement beneath Site 901 or Sites IBERIA08A/8B to confirm predictions of the existence of continental crust, determine the approximate level in the crust from which it came, thereby setting an unequivocal landward limit to the OCT, and define geometrical relationships between deep and shallow lithospheric levels.
- Sample the early-formed oceanic crust, as this would complete the whole transect from continental to oceanic crust. Its presence is inferred only by geophysical observations. Samples from this site (Site IBERIA10A) are expected to provide definitive evidence of the oceanic nature of the crust immediately (20 km) west of the peridotite ridge and may enable the seafloor-spreading model to be verified. They will also yield the, possibly unusual, chemistry of the thin crust formed by the earliest magma-starved seafloor spreading and provide valuable petrological and geochemical information about initial melt production (c.f. Site 900 gabbro) following continental break-up at a non-volcanic margin.

Ship's Schedule

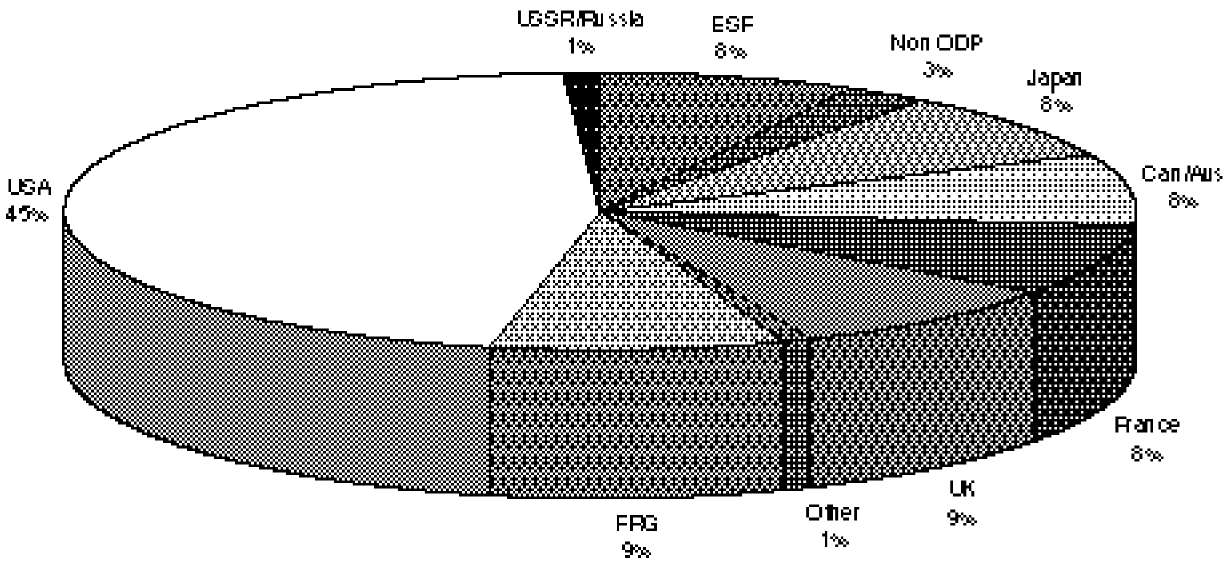
Leg name	Cruise dates	Port of origin*	Total days	Days in transit	Days on site
Leg 170					
Costa Rica	22 October–16 December 1996	San Diego, California, U.S.A.	56	11	45
Leg 171A					
Barbados LWD (Logging While Drilling)	21 December 1996–8 January 1997	Panama	18	7	11
Leg 171B					
Blake Nose	9 January–14 February 1997	Bridgetown, Barbados	36	6	30
Leg 172					
NW Atlantic Sediment Drifts	19 February–16 April 1997	Charleston, South Carolina, U.S.A.	56	15	41
Leg 173					
Iberia	21 April–16 June 1997	Lisbon, Portugal	56	10	46
Leg 174A					
New Jersey Shelf	21 June–19 July 1997	Halifax, Nova Scotia, Canada	28	3	25
Leg 174B					
CORK Hole 395A	22 July–10 August 1997	New York, New York, U.S.A.	19	14	5
Leg 175					
Benguela	15 August–10 October 1997	Las Palmas, Canary Islands, Spain	56	19	37
Leg 176					
Hole 735B	1523 October–10 December 1997	Cape Town, South Africa	56	16	40
Leg 177					
Southern Ocean Paleoceanography	15 December–9 February 1998	Cape Town, South Africa	56	16	40
Leg 178					
Antarctic Peninsula	14 February–11 April 1998	Puntas Arenas, Chile	56	18	38
Leg 179					
NERO/Hammer Drilling	16 April–30 May 1998	Cape Town, South Africa	44	22	22
Leg 180					
Woodlark Basin	4 June–30 July 1998	Singapore*	56	14	42
Leg 181					
SW Pacific Gateways	4 August–29 September 1998	Townsville, Australia	56	15	41
Leg 182					
Great Australian Bright	4 October–29 November 1998	Wellington, New Zealand	56	13	43
Leg 183					
Kerguelen	4 December–2 February 1998	Fremantle, Australia	60		

Although five-day port calls are generally scheduled, the ship sails when ready.
* Under review.

Ship's name change

The name of the ship has been officially changed through the Liberian Registry from the "SEDCO/BP471" to the "*JOIDES Resolution*" effective 11 November 1996.

Staffing Information



Country	No. of Scientists Sailed
ESF	129
Non ODP	44
Japan	132
Can/Aus	138
France	141
UK	142
Other	11
FRG	148
USA	761
USSR/Russia	17
Total	1663

Pie chart shows percentage of scientists from member countries who have sailed aboard the *JOIDES Resolution* on Legs 100–171.

Current staffing status

All cruises are fully staffed through Leg 173. The Leg 174 science party has received letters of invitation to participate in the cruise. Until their responses are received, no further applications will be processed. Staffing activities for Legs 175–on have not yet begun.

Applications for participation on cruises can be found at:

http://www-odp.tamu.edu/sciops/cruise_application_info.html

NEW INITIATIVES

Reorganization of the Ocean Drilling Program

Introduction

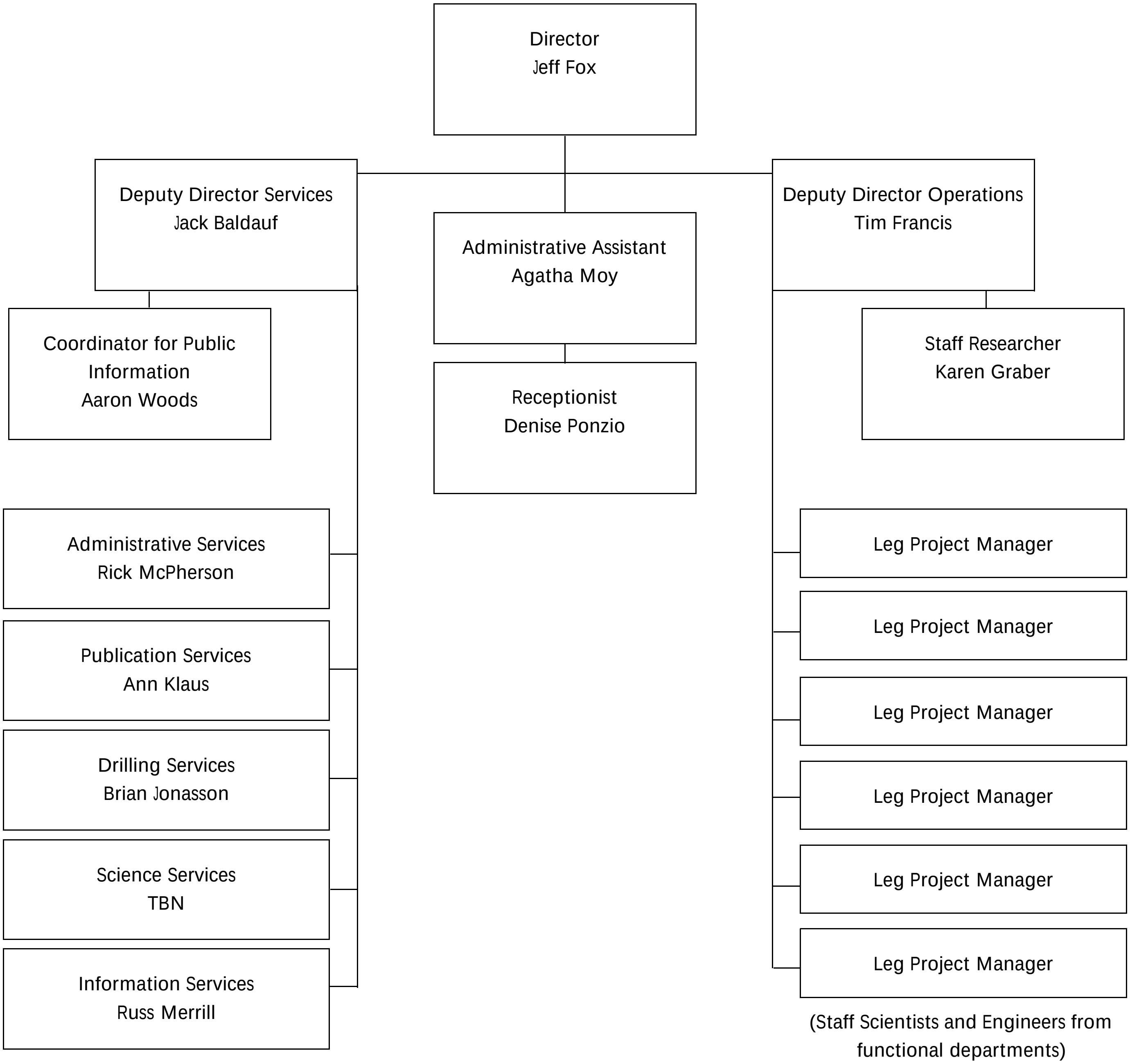
Since last spring when the Program's leadership challenged all components of the Ocean Drilling Program to achieve optimal effectiveness, a number of initiatives have been implemented at ODP/TAMU that are designed to make us even more effective in delivering our services. In response to a request by the Program's Executive Committee, we have incorporated the principles of Project Management, with a goal to better integrate activities across functional boundaries and to develop a better linkage between costs and the services we provide. As a consequence of the incorporation of Project Management into our organization, we have modified the job requirements for our staff scientists who will have increased authority and responsibility for the services provided on a leg of drilling operations. We have, in addition, reviewed the long range science objectives of the Program and used these data to define a five year strategic plan for ODP/TAMU focused on achieving enhanced science delivery to ensure long term competitiveness. To achieve the goals of these initiatives most effectively, ODP/TAMU instituted a major reorganization in December.

To arrive at the new ODP/TAMU organizational model, the Director's Office utilized contributions from a broad range of sources including recommendations by ODP/TAMU staff, comments provided by the science community, and proposals made by a management consultant team hired specifically to review the organizational structure of ODP/TAMU. The new model is revolutionary in that it fundamentally alters our organizational structure to most effectively incorporate leg-based project management while maintaining a coherent and supporting functional structure. Furthermore, we achieve greater functional efficiency by re-distributing disciplinary expertise within the organization. The re-organization results in the elimination of one functional department and affects 74 positions in the organization by modifying, reassigning, eliminating existing positions, as well as creating positions. The benefit will be a more streamlined and integrated organization, allowing ODP/TAMU to be more competitive by providing the best service to the community for the lowest possible cost.

New organization

Review of both the old organizational structure and departmental tasks has identified areas where structural reorganization will enhance the efficiency and cost-effectiveness of the overall Program. This transformation includes redefining departmental functionality, eliminating departmental redundancies, redefining individual task assignments, creating new positions, and eliminating positions no longer necessary. The new ODP/TAMU organization consists of the Office of the Director, Administrative Services, Science Services, Drilling Services, Information Services and Publication Services, and represents a significant structural change reflecting a substantial paradigm shift. The premise of the new structure is that ODP/TAMU activities are divided into two distinct, yet intertwined, functions—operations and services. Operational functions focus on activities related to the successful implementation of each scheduled cruise using project management techniques. Service activities focus on all tasks that indirectly support leg functions or are a consequence of leg-related projects such as strategic planning, technological developments, personnel, resource allocation, publications, and data and core archiving. Effective management and facilitation of these two components will be the responsibility of two Deputy Directors. The current Deputy Director position is modified to the Deputy Director of Operations and the position of Deputy Director of Services is newly created. This divided Deputy Director structure is necessary to ensure appropriate supervision, direction and

Figure 1. Ocean Drilling Program/Texas A&M University structure.



resource management of both functional departments and leg operations. Such a structure also allows the Director to maintain broad programmatic oversight of ODP/TAMU, while also having sufficient time to deal effectively with external obligations of the Science Operator.

Included in this new framework is the integration of the technical functions and corresponding personnel into the Science Services Department, and integration of the logistical functions and appropriate personnel into the Drilling Services Department. This modification eliminates redundancies of effort, unifies implementation of programmatic goals, provides consistency in responsibility and authority, maximizes the cost-effectiveness of the technical and logistical services ODP/TAMU provides to the client, and ensures closer scientific overview of technical support functions. With redistribution of responsibilities and supporting personnel, there is no longer a need for a Technical and Logistics Department.

Modifications proposed for the Information Services Department focus on better integration, oversight and cost-effectiveness of services provided to the science community and other ODP/TAMU departments. The Curatorial group was originally assigned to this department based upon individual experience, not on functional alignment. Curation is a scientific service and requires closer alignment with Science Services. Management of the Curation function must carefully balance the requirement to implement a sampling policy that maximizes the science that can be obtained from the cores with the responsibility to preserve the cores for decades until new scientific technology enables even more information to be gleaned. In order to provide greater scientific oversight, the Curatorial group is transferred to the Science Services Department.

Second-order changes include reassigning the computer systems operation in Administrative Services to the computer group in Information Services and photographic services in Publication Services to Information Services.

Central to this new order is the adoption of leg-project management and an overall team approach. The formalized use of leg-project management throughout ODP/TAMU for cruise-related and special operating activities is new and requires substantial changes in routine procedures. In the new structure, Staff Scientists and, when required, Engineers will become Project Managers for legs and will coordinate leg-related resources including personnel, budget and a team consisting of representatives from each department. This team will be responsible for all aspects of each cruise.

Project Management

The advisory structure of ODP/TAMU has stated that the Program will incorporate the principles of project management as an operational paradigm. The incorporation of project management will be phased in over approximately 2½ years and started summer 1996.

The ODP/TAMU Administration Department hosted a two-day programming workshop with the assistance of consultants from the American Management Association. Attending were JOI and NSF representatives, senior management from the science operator, and administrative support personnel. The purposes of the meeting were:

- to develop an appropriate project management implementation program,
- to define ODP/TAMU activities and how they will be grouped into projects, and
- to develop a course of instruction related directly to the needs of ODP/TAMU employees.

At the conclusion of the workshop, legs were divided into three categories characterized as

- Project A: Pre-cruise proposal ranking with development of operational parameters and costs.
- Project B: Operational legs.
- Project C: ODP leg publications.

Additional projects were identified and fixed budget services were defined. Initial efforts were made to identify project managers for the three categories of a leg, the responsibilities of each of these project managers, and the persons to whom these project managers will report.

Project A

Project A began soon after the August 1996 PCOM meeting and was devised to provide PCOM with cost and feasibility estimates of proposed legs enabling them to effectively evaluate drilling proposals. Each year the highest ranked scientific drilling proposals will be evaluated by the Project A team prior to the December PCOM meeting. In this meeting, PCOM will select about 6 of these to be scheduled for the next year of drilling operations. Pivotal in the evaluation process is the concept of the "standard leg." A "standard leg" is a minimal definition of leg costs and, as such, creates a financial base to which the additional costs for more sophisticated operations can be added (Table 1). Note: Table 1 reflects the old organizational structure and is currently being revised in the light of the recent changes. In addition, the costs associated with providing the full range of laboratory services have also been broken down into their component parts in line with EXCOM Motion 96-1-14: Component Costs.

When evaluating a proposal, its deviation from the standard leg in terms of costs and the resources it requires will be considered. The project A team must also weigh parameters such as proposed area of operation, site locations, and estimated number of days in port/transit in order to produce a cohesive FY plan maximizing the operational usage of the ship and scientific results, and satisfying the demands of the FY budget. The first report by the team (for FY98) will be submitted to PCOM for consideration at its December 1996 meeting (this will be PCOM's last meeting; in future, the ship's schedule will be determined by OPCOM in August).

In general, a standard leg of scientific drilling operations consists of 4 to 10 drill sites with 1–3 holes drilled per site. Typically, sites are in water depths ranging from 1000–4500 m of water and penetration depths of the holes will vary between 100 and 1000 mbsf. Core recovery of 2500 m of unconsolidated sediment and sedimentary rock is anticipated. A deviation from this norm does not necessarily imply a non-standard cruise. However, holes drilled deeper than 1000 mbsf or in water depths larger than 4500 m tend to increase the likelihood of technical complexity, higher usage of expendables, and accordingly the potential for higher operational costs.

Specifically a standard cruise can be defined as follows:

1. Only basic "operational" coring systems are used including the Advanced Piston Corer (APC), Extended Core Barrel (XCB), and rotary core barrel (RCB). Other operational wireline tools such as Tensor electronic core orientation hardware, Adara temperature measurement tools, and the Kinley wireline crimper/cutter capability should also be considered routine for standard cruises.
2. No seafloor structures or casing strings are required for standard cruises with the exception of a free fall funnel (FFF) which may be the result of a planned deployment (to save operational time) or an unplanned deployment as required by the operational situation.
3. Standard cruises do not require special drilling/coring hardware, instrumentation packages, complex/or novel operational techniques, or additional technical expertise during the planning stages or onboard ship during cruise operations. In addition these cruises do not require the use of a support vessel or consultants.

Table 1 shows standard leg costs based on 2500 m of recovery of unconsolidated sediment and sedimentary rock.

Table 1. Standard leg costs

Pre-Cruise (20 month duration)		**$604,559**
Administration	30,050	
Publications	3,000	
Engineering	360,406	
Technical and Logistics	155,100	
Science Operations	34,028	
Information Services	20,872	
Curation	1,103	
	604,559	
Cruise		**$451,186**
Administration	2,299	
Publications	0	
Engineering	48,845	
Technical and Logistics	335,700	
Science Operations	17,340	
Information Services	47,002	
Curation	0	
	451,186	
Ship Operations - ODL	3,498,702	**$3,596,819**
Ship Operations - ODP	98,117	
	3,596,819	
Post-Cruise (36 month duration)		**$543,568**
Administration	50,637	
Publications	324,051	
Engineering	22,893	
Technical and Logistics	84,000	
Science Operations	39,708	
Information Services	17,064	
Curation	5,215	
	543,568	
Grand Total		**$5,196,132**
Grand Total less Ship Expenses		**$1,599,313**

Note: this table was constructed before the reorgnaization, and reflects the old departmental structure.

Project B

Once the ship's schedule has been determined by PCOM (OPCOM) each leg will then be identified as a separate project (Project B). Each leg will have its own project manager, probably a staff scientist or drilling operations specialist. The job of the project manager will be to oversee all aspects of the leg, from the planning stages to the end of ship operations at sea, and the production of IR volume content at the first post-cruise meeting.

Project C

An implementation plan for Project C will not be developed until current publications issues are resolved.

JOIDES Resolution Refit

The *JOIDES Resolution* was constructed in 1978 as the Sedco/BP 471, initially for use as an oil exploration vessel. In 1984, after being awarded a long term and

exclusive contract with the Ocean Drilling Program, the vessel was converted from oil exploration service to function as a scientific research vessel. Since January 1985, the Sedco/BP 471 has been known in the scientific community as the *JOIDES Resolution* and has been the center of the very successful Ocean Drilling Program. During this period the *JOIDES Resolution* has operated extremely efficiently and has attained a reputation as one of, if not, the world's most successful ocean research vessels.

In 1998 the *JOIDES Resolution* will be 20 years old. While the vessel continues to operate efficiently there are several vital systems aboard which are obsolete by today's technological standards. Many of the systems original manufacturers are no longer in business and spare parts are no longer obtainable. In addition new technological advances have been introduced to the industry which provide for enhanced safety, efficiency and reliability when compared to the older technology now aboard the vessel. Even though the *JOIDES Resolution* is nearly 20 years old, with the proper upgrades in equipment and maintenance there is no reason to suggest that the vessel cannot continue to operate as efficiently and effectively as in the past for another 15 to 20 years in the future.

The uninterrupted operation of the vessel over the past 15 years has not allowed for complete stripdown, inspection and repair of several systems. If ODP is to continue operating as successfully in the next century as it has become accustomed to, the opportunity to extend the original contract for another 5 years at the existing conditions with the injection of 5 Million in 1992 dollars (based on current rate of escalation it is anticipated that the ODP contribution expected by the ship's owners will be 6.0 Million spread over 1997, 1998, and 1999 with an additional 3.3 Million which they themselves may contribute) is in effect a very attractive consideration when viewing other options available. After such an upgrade and repair period, the *JOIDES Resolution* can once again embark, with confidence, on a journey to continue unraveling the mysteries of the Earth.

Drydock typically means taking the vessel completely out of the water so that those sections normally under water can be inspected and protected. The current plan is to carry out the necessary drydock activities to meet classification society requirements and the terms of the contract extension over a two month period in June/July 1999. This schedule accommodates the scientific program plan and allows for appropriate management planning, design and equipment procurement activities prior to the drydock.

The vessel has been in drydock twice since the contract with ODP/TAMU commenced. A summary of the past and future drydock costs is presented in the following table.

Year	Location	Approximate Cost	Purpose	Upgrades
1989	Singapore	$1,200,000	Routine-maintain class	None
1994	Falmouth	1,500,000	Routine-maintain class Repair tank corrosion	None
Planned 1999	Far East Singapore?	Estimated $6,000,000 ODP $3,300,000 ODL =$9,300,000 total	Routine-maintain class Prepare for 5 more years Replace obsolete equip. Service existing equip. Improve Quarters Add Improvements	Proposed: Station Keeping (ASK) Power Generation Thrusters Propulsion and Steering Drilling Systems Living Quarters Lab Stack Hull, Tanks, and Pipework Shipboard Systems Health Safety and Environment

Discussions between ODP/TAMU and ODL have identified some ship related improvements which may take place during dry dock, such as modifications to the major labstack and downhole measurements lab.

Drilling and Coring Technology Development

ODP/TAMU has proposed a workshop to review operation, technology, and equipment needed in relation to boreholes greater than 2 km deep. The team will include members of the science community, and will review and evaluate the technology required to meet the Long Range Plan and see if it is sufficient to meet the requirements of the science objectives. It will also serve as a platform to disseminate information on the full capabilities of the *JOIDES Resolution*.

Re-Entry Boreholes

Only around 30 of the more than 1000 holes drilled by ODP/TAMU are available for re-entry and further measurement. A BOREHOLE (BORE Hole Observations Laboratories and Experiments) group want to change this by integrating post-drilling sub-seafloor science into the program. A workshop is proposed in 1999 to deal with re-entry holes and define how to proceed both in technology and requirements to meet the Long Range Plan and science objectives.

High Speed Transmission of Log Data

Contributed by the Borehole Research Group, Lamont-Doherty Earth Observatory (LDEO-BRG).

Beginning with Leg 166, LDEO-BRG has been routinely utilizing high-speed satellite equipment to transmit log data from the *JOIDES Resolution* to shore. Transmitting log data for rapid processing enhances the accuracy of shipboard logs data analysis and reporting and increases data quality control. Data are corrected for depth, borehole conditions, and environmental effects on shore, then returned to the ship within days of logging. This “near-time” response has been very well received by both the shipboard scientists and operations personnel.

The deployment of VSAT (very small aperture terminal) satellite equipment, leased from Schlumberger on a trial basis, has realized transmission rates up to 180 Kbps. VSAT equipment consists of a stabilized mount and antennae currently located on the helipad. Electronic equipment is integrated into the Maxis 500 data acquisition system making installation and operation extremely simple. Two antennae dishes and radios are available as the ship moves between various satellite coverage regions. A 1.2 meter satellite dish is utilized when in the Ku-Band footprint, typically located within 100 miles of the continental United States. When out of the Ku-Band footprint, a larger 2.4 meter dish and more powerful radio are installed to capture the less focused energy of the C-Band thus extending the effective coverage area of the system. Presently, the VSAT system coverage includes the waters adjacent to North America and the majority of the Atlantic including Africa. Satellite coverage, however, is not at present available in all oceans.

To extend beyond the operational limits of the VSAT system and to more fully integrate with ODP/TAMU operations, LDEO-BRG began investigation of other high-speed data transmission alternatives. During Leg 170, an Inmarsat B terminal was made available to ODP by the SeaNet program for testing. The unit had previously been used aboard the R/V *Thompson*. Inmarsat B satellite coverage is global between 70 degrees north and 70 degrees south latitude. The system is an ABB Nera Saturn Bm with a SeaNet Communications Node for high-speed (64 Kbps) data transmission. The lower transmission rates with this system, however, will make processing of images on shore prohibitively expensive.

Initial tests of log-data transmission from the *JOIDES Resolution* have been very successful. A joint satellite communication arrangement among LDEO, TAMU, and Sedco is the ultimate goal of the present tests. Both Sedco and TAMU personnel are examining these systems so that the most suitable system for ODP/TAMU as a whole can be chosen. It is anticipated that a permanent system will be in place in mid-FY 97.

Entertainment Facilities

Gym

Optimal use of the limited space available on the ship is always a high priority and nowhere more so than the gym. In the past, ODP/TAMU and Sedco have endeavored to keep the gym up to date and well stocked with modern equipment. Feedback from the ship indicated that the universal-gym, the center piece of the area, was beginning to wear out. It was cumbersome, too large and inadequate by modern standards. Therefore, the decision was made to purchase a new Pro Trainer Multi-Gym, a comprehensive system which also eliminates the need for some of the home made and bulky peripheral equipment currently used. The new equipment will be shipped to the *JOIDES Resolution* in time for Leg 171A.

Satellite television

The plan to install 3 satellite TV stations along with 6-7 on board channels for dissemination throughout the ship is currently on hold. It is hoped that funding can be secured for this project in the near future.

Public Relations

The Ocean Drilling Program Museum Exhibit was transported from Edinburgh, Scotland to a permanent site at the Senckenberg Scientific Research Institute and

Natural Museum in Frankfurt, Germany. Senckenberg is the site where Dr. Alfred Lothar Wegener made his initial presentation on continental drift in the 1920s, laying the foundation for the first serious study of what would evolve into the theory of plate tectonics.

Several public relations activities during port calls in San Francisco, Victoria, and San Diego, a product of teamwork between JOI, ODP/TAMU, and onsite hosts, helped enhance the public visibility of the Program with ship tours, local media coverage in each city and special events for government officials and the scientific community.

The Discovery Channel sent a film crew to San Francisco to interview David Falvey and Jeff Fox for a documentary program to be aired in December 1996.

A new 30-minute video produced by the Public Information Office, titled "A Planet In Motion," will soon be completed. This video replaces an out-of-date one and provides an introduction to ODP and the *JOIDES Resolution*. It will be distributed to the ODP directorates of each partner.

Implementation of Publications Changes

New publication format

On Friday, 13 September 1996, ODP/TAMU received a directive from JOI that outlined the new plan for moving from book to electronic publications. The summary below outlines the plan.

A Publications Steering Committee is being formed to provide advisory input to the Publications Department during the shift to electronic publications. The activities of the Steering Committee and the developments made by the Publications Department will be reported at all JOIDES Scientific Committee (SciCom) and EXCOM meetings.

During FY97 the Publications Department will develop a prototype all-electronic volume to be reviewed by the Publications Steering Committee. The shift to all-electronic publishing will proceed only when JOI receives (1) a positive recommendation from the Publications Steering Committee and (2) endorsement by JOIDES SciCom.

Schedule for Implementation

The following outlines the current ODP/TAMU publications plan to move to electronic *Initial Reports* and *Scientific Results* volumes. This plan is based on the assumption that the Publications Steering Committee and JOIDES SciCom endorse the move by the end of FY97.

Initial Reports

Volumes 169–175	
Book	
	scientific overview
	site chapters (including site summaries, operations reports)
	guide to usage of material on CD
CD	
	prime data (core-description forms, core photographs, thin-section descriptions and smear-slide descriptions)
	large tables
	logging figures
	large data sets (including GRAPE, index property, magnetic susceptibility, and natural gamma data)
	viewable/printable copy of book material
Volumes 176 and beyond	
Book	
	none
CD	
	scientific overview
	site chapters (including site summaries, operations reports)
	prime data (core-description forms, core photographs, thin-section descriptions and smear-slide descriptions)
	large tables
	logging figures
	large data sets (including GRAPE, index property, magnetic susceptibility, and natural gamma data)
	viewable/printable copy of book material
WWW	
	All CD material available (viewable, downloadable, printable)

Scientific Results

Volumes 152–168	
Book	
	contains peer-reviewed papers
Note: Beginning with Leg 160: The Publication obligation may be met by publishing in the outside literature after one-year post-cruise. Beginning with 161: SR volumes are limited to 500 pages; reprints no longer published in book.	
CD	
	Viewable volume and data sets (if provided by author)
Volumes 169 and beyond	
Book	
	none
CD	
	Entire publication published on CD
WWW	
	All CD material available (viewable, downloadable, printable)

Schedule for implementation of electronic publication plan						
(Based on directive given by JOI to ODP/TAMU on 9/13/96)						
	FY97	FY98	FY99	FY00	FY01	FY02
INITIAL REPORTS						
Book (site chapters & prime data) + CD (for viewable volume and data sets)	165, 166, 167, 168					
Book (site chapters) + CD (prime data, viewable volume, and data sets)	169	170, 171, 172, 173, 174, 175				
CD viewable volume (site chapters, prime data, and data sets) + WWW version	Develop prototype all-electronic volume		176, 177, 178, 179, 180, 181	182, 183, 184, 185, 186, 187	188, 189, 190, 191, 192, 193	194, 195, 196, 197, 198, 199
SCIENTIFIC RESULTS						
Book	150X					
Book + CD (for viewable volume and data sets)	152, 153, 154, 155, 156, 157	158, 159/ 159T, 160	161, 162, 163	164, 165, 166, 167, 168		
CD + WWW version					169, 170, 171, 172, 173, 174	175, 176, 177, 178, 179, 180

ODP publications policy

(Adopted by PCOM 1989; updated 1993, 1995; revised 16 July 1996)

On 16 July, JOI approved a revised publication policy. This policy outlines the revised regulations concerning publication of post-cruise research. (See Appendix “Publications Policy” on page 68.)

Schedule changes associated with the revised publication policy

1. The *Scientific Results* volumes will be published 4-years post-cruise beginning with Leg 164. The Leg 160 SR will be the last volume published 3-years post-cruise. The SR volumes for Legs 161–163 will be published as follows: 161—42 months post-cruise; 162—44 months post-cruise; 163—46 months post-cruise.
2. Second post-cruise meetings may be scheduled 12–24 months post-cruise.

WWW Publication Project

About one year ago, the responsibility for coordinating the ODP/TAMU homepage was turned over to the Publications Department when ODP/TAMU management commited to the presentation of the ODP/TAMU homepage as an official publication. During the last year, department staff completed the following: streamlined the processing of new files into HTML format and improved formatting procedures for Preliminary Report, Scientific Prospectus, and Technical Note publications.

Members of each department assisted Publications in the redesign process. After the primary audience was defined (a scientist trying to get information about ODP/TAMU), it was agreed that the layout of the first page needed to be redesigned.

The requirements were: a design that downloads quickly and has an easy-to-use format that should not require users to access information via departments, but through menus that listed how to access, view, or obtain important types of information. The ODP/TAMU homepage is an evolving publication that will change as Internet publishing technology changes.

The Publications Department staff developed two prototype designs based on the input of the department representatives and members of the community. These designs were tested by the department representatives and by a focus group of scientists and non-scientists from all of the ODP member countries. A final design was refined in the summer. In October members of the Publications and Information Services Departments converted the main ODP/TAMU pages and the Publications Department pages to the new design. The next step in the ODP/TAMU WWW Project will be to reformat the remainder of the ODP/TAMU pages.

During the fall, the WWW Administrator position was advertised. Responsibilities associated with this position include: developing guidelines for ODP/TAMU's homepage (mission statement, goals, objectives, and policies); working with Publications Department staff to define design and style standards for new format; coordinating development of templates for standard page design; preparing documentation outlining standards for all ODP/TAMU WWW publications; standardizing existing material and converting it to the new format; preparing new WWW pages; coordinating work flow of new material to be designed, formatted, and edited by Publication Department staff and other departments; reviewing all material for appropriateness on ODP/TAMU's site; monitoring pages regularly; establishing a schedule for updates and removal of information; providing a help line for other departments who have formatting questions; supervising Graduate Research Assistants.

ODP/TAMU homepage location

http://www-odp.tamu.edu/

Review the new homepage design and submit feedback to:

webmaster@odp.tamu.edu

Test publications in electronic format

Test CD-ROMs have been produced for the Legs 163/164 *Initial Reports* volumes and the Leg 151 *Scientific Results* volume. These volumes will be distributed in November and December, respectively.

The first *Proceedings of the Ocean Drilling Program* manuscript was published on the World Wide Web in November. The 150X *Initial Reports* Supplement is available for viewing in both html and Acrobat formats.

HTML file URL: http://www-odp.tamu.edu/publications/150x/index.htm

Acrobat URL: http://www-odp.tamu.edu/publications/150x/150x_1.pdf

Both formats were prepared to allow the community to explore the differences and capabilities.

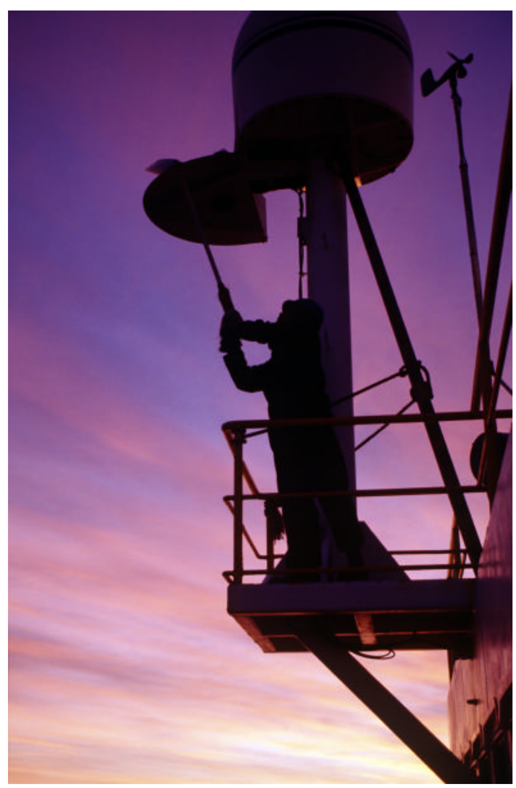
The HTML file, while quick and easy to access, does not print well, and images are less than consistent. Each section requires a separate print operation, as well.

The Acrobat file, which requires the user have the Acrobat Reader, is slower to download, but prints to the capability of the user's printer. It is paginated and the entire file prints as one print job. Because the original PostScript files were available of the images (no scanning was required) it allows extraordinary close-ups.

To download a free version of the Acrobat Reader see the Adobe site. Copies of the Reader are also available as shareware on recent ODP/TAMU CD-ROMs (163 and 164 IR, and 151 SR).

http://www.adobe.com/prodindex/acrobat/readstep.html

Project Summaries



JANUS

A major paradigm shift in the way material and scientific data are collected, managed and accessed on board the *JOIDES Resolution* is set to occur on Leg 171B. The existing data collection systems will be replaced by an integrated set of applications and a new relational database which will provide a central repository for all the data collected on board (the JANUS project). This includes operations related functions as well as the material tracking and scientific data collected for all cores and the samples taken from them. Significant highlights include;

- A new corelab application for the entry of cores, sections, etc.;
- A new sample application used at the sampling table for the entry of samples taken and their related data;
- Collection of MST and Physical properties data controlled via a visual front-end provided by ODP, with the data being uploaded through JANUS to the Oracle database;
- Logging data will now be immediately uploaded and stored in the database;
- A new Paleontology application will be used in the paleontology laboratory;
- The chemistry laboratory will provide integrated visual spreadsheet-like applications for data entry and tracking; and
- Core description will utilize a third party program (AppleCore), with the data being saved in Oracle.

All data collected through these interfaces will be stored in a common database that maintains the appropriate relationships (e.g., core->section->sample->depth-> shear measurement).

Progress

Since the Miami port call (Leg 165), a great amount of progress has been made on the JANUS Project. During that port call, the DEC Alpha servers (hudson and byrd) were installed on the ship, as well as the JANUS database and client builds that were available at that time.

A production database and a test database were installed at the shore-based facilities at Texas A&M University in College Station, by ODP/TAMU and Tracor personnel. These databases were installed to provide the Marine Computer Specialists with a tool for JANUS training, as well as a means of testing the ship-to-shore and shore-to-ship data transfer functions. In addition, ODP/TAMU and Tracor personnel cooperatively installed the defect tracking database at the ODP/TAMU facilities. The defect tracking database is currently being utilized to record and track bugs which are discovered in the JANUS applications either on the ship or on shore.

Functional status

At the present time, Tracor considers the development of Group 1 applications (Corelog, Curation, Sample, Operations, Splicer) to be 100% complete and user group requirements met. The following tasks have been completed: software development, functional specifications, on-line help, user manual, test plan, and build test. Still incomplete is the internal documentation of the software source code, but this does not affect functionality of the code. ‘Complete’ does not mean ‘perfect’ and there may still be some minor software bugs, but the applications have been tested quite extensively at ODP/TAMU in College Station, at Tracor in Austin, and on the ship. No major problems are being found now in the Group 1 applications. Extensive data collection and testing have taken place during the current (Leg 170) and previous Legs.

As of mid-October 1996, software development was considered by Tracor to be 100% complete for MST, Logging, Paleontology, Phys Props M&D, Chemistry IW, Chemistry Carbonate, and Chemistry Rock/Wet. The Phys Props V&S was considered to be 95% complete, and the Chemistry areas of Gas, Support, XRD and XRF were in various stages of completion. No testing has been done since that time to substantiate this information.

A final decision to deploy JANUS on Leg 171B will be made on December 13, 1996. The current view (end Nov 1996) is that deployment will almost certainly take place on Leg 171B. A contingency plan is in place in the event that any catastrophic problems were to occur where data might be lost; therefore ODP/TAMU is confident that deployment can take place even if problems are detected. Extensive shipboard testing will take place on the deployment leg, and problems will be corrected as they are found in the production environment. The actual environment found on the ship cannot be recreated on shore, so the most crucial testing toward acceptance of the product will occur on the ship during the deployment and subsequent legs. Tracor is obligated to correct any defects which are found during this time before final acceptance of the product, after which maintenance of the software will devolve upon ODP/TAMU personnel.

Plans for Leg 171B

There are certain risks associated with the deployment and initial production use of a system of this magnitude. In order to minimize the risks, two different approaches will be taken. First, two developers from Tracor, Inc. (the subcontractor who developed the system) will be sailing on Leg 171B. They will be working split shifts, so that there will always be someone available for consultation, explanation or problem handling. Second, the existing S1032 data collection system, spreadsheet templates, processes, etc. will remain on board. In the unlikely event that the new system must be backed off, the old system will be put in place for use during the remainder of the leg. This is viewed as highly unlikely but these situations must be planned for.

JANUS Steering Committee (SC)

The 18–20 October JANUS SC meeting recommended the following:

1. ODP/TAMU should sail one of its application developers on Leg 172.
2. The smear slide module should be deleted.
3. Implementation of the current logging data module should be stopped, primarily because it uploads only raw data. Tracor is to ensure that the processed logging data are correctly integrated into the data model and will develop a report that presents processed data parameters versus depth. LDEO will write the upload parsers, etc., to get processed data into JANUS. All testing of IPL and GLT logging modules will be abandoned until LDEO and Tracor have completed their requirements.
4. Officially, the SC concluded that Tracor has met all of the user group design requirements for those modules that were complete.

The next SC meeting will be at the Charleston port call, 13–18 February 97, to review the production version after 171B. This will be part of the acceptance process.

Implementation schedule

Deployment: Leg 171B (9 Jan.–14 Feb., 1996); testing and acceptance: Leg 1 72 (19 Feb.–16 April, 1997); and warranty support: mid July, 1997.

Related applications

ODP/TAMU has programmed enhancements to the curation sample request screens that are actually part of, and incorporated into, the JANUS application. Other JANUS related development by ODP/TAMU includes the JANUS Repository Sampling (JRS) and Biblio applications. JRS, a program for doing sampling in the repositories, has been ready to go for months now. Biblio (Bibliographic Application) is a publications database linked to the sample requests to verify publications and cross reference research. All three of these applications are currently in the hands of the users and being looked at in test mode. In addition, coulometrics and moisture density software applications have been delivered and are currently in use on the ship.

JANUS web

http://janusaxp.tamu.edu

This homepage is being developed as an exercise to review the viability of providing Internet access to the JANUS database. Both the homepage, and the database it queries, are still under construction.

JANUS Phase II (Visual Core Description Project)

At a meeting of the JANUS Steering Committee in March, Tracor announced that, under the current contract, they would not be able to complete development of the User Group 4b/5 applications. Because of this, the members of User Group 4b/5 met to discuss alternative solutions. An existing software product was evaluated by members of the various JANUS working groups, the scientific community, Tracor, and the publications department at ODP/TAMU. The evaluators agreed that, with some modifications, this application would generally suit the Group 4b lithologic core description requirements, the JANUS database interface, and the publication of the *Initial Reports* volumes. The task of developing visual core description is now referred to as JANUS Phase II.

The next step was to produce a statement of work for the project. The statement of work was completed and contractual issues are currently being settled between the parties. This statement of work identifies the modifications that must be accomplished by the software developer in order to use the application as a sediment description tool.

In addition, during FY97, it is ODP/TAMU's goal to determine the user requirements for the application. This will require working with members of User Groups 4b/5, the development of prototypes, and a complete definition of the software development environment.

Data Migration

The Data Migration project was set up in order to migrate the ODP legacy data from its current diverse format files into the new Oracle JANUS database. Obviously, the data migration work depends on successful completion of the JANUS data model. The data model for User Group 1 (Corelog, Sample, Drilling, and basic Leg, Site, Hole) was completed by Tracor in July 1996. Since then the Corelog and Sample S1032 data attributes have been mapped into the JANUS data model, SQL scripts have been written to migrate those data, and some data migration to a TEST database has been accomplished.

The actual migration of these data will proceed after the JANUS system becomes operational on the ship (planned for Leg 171B). The data model for User Group 2a (MST), User Group 3 (physical properties), and User Group 4a (chemical properties) data is being worked on by Tracor and is likely to be completed before the JANUS system becomes operational. The Information Services Department plans to prepare a Request For Proposals (RFP) and select subcontractor(s) to migrate those data to the JANUS database.

Split-core MST

A representative from GEOTEK sailed on Leg 169 with a split-core MST track, as part of an ODP feasibility study.

Results of the feasibility study

Hardware

The GEOTEK MSCL is well designed and built. Hardware and controlling electronics are well integrated. All aspects of track and sensor control are handled by a dedicated microprocessor. This microprocessor is in turn controlled by a host computer that downloads the measurement parameters. During logging the microprocessor sends the host computer continuous information on track position and sensor data.

Software

The new version of the GEOTEK software is currently being modified and still has a few bugs that need to be worked out. But overall, the interface is very good (for windows) and relatively intuitive once the fundamentals are understood. In a few hours several members of the science party were trained to log cores. The GEOTEK software allows for some limited real-time processing of the data. The user can re-scale the graphical displays and edit bad data points. Occasionally, this type of activity will cause the program to hang but this is a rare event.

Raw and processed data collected from each sensor are written to separate binary files. Utilities are available to convert these files into an ASCII format. These files are immediately available for plotting by the scientist once the depth information has been merged with the log file.

Operations

ODP's MST proved to be much faster at processing the cores than the GEOTEK MSCL. One reason for the difference in speed is that the GEOTEK MSCL must raise and lower the PWL (minimum of 4 seconds). Also, the pusher must be adjusted manually for sections less than the default 150 cm, which is much slower than loading a core boat. But the main reason for the delay is that there is only room for two split cores, therefore, core description or sampling can hold up core logging.

The argument that pushing the cores can provide better data by eliminating end-of-section effects, does not apply to a MST track with a point MS sensor and no NGR. The point MS can only sense 1 cm of core, unlike the loop sensor which integrates over 8 cm or the NGR which can integrate over 20 cm of core. It would actually make more sense for a push system to be on ODP's MST rather than GEOTEK's.

The push system requires constant monitoring to prevent core jambs, wetting transducers, and removing and loading cores. Also, it is very important that the users insure that the core is flat (cut surface is normal to the P-wave transducer) so that an accurate thickness measurement is made by the P-wave transducers. This is very important because the thickness measurement is not only used for the velocity calculation but for correcting the GRAPE data as well.

With good piston cores there was no advantage in using the GEOTEK's MSCL over ODP's in regards to GRAPE and P-wave measurements, although, the point

MS is clearly superior to the loop MS in terms of both data quality and resolution. In XCB and rotary cores, the GEOTEK P-wave produced velocity data where ODP's P-wave could not, and GEOTEK's GRAPE data were better because they were corrected for thickness.

Reconfiguring the GEOTEK MSCL into two tracks

High-resolution measurements with the point MS sensor and the ability to select good sections of core for spot P-wave and GRAPE measurements is the only clear advantage of the GEOTEK MSCL over the ODP MST. Therefore, the GEOTEK unit was purchased by ODP/TAMU as a test bed for further development. To be successful, the development work needs to address questions such as;

- Where is the best place to take these measurements in the lab and still maintain good core flow;
- How can the impact on work loads for scientific and technical staff be minimized;
- How can limited laboratory space be utilized efficiently; and
- Measurements must be conducted on the appropriate core half.

The proposed solution will be to produce two half core tracks. One would involve upgrading the VS track to measure user specified intervals on the working half, adding the GRAPE, replacing the PWS#3 (Hamilton Frame) with the GEOTEK P-wave, and motorizing the track. GRAPE and P-wave measurements would be under computer control and a joy stick would be used to position the core for Vane Shear and PWS 1 and 2 measurements. The second track should be built for high-resolution scanning of archival cores. It would be designed for the point MS, the Minolta spectrophotometer, and a digital line scan camera.

To summarize, there would be a working-half track for low-resolution, selective physical properties measurements and an archival-half track for high-resolution point MS, spectroscopy, and imaging. As yet no funds have been allocated for the development work, although some funds remain in the budget after a judicious purchase. It is estimated that these funds would be sufficient to initiate the development work.

Solaris 2.5 Upgrade

A Solaris version of the seismic acquisition software “A2D” was supplied a by University of Hawaii developer but was found to contain severe bugs. The developer has not agreed to debug the software at this time. The project team initiated a back-up plan utilizing in house expertise to rectify these deficiencies. This resulted in the production of an apparently functional (bug-free) version of A2D and deployment is now scheduled for Leg 171A. Testing will be conducted on the backup seismic acquisition computer in parallel with the primary system (running SunOS). Testing will take several legs at least to show if it is possible to phase out the SunOS 4.1.3 operating system in the Underway Laboratory.

New Jersey Shelf (Leg 174A)

Seafloor mapping over the proposed shelf sites was conducted in May–June 1996. Bathymetric and backscatter data was presented to PPSP in College Station 19 September.

At the PPSP meeting the following decisions were taken;

- The 7B sites in 66 m water depth were determined to be too shallow to drill. None of the 7B sites are approved for drilling.
- Site 8B-1 was rejected. Site 8B-2 was approved to 1166 mbsf and Site 8B-3 to 1165 mbsf. Site 8B-3 is to be the primary site for this location.
- Site 9B-1 is approved to 1096 mbsf. Site 9B-2 is approved to 1199 mbsf. Site 9B-3 is approved to 1206 mbsf.

Diamond Coring System

ODP/TAMU carried out an in-house technical audit of the present derrick mounted DCS and also commissioned an independent safety assessment to comment upon the use of the DCS. Both reports gave it a fundamental clean bill of health from a safety and technical viewpoint, with associated recommendations for improvements.

In continuation of the TEDCOM recommended phasing of DCS work, the *JOIDES Resolution* Top Drive and Compensation System has been instrumented for collection of data during the range of coring and drilling operations. Data are being collected at present. Initial teething problems have been ironed out and Leg 170 is attempting full data gathering. This data collection is to be used to verify the controller system and simulation studies already completed, and proceed the DCS to a land test using the new controller. Some of the data collected may be unreliable due to the specification of the sensor. This is being investigated at present.

Primary heave compensator improvements

The primary heave compensator seals have been reviewed and options to change are now available. Measurements will be made on the condition of the cylinders during the June 1997 Halifax port call (Leg 174A) and two replacement options, plus re-packing with original type materials, will be the choices available. If at all possible the sensors presently fitted will remain in order that the performance of the compensator, with new seals, can be evaluated. The most favored seals can only be used if the cylinders are in good condition and this cannot be determined until inspection which will take place at the same time as replacement. An operation schedule has been developed.

Active heave compensation

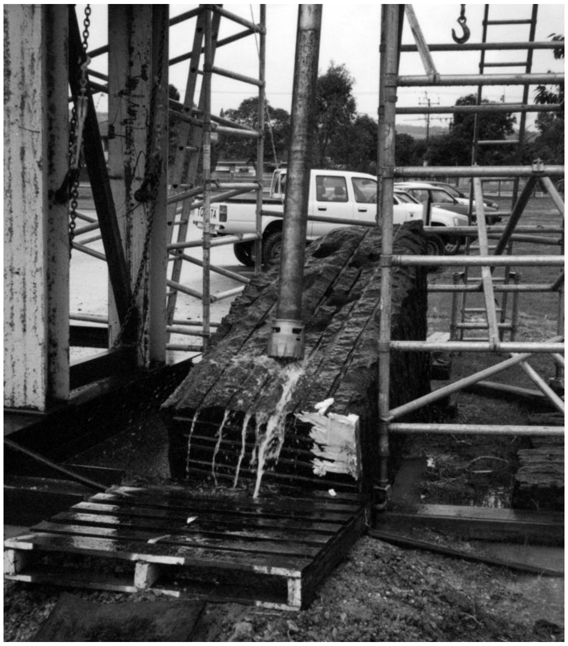
The ultimate aim of the DCS is to operate it at the rig floor (DCS Phase 3). It has been proposed that work on the DCS in its present form stops, and consideration be given to using the immediate savings to purchase an Active Heave Compensator (AHC) system to act as the primary heave compensator. AHC has already been identified by TEDCOM as being useful to assist (together with low friction seals) in bringing the residual heave that the secondary compensator has to deal with, down to acceptable levels.

An AHC system will improve all coring activities on the *JOIDES Resolution*, and may allow the secondary active heave compensator on the current DCS design to be eliminated.

(See “Technology and Engineering Development Committee (TEDCOM)” on page 59.)

Hammer Drill System

Hammer Drill tests were performed by SDS Digger Tools, PTY. LTD. of Canning Vale, Australia. These field tests were successfully completed in early August of



Inclined spudding tests with ring style bit.

this year as part of Phase I of the Hammer Drill project. Results from this testing program were encouraging and have resulted in ODP/TAMU recommending that the development of a larger hammer be pursued.

The primary objectives in the initial tests were to determine whether the hammer and bit combination would spud on high inclination slopes and whether casing could be drilled in at the same time as the hole was being drilled. Both of these objectives were satisfied during the field testing program.

It was hoped that holes could be spudded at angles of 15–30 degrees to simulate what had been encountered at hard rock locations similar to those at MARK, EPR and other spreading ridge centers. The actual results of spudding with the hammer/bit combination were above expectations. The two part bit successfully started holes at angles of 15–45 degrees. Seven tests were performed with each attempt resulting in a hole being started in the black granite test piece. The bit was operated both with and without the outer casing shoe portion of the bit.

The second portion of Phase I was to drill in 7" casing with the SDS 4¾" water hammer using the same 7½" two- part center bit tested during the inclination work. This 4¾" water hammer was initially designed for bits of 5½" diameter. Even though the water hammer was not the optimum size for the bits being tested, SDS agreed to perform the tests with the existing "off the shelf" hammer. This tested the hammer at a lower efficiency than a custom designed hammer for the size of bit being drilled. The test resulted in ODP/TAMU being able to assess if the hammer worked as claimed by the vendor without a large capital outlay for a custom design during this initial phase. The test also provided SDS the opportunity to see how far the envelope could be pushed using larger sized bits with an existing hammer.

The second half of the field testing program entailed actually driving-in casing. Originally, two 20+ m drill-in casing holes were planed to be performed. In actuality, only one 21 m hole was achieved. The results in achieving less than the proposed program plan were due to ancillary equipment and drill-water supply problems at the remote quarry site and not due to inadequate hammer performance. The hammer did perform as designed, despite the fact that it was being asked to drill a larger hole than it was originally designed to accommodate. The average rate of penetration with the 4¾" hammer drilling a 7½" hole was 3.72 m/hr. Rates as high as 7.35m/hr were recorded during the tests. Based on the results of the water hammer and bit tests, ODP/TAMU has recommended that the next Phase of the project be initiated.

Results of inclined spudding tests. Note: bit walking until securing a toe hold to make hole.

Currently ODP/TAMU is discussing several options for Phase II of the Hammer Drill project with SDS Digger. In the original contract, a larger sized hammer was to be built if the prototype testing was successful. These hammers were envisioned to be capable of drive-in 16″ casing. Since that time, SDS has designed and begun to manufacturing three 12¼″ hammers for a different project. The project for which these hammers were produced has been delayed. Therefore, SDS has offered them to ODP/TAMU. Since the objective of hammer casing project for Leg 179 is to test the hardware by driving casing from the surface into hard rock, it really does not make much difference whether this is demonstrated with 13 3/8″ or 16" casing at this time. There is a considerable cost difference between these different size hammers and the associated hardware to support the larger hammers. Consequently, it is felt that the selection of the 12¼″ at this time is a more prudent decision based on the available funds and manpower available within ODP/TAMU.

There are still some technical and contractual hurdles which will have to be cleared, but two 12¼″ prototype hammers are available for testing during Leg 179. Also, one eccentric, and one retractable bit will be used with the hammer. Casing will be suspended from the top of the drill string.

Technical issues which are yet to be resolved are

1. weight on bit requirements;
2. level and magnitude of field test prior to going to sea; and
3. flow rate and pressures obtainable from the current mud handling system on the *JOIDES Resolution* to support the size of hammer selected for Phase II. Determinations will be made during the Panama port call.

(See (“Technology and Engineering Development Committee (TEDCOM)” on page 59.)

Note: At the December 1996 PCOM meeting it was decided to postpone the Hammer Drilling to Leg 179 (formerly scheduled for Leg 174B). This allows the saving of 10 days from the 1997 schedule providing 2 days for the extension of the Halifax port call and bringing the schedule after leg 174B forward by 8 days. Bringing the schedule forward was necessary to allow the ship to leave the Antarctic Peninsula area by the end of March 1998 (the end of the good weather window). The Kerguelen leg will start in early-mid December 1998.

Fisseler Water Sampler

Following its deployment on Leg 164, some changes were made to the electrical system of the FWS. These changes required some of the internal plumbing to be re-routed. The internal plumbing system was pressure tested after all new tubing and fittings were installed. The complete tool was also tested under simulated hydrostatic pressure at the TFAC. The tool functioned properly during test and was shipped to Leg 169 for further field testing. However, the FWS was not run on Leg 169 as planned as, in general, formation temperatures were too high. At the one site where it could have been run, time constraints dictated otherwise.

Davis/Villinger Temperature Probe

Recent history, performance on Leg 168, and current status

After being successfully tested to 414 mbsf during Leg 164, a second tool was completed, along with a third spare tip including thermistors, and two additional thermistor strings. This second tool was deployed 45 times during Leg 168 with 100% data recovery. Depths of measurements ranged from about 40 to 575 mbsf, and formation temperatures ranged up to 64°C.

The DVTP proved to be extremely robust. Contact with basement did not damage the tool, nor did using the tool as a “smart” sinker bar for checking hole depths prior to running in CORK sensor strings and gaining a temperature log at the same time.

A program, originally created to reduce marine heat flow probe measurements (which require extrapolation of penetration transients that follow cylindrical decay functions), has been modified to run with a conical decay function matched to the dimensions and thermal properties of the probe tip. This program, dubbed “Conefit,” will be described in a paper being prepared as part of the Leg 168 SR (Grigel, Villinger, Fisher, and Davis). Also, a general description of the tool, its operation, and its data (Davis, Villinger, Macdonald, Meldrum, and Grigel) is being prepared for the Leg 168 IR volume.

Initially, a problem was encountered with the dimensions of the spacer subs for use in the XCB core-barrel assembly, causing too little of the tool to be extended below the bit after the tool was landed (something like only 6 inches). This explains the partial penetrations observed during Leg 164 and early in Leg 168 (with only the tip thermistor correctly registering formation temperature). The problem of partial penetration did not completely disappear after the space-out was revised. It is suspected that a problem still remains with attaining reliable latch-in (with the tool properly extended by 1.1 m beyond the bit, with a full 10 k lbs load limit). Partial penetrations usually gave reliable formation temperatures at the tip thermistor, but agreement between the extrapolation of the lower and upper thermistors (separated by only 10 cm) was rare. A careful investigation of this problem may also help to explain some of the problematic data from the WSTP tool.

Future development of the DVTP may involve adding pressure capabilities to the tool. This will help tremendously when using the tool in “logging” mode, and, although it may be too optimistic, it is hoped to be able to recover formation pressures at a level of accuracy sufficient to make some advances in understanding the distribution of pressures in accretionary prisms and near décollement faults.

(See “Downhole Measurements Laboratory” on page 51 and “Downhole Measurements Panel (DMP)” on page 60.)

XCB Shoes

Carbonado Diamond shoes have been designed, purchased, and deployed on the ship. However the bits have only been used on one occasion so far. Currently there are not enough applications to run them, and therefore insufficient data to determine if these shoes should be added to the current arsenal.

Gulf Coast Repository Expansion (GCR)

The expansion of the GCR that will create refrigerated space for cores to be recovered from the Indian and Pacific Oceans in 1998 to 2003, will also create an additional 4000 sq. ft. of office space. This office space will be utilized by Administration and Public Information, and their existing areas in the "A" building will be reallocated. Plans for the expansion were submitted to TAMU facilities planning in September 1996.

FAMIS

In September, ODP/TAMU's Administration Department completed its first year of operations using the new accounting system called FAMIS. The system is used to set up budgets, input transactions and produce reports. During the first few months of the year, procedures were developed for handling all routine and unique transaction types that are encountered in conducting ODP/TAMU business.

On completion of the fiscal year, Administration closed general and subsidiary ledgers and support accounts for FY96. Outstanding items (posted invoices, purchase orders, "to be obligated funds") were transferred to FY97 in a one-step process. The old IMS system first required all items being transferred to be individually deleted from the previous year's books and then reinput in the new year. The process under FAMIS was much simpler, thereby reducing the occurrence of inputting errors and allowing the closeout process to be completed in considerably less time.

Development is continuing on a supplemental database which stores financial transactions downloaded from FAMIS on a daily basis. The database, which is currently used for ad hoc queries, will meet specialized reporting and information retrieval needs for internal and external parties. Development is also continuing on formal, written departmental policies and procedures for the FAMIS system.

LABORATORY WORKING GROUPS

Paleomagnetism Laboratory

2G cryogenic magnetometer

Installation took place as planned during the San Francisco port call. The software delivered by the vendor failed to provide the needed data reduction and did not allow entry or storage of the ODP sample conventions. This deficiency was temporarily rectified by Greg Lovelace and Margaret Hastedt (Marine Laboratory Specialists) who wrote LabView Software for the 2G Enterprise Model 750R Magnetometer.

During Leg 169, Bill Mills wrote a program "CRYO" as a permanent solution. Based on the algorithms of the earlier program, the new program included a graphical user interface similar to that of the Multi-Sensor Track (MST) device, and incorporated output fields that had been suggested by the Paleomagnetism LWG. Also the Vexta stepper motor was changed to a Compumoter stepper motor, which is the same motor that controls the automated track on the MST.

The magnetometer and the software were thoroughly tested by scientists and technicians during the San Diego port call (18–21 October, 1996). The software proved to be extremely impressive, as was the sensitivity of the new magnetometer.

Alternating field demagnetizer

The GSD-1 is to be replaced by a more efficient and modern unit, the D-2000 from DTECH.

Advantages of the D-2000:

- Handles 4 (or more) samples at the same time
- Relatively inexpensive
- Small
- Built-in ARM, pARM
- Higher peak AF fields (up to 200 mT)
- Easy to control with excellent software

The D-2000 has been ordered and is currently being built. It is hoped that it will be sent out to the ship in time for Leg 171.

Computer Laboratory

Standard UNIX configuration

A standard UNIX configuration has been defined and is in the process of being implemented for both the UNIX machines on shore and those on the ship. The primary advantage and the objective of this standardization is to create the capability for shore testing of user introduced UNIX applications before they are installed in the shipboard environment. This should provide for early identification and resolution of problems that might exist because of differences between the user's native UNIX environment and our standard.

USERVOL disk

Generally all science reports and shipboard data are placed on this disk and are accessible to all scientists. The entire disk can now be copied onto backup media (such as 1 Gb Iomega Jazz cartridges), which should be considered a positive step. A concern expressed by some scientists, however, is that personal data, processed shipboard data, or personal science reports, which were not intended for general use, will be copied by others. The USERVOL was never intended to have personal accounts attached to it nor to be a place to store "protected" data. In fact, its purpose is to provide a disk where information can be made available to all.

Creating accounts would defeat the purpose of the disk and would be difficult to administer.

Having these data available, however, does not give users the right to abuse the privileges of the owner(s). For instance, files created by others should not be moved nor should reports or data be used without permission of the creator. Proprietary data that a user does not want to have viewed by others should not be placed on the USERVOL, but should be stored on the user's personal backup media.

Scientists wishing to take home these data from the ship should provide their own backup media.

AppleCore status

A new version should be ready by January 1997. The old version was used during Leg 169 and will likely also be used during Leg 170.

ODP/TAMU web pages on the ship

The Marine Computer Specialists take a copy of all public ODP/TAMU web files from the shore-based server approximately 1–2 weeks prior to departing for port-call. Thus, the shipboard web files are regularly updated and will include the Scientific Prospectus for the current leg.

LabView software for lab equipment

The new LabView software for the cryogenic magnetometer is yet another exceptional package that will make using the magnetometer simpler and more efficient.

In view of the proliferation of LabView software for lab equipment, further training of Lab Technicians who are interested will be encouraged. Expanding ODP's pool of LabView experts is an important step in maintaining and further developing the high-quality software of the labs.

Status of PC/MAC applications and upgrades

PC's will eventually run Windows NT, but the change will not likely occur for 6 to 8 months. In the mean time, Excel, Word, and most other PC software versions will not likely be upgraded. Once NT is installed, these software packages will likely be upgraded to the new 32-bit versions.

Fiber Optics Cable (FDDI)

The cables were installed, but are not yet linked to computers. More funding (~$50,000) is needed before this project can be completed.

Downhole Measurements Laboratory

"WSTP Adara-style" data loggers

Health problems with the primary Adara developer have resulted in an additional delay in delivery of the new "Adara style" data loggers for the WSTP tool. Adara has informed us that it will take an additional 3–6 months for delivery (Spring '97). Any additional delays are hoped to be avoided as they may impact WSTP temperature measurement capability. Adara expects to be able to provide more concrete delivery date by the end of 1996. Adara temperature tools that were damaged during 1996 will be sent to Adara for repair once new WSTP data loggers are delivered.

Computer upgrade

A new Pentium (166 MHz) computer will be delivered to the DHML for Leg 171.

Underway Geophysics Laboratory

6-channel seismic streamers

Tests during Leg 168 successfully collected a small amount of analog data on the chart recorders. However, the first streamer failed (signal lost, flaky depth readout) and the crew were unable to get the digital acquisition system to acquire, display, and archive the seismic data. The problem streamer was returned to the manufacturer for repair. The second streamer was successfully tested on Leg 169. Additional testing needs to take place to determine optimum towing depth to ensure best quality data.

Innovative Transducers, the streamer manufacturer, decided to provide a new streamer to replace the one which failed on Leg 168. Delivery is expected in late November 1996 after which it will be prepared (weight, electrical testing) prior to deployment on Leg 172/173.

Chart recorders

Four new EPC chart recorders, to replace 3.5 and 12 kHz PDR's and two analog seismics, arrived at ODP/TAMU in October. Initial testing is being conducted on all four. A statement of work for software control and annotation (via navigation acquisition system software-Winfrog) is being prepared. Deployment date will depend on the progress of software development.

Winfrog real-time navigation software upgrade

The latest version of Winfrog was installed by Pelagos during the San Diego portcall. Pelagos personnel met with U/W technicians to show them how their software is used by ODP, and to discuss software features, operations, and potential future changes.

Solaris 2.x upgrade

(See Project Summaries, "Solaris 2.5 Upgrade" on page 43.)

Leg 174A (New Jersey Shelf) dGPS

Omnistar dGPS service will need to be reactivated for this leg.

Chemistry Laboratory

Rock Eval/GHM evaluation

Although one of the organic geochemists on Leg 167 was interested in conducting the SMP requested comparison between the two instruments, because of the tremendous amount of core recovered and technical difficulties with the GHM, the comparison could not be conducted.

CHNS analyzer

The CHNS analysis system has been reconfigured. However, the last three legs (Legs 168, 169 and 170) have all required sulfur analysis. Therefore, SMP has made the recommendation that the possibility of replacing the GHM with a LECO S analyzer should be investigated. The chemistry LWG will be looking into the cost and support requirements of the LECO system.

Headspace sampler

Responding to SMP's request, the chemistry laboratory working group has been evaluating possible designs for a uniform HS sampler. To obtain constant volume samples in both soft and indurated lithologies, the LWG believes two different samplers will be necessary: one for soft sediments and another (similar to the SMP-proposed battery operated hand drill with serrated steel tube) for indurated samples. In all the proposed designs investigated to date, the ability to cut the sample once the device has been pushed/drilled into the core seems to be a major stumbling block. ODP/TAMU engineers are being consulted for possible design solutions.

Coulometer

Labview software to operate the coulometer and associated microbalance have been completed by IS and tested by Chemistry MLSs on shore. The software was installed during Leg 169S and was used during Leg 169. According to the MLSs on Leg 169, the program ran well and promises to streamline the measurement process significantly. They have made several suggested minor modifications to further improve the program. IS has already completed these modifications and an upgraded version of the software was sent to the ship for Leg 170. Additional suggestions are expected from the MLS sailing on Leg 170.

Physical Properties Laboratory

Teka thermal conductivity system (TK04)

The new Teka system has been installed on the ship. It functions well but is not integrated into the 'ODP system' in terms of the computer front end, and its ability to download data to Janus. Also the system still features only one probe. Further development is on hold pending a planning workshop to include WHOI, Teka, and other specialists.

MST upgrade

Natural Gamma-ray Spectral Data

The NGR has been changed (Leg 169) from 2048-channel to record 256 channels. However ODP/TAMU will look into the possibility of this overwhelming the database.

The acquisition of appropriate custom-made standards (for K, U, and Th) from Isotope Labs has been approved by SMP.

Gamma-ray Attenuation Calibration

Density calibration standards which could be used for the existing whole-core MST, were acquired with the purchase of the split-core MST system. Density methods now agree. The previous systematic offset was due to using the wrong density value for Pyrex glass.

Investigation into the purchase of a balance, suitable for determining the mass of whole cores, is still in progress.

Moisture and density methods

A new program designed to allow computer control for moisture and density measurements (MAD) has been written which controls both the balance and picnometer. The program demonstrates compatibility with the Janus database and was installed during the Leg169 port call.

Split-core MST

(See Project Summaries, "Split-core MST" on page 42.)

PANEL RECOMMENDATIONS

Executive Committee (EXCOM)

ODP Staff Liaison	e-mail address
Jeff Fox	jeff_fox@odp.tamu.edu
Date and location of last meeting: 25–28 June 1996, Oslo, Norway	
Date and location of next meeting: 10–13 February 1996, Washington, D.C., U.S.A.	

June 1996–Motions and consensus statements requiring action by ODP/TAMU

EXCOM Consensus 96-2-6

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

Action: See "Implementation of Publications Changes" on page 34.

Planning Committee (PCOM)

ODP Staff Liaison: Tim Francis	e-mail address: tim_francis@odp.tamu.edu
Date and location of last meeting: 19–22 August 1996. Townsville, Australia	
Date and location of next meeting: 9–13 December 1996, LDEO Biosphere 2, Arizona, U.S.A.	

December 1995–Motions and consensus statements requiring action by ODP/TAMU

PCOM Consensus 95-3-13

PCOM, endorsing the recommendation of PANCH, supports the TEDCOM subcommittee's recommendation regarding the acquisition of quotes for the evaluation and construction of the alternative seafloor DCS feed control system, and recommends that JOI ask ODP/TAMU to conduct this evaluation.

Action: Quotes have been received from parvus and Stress engineering. However the project is now on hold for the short term, while the ODP/TAMU revisits the whole controller issue and investigates the potential of activating the primary heave compensator.

PCOM Motion 95-3-16

PCOM advises JOI that it gives a high priority to purchase of scanners and disc storage space for the production of the *Initial Reports* volume. PCOM requests that this equipment be purchased after further investigation of available options and their cost-benefit ratio.

Action: The equipment was purchased in the summer of 1996. The scanner is functional and the server is scheduled to come on line later this year, or early 1997.

PCOM Motion 95-3-18:

PCOM requests JOI to direct ODP/TAMU to raise the price of *Proceedings of the Ocean Drilling Program* volumes to $60 and widen the distribution of volumes rather than to cut the size of the production run.

Action: The revised price list was approved by JOI on 15 May 1996. This included the increase in the cost of books from $45 to $60, and the initiation of credit card payment for publications.

PCOM Consensus 96-1-3

PCOM encourages a workshop to be held in June 1996 to investigate the scientific and technical benefits of using *JOIDES Resolution* to conduct tension pile tests necessary for commercial operations in water depths beyond those accessible by jack-up rigs. Future utilization of *JOIDES Resolution* in such operations would depend on the possibilities of significant benefits to both the scientific and technical communities. Actual scheduling of *JOIDES Resolution* ship-time must be done in the context of other programs scheduled or under consideration.

Action: The workshop on "The Application of Hydraulic Piston Coring to Site Investigation for Deepwater Production Platforms," co-sponsored by ODP/ TAMU and the Offshore Technology Research Center at TAMU, took place on 18 June 1996 in Houston. ODP/TAMU made a presentation which provoked interest from the technical community. However, interest was stalled because of an apparent conflict of interest between the science and technical communities over the use of the ships operational time.

PCOM Motion 96-1-7

PCOM accepts the recommendation of DMP to redefine the geochemical tool string as an ODP Specialty Tool and sees no other significant way to reduce items for inclusion in the WLS Scope of Work. PCOM agrees that the WLS RFP should refrain from descriptions that compel selection of any specific operator as the provider of logging tools.

Action: Legs requiring use of the geochemical tool to attain primary Leg objectives will be flagged under Project A.

PCOM Motion 96-1-18

PCOM recommends the formation of a Detailed Planning Group to further develop and prioritize proposals near Antarctica related to the history and extent of Antarctic Glaciation and Climate (the JOIDES Office will determine which proposals and LOI's are appropriate). The mandate for this working group is to:

1. develop viable drilling plans to constrain the timing and extent of regional glaciation;
2. guide the proponent groups as they assemble relevant site survey information and submit it to the Site Survey Data Bank;
3. prioritize the proposals based on scientific quality and consistency with the ODP/TAMU Long Range Plan;
4. consider operational constraints, recognizing that weather will likely limit the extent of drilling operations in the region; and
5. submit a drilling plan for possible inclusion in the 1998 drilling prospectus for the August 1996 PCOM meeting, and further reports if needed for Fall 1996 thematic panel meetings and the December 1996 PCOM meeting. PCOM will evaluate in its December 1996 meeting whether to disband this DPG, or continue its operation.

Action: The DPG met at ODP/TAMU on 29–31 May 1996. The report of the group was presented to PCOM for its August 1996 Meeting. Three of their proposals for drilling are included in the FY 98 Prospectus of proposals, which the thematic panels ranked at their October 1996 meetings.

PCOM Consensus 96-1-19

PCOM requests that ODP/TAMU investigate the use of differential GPS on board the *JOIDES Resolution.*

Action: A presentation was made to PCOM (August) on the options, costs and implications of such an acquisition. As a result dGPS will be available for Leg 174A (New Jersey Shelf).

August 1996

PCOM Consensus 96-2-7

PCOM expresses its enthusiasm for industrial company consortium plans to design and build a deep 'riserless' drilling system that could provide pressure control and return flow for a deep hole drilled below at least 4 km water depth. PCOM asks JOI to continue to seek ways and means by which ODP interests could join at least the feasibility phase of this consortium, so that consideration of incorporating such a system is part of future ODP drilling plans.

Action: ODP/TAMU has been invited to join the consortium by simply signing a confidentiality agreement. Sufficient parties are already interested to fully fund the project. ODP/TAMU's value to the consortium lies with its potential to test prototype equipment onboard the *JOIDES Resolution* in deep water. A working group meeting will be held in Houston on 19 and 20 December 1996 to begin work on Phase 1 of the project (conceptual evaluation).

PCOM Motion 96-2-8

The contents of the FY98 Prospectus and initial long-term Planning Prospectus to be considered for Thematic Panel ranking shall include the following proposals and programs:

79 Somali Basin, 367 GAB Cenozoic Carbonates, 431 W Pacific Seismic Network, 441 SW Pacific Gateway, 445 Nankai, 447 Woodlark Basin, 450 Taiwan Arc, 451 Tonga Forearc, 457 Kerguelen LIP, 464 S Southern Ocean Paleoceanography, 472 Izu-Marina, 485 Australia-Antarctic Southern Gateway Antarctic DPG 1, 2, 3

Additional programs may be considered by the panels at their discretion. A DCS/LWD Engineering Leg is also to be considered by PCOM for scheduling. The panels and TEDCOM are asked to comment on this proposal, which is included for information in the prospectus.

Action: As soon as the formal schedule is identified ODP/TAMU will begin Project B activities for those legs chosen.

PCOM Motion 96-2-9

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

Publication of the basic information in this format in an *Initial Reports* volume will consist of the site summaries, operations reports, site chapters, one scientific overview authored by the co-chiefs, and a guide to electronic usage.

Other items specified in 96-1-13 for electronic publication, section 3 B (e.g. core descriptions, VCDs, etc.), will remain in electronic-only format and will be published 12 to 18 months post-cruise.

PCOM acknowledges the need for additional cost savings over the original form of motion 96-1-13 and therefore proposes that the *Scientific Results* volume consisting of scientific papers, texts of data reports, and abstracts of papers published outside of ODP, be published in electronic format only, starting with

Leg 169. Electronic publication of the *Scientific Results* volume should be 48 months post-cruise. The publication of the *Initial Reports* volume, 12–18 months post-cruise, in text form will alleviate the need for an initial core description volume as described in 96-1-13, section 5, and this will achieve further cost savings.

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

Action: See "Implementation of Publications Changes" on page 34.

PCOM recommendations to EXCOM

PCOM Motion 96-2-3

PCOM recommends to EXCOM the proposed new advisory structure with wording modified from the version of July 24, 1996 (attached). Under JOIDES Service Panels, the mandate for the new Scientific Measurements Panel will be refined by a sub-committee formed of the present chairs of IHP, DMP, and SMP, plus the following PCOM members: Brown (SMP liaison), Moore (DMP liaison), Suyehiro (Japan), Humphris (PCOM chair-elect) and Sager (IHP liaison and chair of sub-committee). This group shall meet at College Station in November 1996. Any revisions to the mandate will be approved by PCOM through e-mail review.

PCOM Motion 96-2-4

PCOM requests that EXCOM approve the proposed new JOIDES advisory structure before the December PCOM meeting.

PCOM Motion 96-2-5

PCOM recommends that EXCOM approve the attached implementation timetable for the new JOIDES advisory structure, modified slightly from the version of July 24, 1996. The principal revision is that an interim joint SSEP, comprised of two members each from the current thematic panels, shall meet in January, 1997 to initiate proposal mail review.

PCOM Motion 96-2-6

PCOM directs each thematic panel to recommend four of its members to serve on an interim Scientific Steering and Evaluation Committee to meet once, in January, 1997. The panel is to specify which of the proposals received and current as of January 1, 1997, should be sent out for mail reviews, based on guidelines which PCOM will establish at its meeting in December, 1996. The reviews need to be completed in time for the an initial meeting of the new Interior and Environment SSEPs in May 1997.

Technology and Engineering Development Committee (TEDCOM)

ODP Staff Liaison: Brian Jonasson e-mail address: brian_jonasson@odp.tamu.edu

Date and location of last meeting: 30–31 October 1996, Yokohama, Japan

Date and location of next meeting: 24-28 June 1987, College Station, Texas, U.S.A.

October 1996 TEDCOM recommendations to PCOM

TEDCOM Recommendation 96-2-1: Active Heave Compensation

TEDCOM will advise PCOM, by the December 1996 meeting regarding Active Heave Compensation (AHC) which could be fitted to the *JOIDES Resolution* to improve coring.

TEDCOM Recommendation 96-2-2: HDS

The Hammer Drill Project should be closely monitored and be slowed down if good information and favorable results for a *JOIDES Resolution* operation are not forthcoming from SDS, rather than trying to attain a product for an engineering test leg in 1997.

Action: Two TEDCOM panel members will monitor the progress of this project.

December 1996 Recommendations from DCS Subcommittee meeting

DCS Recommendation

At the last TEDCOM meeting, ODP-TAMU proposed deferral of currently planned work on the DCS secondary compensator system and purchase of a commercially available system to provide active compensation to the *JOIDES Resolution* primary drill string compensator, which is now passive. TEDCOM requested its DCS subcommittee to review this proposal in depth and make its recommendation to PCOM. The DCS subcommittee developed these recommendations:

1. DCS Phase 3B and succeeding steps should be put on hold.
2. ODP should proceed with simulations including active primary compensation as applied tothe *JOIDES Resolution*.
3. ODP should proceed with obtaining detailed proposals and competitive bids from Retsco, et. al. for the system.
4. Provisional with available funding and satisfactory simulation results, a high quality active heave compensation system should be procured and installed on the *JOIDES Resolution*.
5. A continuing level of effort by ODP on DCS system and alternatives should be retained.

The *JOIDES Resolution* present passive drill string compensator absorbs 75%-80% of vessel heave with 2500m of API drill string riser attached to the sea floor. Addition of AHC is expected (guaranteed by prime candidate vendor) to increase this to about 90%, and actual performance may be in range of 95%. With this, there is some possibility that much of DCS coring could be accomplished without need of a secondary heave compensator and would provide the large advantage of moving the DCS operator down to the rig floor level. Even if secondary compensator for DCS is eventually required, it could be accomplished more readily. Additional advantages of a more everyday nature for AHC include the following:

1. Core recovery is expected to be improved in all formations, especially under high heave conditions.
2. Capability for landing of equipment on the sea floor, e.g., guide bases,

CORKs, reentries, bare rock spud-in should be improved.

3. Capability for improved operation of a wider range of coring and evaluation tools, e.g., logging is possible.

HDS recommendation

ODP-TAMU proposes to carry out a three stage testing program of the SDS 12 ¼" diameter water percussion drill.

1. Bench testing in Australia (motor only) January 1997.
2. Downhole drilling tests in Norway (motor and bit only) January 1997.
3. Sea trials on the *Resolution* (hammer, bits, drill-in casing system) July 1997.

Success in these three steps would be followed by development of larger and smaller hammers for routine applications.

Subcommittee recommendations to PCOM

1. PCOMs full support of this planned test sequence, assuming timeliness and tool success at each prior stage.
2. More refined analysis of drill string/casing behavior during set down for bare-rock spud-in.
3. Moderate advance expenditures to maintain timeliness of succeeding steps.

Downhole Measurements Panel (DMP)

ODP Staff Liaison: Adam Klaus   e-mail address: adam_klaus@odp.tamu.edu

Date and location of last meeting: 30 October–2 November 1996, Salt Lake City, Utah

March 1996–DMP motions and consensus statements requiring action by ODP/TAMU

Consensus 2-96:

The Fisseler water sampler should be further tested, in mechanically different sediments, to permit evaluation of whether or not additional development efforts are warranted. Comparison of this tool's performance to adjacent WSTP sampling is recommended.

Action: The FWS was not run on Leg 169 as planned as, in general, formation temperatures were too high. At the one site where it could have been run, time constraints dictated otherwise.

September 1996 DMP consensus

DMP is encouraged by the initial results of BRG trials of satellite ship-to-shore communications: both logging operations and the shipboard usefulness of logs were enhanced.

Action: See "High Speed Transmission of Log Data" on page 32.

DMP applauds the BRG initiatives in on-line browsing and access to logging data. Coupled with the current program of rapidly adding older data to the database, this initiative is a significant step toward the long-standing DMP goal of making ODP downhole measurements a truly effective legacy.

Action: See BRG Homepage:

http://www.ldeo.columbia.edu/BRG/brg_home.html

The performance of the Davis-Villinger temperature tool in abundant Leg 168 runs satisfies the third-party tool requirement for a successful ODP test. DMP commends the developers and encourages them to initiate steps to apply for certified status for this tool.

Action: The tool is still on the ship (as of Leg 170) and undergoing thorough evaluation by the technical staff. This includes documenting and evaluating all aspects of its operation, maintenance and the quality of data which it produces. ODP will work together with the third party tool proponent to provide the necessary documentation for it to attain certified tool status (as per the third-party tool guidelines). This process will require significant amount of ODP input during 1997. To be accepted as an "ODP tool," a tool has to progress from certified status to mature, and then finally functional tool status.

Information Handling Panel (IHP)

ODP Staff Liaison: Russell Merrill/Ann Klaus e-mail address: russell_merrill@odp.tamu.edu/ann_klaus@odp.tamu.edu

Date and location of last meeting: 11–13 September 1996, Kiel, Germany

March 1996–Proposals requiring action by ODP/TAMU

Technical Notes

The Paleo Group decided that the Nigrini/Sanfilippo document *Cenozoic Radiolarian Stratigraphy* would be a very valuable Technical Note. They agreed that this document would be valuable in three formats:

1. Hard copy
2. Web version
3. CD-ROM (the Technical Note could be added to an IR or SR viewable volume CD to decrease publication manufacturing costs). The subcommittee recommended that ODP advertise the availability of the publication on the Internet (e.g., micropaleontology list server) and query recipients of Technical Note 24.

Action: ODP/TAMU Publications has published the technical note in hardcopy and will be producing the CD-ROM and Web version during the winter 1996/7.

September 1996

IHP Recommendation 96-2-1: Shipboard Collaboration

The IHP recommends that in the future, any and all collaborative arrangements made among groups of scientist aboard the ship must be approved, monitored, and adjudicated by the Co-Chief scientists of the Leg.

Action: The new policy recommendation has been forwarded to PCOM for consideration. (see "Publications Policy" on page 68, II. Obligations to Publish.)

IHP Recommendations 96-2-3: JANUS

The IHP recommends that JANUS Phase II be implemented as soon as possible. The IHP recognizes that implementation of Phase II will require that new monies be identified to support this effort. There is an immediate need to ensure shipboard capture of data and to provide the shipboard party with a tool to describe the cores. The IHP recommends going to JANUS Phase II before completion of Phase I (once the SC priorities 1–4 are complete) and made suggestions to the Operator as to what tasks could be taken over by ODP/TAMU instead of having them completed by TRACOR.

Action: See "JANUS Phase II (Visual Core Description Project)" on page 41.

Sample Distribution Policy

Sampling policies have been modified as of March 1996 regarding composite sections and core/core integration. The policy issues were revisited during the Curation Workshop held on 18 and 19 December 1996. The current ODP policy can be found at:

http://www-odp.tamu.edu/curation/index.html#SDP.

Shipboard Measurements Panel (SMP)

ODP Staff Liaison: Jay Miller e-mail address: jay_miller@odp.tamu.edu

Date and location of last meeting: 29 October-1 November 1996, Tokyo, Japan

March 1996–SMP motions and consensus statements requiring action by ODP/TAMU

Recommendation 96-1-2

SMP agrees with the deployment of the Teka TK04 Thermal Conductivity Apparatus as of Leg 167. This deployment will (for the time being) be in addition to the existing WHOI equipment. SMP also recommends that thought be given towards development of an RFP for the expansion of the TK04 apparatus to a multiprobe system. Finally SMP endorses the proposal to integrate the Teka program in the Physical Properties Laboratory and also in the JANUS Data Base.

Action: New TK04 thermcon system has been installed but falls short of an acceptable solution in its present configuration. (See “Physical Properties Laboratory” on page 53.)

Recommendation 96-1-3

SMP recommends that the natural gamma-ray system be configured for 256-channel data acquisition for routine spectral data collection and archival. SMP also concurs with the suggestion that the JANUS Data Base provide three report options: total counts only (for most short-count data sets); 5-window spectra compatible with Schlumberger Downhole Logging; and 256-channel spectra (for rare long count data sets). In addition, SMP supports the suggestion that ODP/TAMU shall purchase standards in 50 cm coreliner segments, having known amounts of K, U, and Th.

Action: Implementing (See “Physical Properties Laboratory” on page 53.)

Recommendation 96-1-4

SMP recommends that the present gamma-ray attenuation density calibration using two aluminum rods of different diameters be replaced by a method that uses a water core and an aluminum rod. This new calibration procedure should first undergo comparative testing. SMP also recommends that ODP/TAMU obtain funds for the purchase of an appropriate balance to determine the mass of whole cores, thus providing an overall check on “whole-core density” evaluations.

Action: A report on comparative testing was submitted to SMP at its fall 1996 meeting. (See “Physical Properties Laboratory” on page 53.)

Recommendation 96-1-5:

SMP recommends that the bulk volume sampling method for density measurement be eliminated from the shipboard measurement program. In addition SMP recommends that the salt corrections should use a standard correction of 0.035 (salinity = 35) with the corresponding density of standard sea water.

Action: Support should be given to this type of measurement if desired by a scientist. Historic records indicate that it only need be measured as necessary. (See “Physical Properties Laboratory” on page 53.)

Recommendation 96-1-7:

As a minimum, thin-section slides should be polished on the side mounted, so that they will be suitable for repolishing of the top surface to meet requirements for probe work and reflected light studies. If the top surface is not polished, then the cover slip should be attached with binder that will allow easy removal. All thin sections of hard rock material (or other appropriate material, e.g., massive sulfides) shall be polished, unless there are friability constraints to prevent this.\

Action: This has been done.

Recommendation 96-1-8:

SMP considers the collection of C/N data of primary importance and C & N data are to be considered as prime data. The CHNS apparatus should be plumbed for C/N only, unless an Organic Geochemist(s) indicates well in advance of the Leg that the S data are requested. In that case the apparatus will be plumbed for that purpose.

Action: This recommendation has been implemented although, recent legs have required S capabilities. (See "Chemistry Laboratory" on page 52.)

November 1996

Recommendation 96-2-9:

SMP agrees that the ODP/TAMU purchased electrical resistivity apparatus should not be deployed onboard the ship at this time.

Action: Joris Gieskes has agreed to undertake the necessary development/ modification of the instrument in his laboratory.

Recommendation 96-2-12:

Action: ODP/TAMU is currently restructuring the LWGs. However, the provision of such cookbooks will be addressed as a high priority item when the new structure has been established.

Recommendation 96-2-13:

SMP endorses the proposal by Peter Blum with regards to an evaluation of the thermal conductivity apparatus available on *JOIDES Resolution:* specifically that ODP initiate phase I of a development project with a modest budget (mainly travel) and the following objectives:

- refine the system specifications with input from expert users,
- review the upgraded Teka, WHOI, and any other existing system,
- specify requirements for these systems to meet specification,
- design one or more plan(s) for a high quality thermal conductivity system for ODP, and
- calculate costs.

In view of the importance of these measurements this project should be of high priority.

Recommendation 96-2-14:

SMP urges consideration of the purchase of apparatus dedicated to the measurement of sulfur compositions of sediments or hard rocks (e.g., sulfides). Such apparatus will help prevent problems with the routine measurements of C/N ratios with the current CNHS equipment. In addition, a more reliable determination of sulfur contents of sedimentary rocks will become feasible.

Action: See "Chemistry Laboratory" on page 52.

Recommendation 96-2-15:

Digital imaging will become increasingly important in the ODP and with high quality imaging of split cores it will soon replace core photography. In addition, records of this type can be used in the Visual Core Description Program. SMP, therefore, urges special attension to this subject in the near future and reccomends a detailed evaluation of the various techniques available, with the specific aim of merging various interests in imaging (e.g., digital photography; color scanning, core description).

Action: See "JANUS Phase II (Visual Core Description Project)" on page 41.

Recommendation 96-2-16:

SMP appreciates the development of the AppleCore program for sediment and structure descriptions onboard the *JOIDES Resolution* laboratories. However, it urges the release of sufficient funds towards the development of a digital imaging system that will allow the development of a modern manner of Core and Structure Descriptions.

Action: See "JANUS Phase II (Visual Core Description Project)" on page 41.

Recommendation 96-2-17:

SMP recommends that a workshop (sponsored by JOI) be held to plan for a Shipboard Microbiology Laboratory. This topic is of great interest to the scientific community, but guidance is necessary with regards to the most appropriate use of samples obtained by the drilling vessel.

Action: This is one of the new initiatives that the SSEP will discuss, and will set up a working group to deal with, at their January 1997 meeting.

Equipment priority lists

Progress on previous SMP (March 1996) priority items

JANUS (See "JANUS" on page 39.)

Split-core MST (See "Split-core MST" on page 42.)

Chart Recorders (See "Underway Geophysics Laboratory" on page 52.)

ODP Equipment List, Prioritized by SMP (November 1996)

Items >$50K

- High priority: X-ray Diffractometer and split-core track development
- Moderate priority: APC temperature tools
- Lower priority: X-ray Fluorescence Spectrometer and Axioscope
- Other: Microbiology Laboratory

Items <$50K

- High priority: NGR standards (pp lab), Leco S analyzer (chem lab), Digital cameras, shipboard color laser printer.
- Lower priority: GC replacement (2), Dionex, Binocular Scopes, dGPS antenna

APPENDIXES

ODP Statistics, Legs 100–167

Leg	Area	Port Days	U/W Days	Site Days	No. Of Sites	No. Of Holes	No. Of Cores	Dist. Trav. (nmi)	Total Penetration (m)	Drilling Penetration (m)	Coring Penetration (m)	Recovery (m)	% Recovery	Max Water Depth (m)
100	Gulf of Mexico	0	6.2	11.7	1	3	37	831	509.6	184.6	325	281.4	87	900
101	Bahamas	2.2	5.3	36.3	11	19	319	853	3558	457.4	2977	1429	48	3581
102	Western Atlantic	9.1	13.7	19.3	1	0	0	3948	0	0	0	0	n/a	5505
103	Galicia Bank	0.4	8	46.8	5	14	157	1741	2961.5	1455	1460	593.9	41	5321
104	Norwegian Sea	8.2	14	43	3	8	291	3688	2936.5	57.3	2419	1695	70	2780
105	Labrador Sea/Baffin	5.4	13.6	45.5	3	11	316	2746	3689.5	723.1	2960	1884.4	64	3870
106	Mid-Atlantic Ridge	6.1	13.1	41.3	2	12	17	3865	101.7	0	92	12	13	3529
107	Tyrrhenian Sea	4	6.3	43.2	7	11	353	1503	3529.3	240.1	3297	1908	58	3606
108	Northwest Africa	3.5	18.8	35.7	12	27	461	5607	4457.4	213.6	4243.8	3842.5	91	4750
109	Mid-Atlantic Ridge	6.4	9.4	47.8	3	5	25	2732	147	0	102	12	12	4494
110	Lesser Antilles	6.6	2.6	48.1	6	10	259	401	3741.6	1327.1	2404	1897.7	79	5018
111	Panama Basin	6.3	10.6	48.2	3	5	79	2705	2137	1431.6	641	428	67	3474
112	Peru Margin	11.7	9.6	44.8	10	27	514	2243	6058.6	1348.3	4710.3	2665.6	57	5093
113	Weddell Sea	5.1	26.9	43.9	9	22	386	6432	4044.2	39	3361	1944	58	4665
114	South Atlantic	3.2	21	39.1	7	12	392	5916	3672.1	70	3602	2297	64	4637
115	Mascarene Plateau	6.7	12.8	30.2	12	22	426	3208	4182.9	0.4	3955	3075	78	4440
116	Bangal Fan	5.4	3.6	39.1	3	10	248	1052	3317	1013.4	2299	991.6	43	4747
117	Oman Margin	4.5	19.8	35.6	12	25	628	4409	7125.5	789.9	5847	4673	80	4045
118	SW Indian Ridge	4.2	6.8	46	4	20	117	1752	754.2	15	780	447	57	5219
119	Prydz Bay	4.6	27.4	37	11	22	427	6861	4446.1	3.3	3652	2102	58	4093
120	S Kerguelen	6	35.1	28	5	12	255	9206	3555.1	483	2140	1082	51	2041
121	Broken Ridge	5.2	19.3	34.2	7	17	310	5100	3732.5	264.5	2722	1824	67	2937
122	Exmouth Plateau	4.6	13.2	43.4	6	15	445	3756	5233.2	0	3911	2445.8	63	2710
123	Argo Abyssal Plain	4.3	13.3	47.4	2	5	189	1485	3091.2	1298.1	1793.1	1080.2	60	5758
124	SE Asia BAsins	4.2	12.5	47.2	5	13	336	3060	1586.35	1197.55	3115	2122	68	4916
124E	Luzon Strait	5	13.6	24.4	7	15	41	2950	5230.1	2117.9	264	156	59	5811
125	Bon/Mar	4.3	8.2	48.6	9	15	323	1640	3540.4	165.5	2917	1019	35	4912
126	Bon Mar II	4.3	4.3	53.3	7	19	500	1919	6492.5	1579.2	4737	2127.7	45	3269
127	Japan Sea I	4.4	9.3	49.3	4	10	317	779	4798.6	1858.3	2917	1655	57	3311
128	Japan Sea II	5.1	8.1	42.9	3	9	226	1480	3720	1654	2044	1548	76	2820
129	Old Pacific Crust	2	11.1	46.3	3	5	199	2675	2403.7	695.7	1708	469	27	5980
130	Ontong Java Plateau	4.2	11.5	51.2	5	16	639	2405	6877.1	987.8	5889.3	4821.61	82	3873
131	Nankai Trough	3.9	6.8	56.4	1	7	165	1750	4140.2	2582.9	1463	735.99	50	4696
132	West/Central Pacific	6.1	12.4	45	3	11	52	3252	324.9	119.69	205.2	164.69	80	4682
133	N/E Australia	4.8	11.8	50.9	16	36	885	3242	10925.2	2952.3	7972.9	5505	69	1650
134	Vanuatu	4.4	9.9	52.7	7	16	541	2133	5640.6	809.3	4831.3	2044.2	42	3101
135	Lau Basin	3.7	18.1	51.2	8	18	409	4065.2	5012.9	1656.9	3356	1248.9	37	4814
136	OSN-1	2.4	1.2	16.3	2	6	20	257	764.2	634.8	129.4	66	51	4441
137	Hole 504B	0.3	19.9	21.5	1	1	8	5072	59.2	10.6	48.6	8.8	18	3475
138	E Equatorial Pacific	4.1	22.1	38.2	11	42	599	5421	5628.3	86.2	5542.1	5536.8	100	3873
139	Sedimented Ridges	6.1	5.6	57	4	23	331	1453	3686.5	1030.1	2656.4	932.9	35	2457
140	Hole 504B	4.6	17.1	40.4	1	1	57	4592	379.7	0.8	378.9	47.7	13	3474
141	Chile Triple Junction	3.5	20	37.8	5	13	284	5212.5	3324.5	809.7	2514.8	1018.8	41	2760
142	East Pacific Rise	6.1	23.4	36.5	1	3	5	6361	29	27	2	0.5	25	2583
143	Atolls & Guyots - I	4.5	14.2	43.2	6	12	441	3371	4135	140	3995	1075.7	27	4838
144	Atolls & Guyots - II	4	12.2	45.6	11	21	358	3145	3489.1	284.5	3204.6	1087.7	34	5685
145	N Pacific Transect	4.1	17.3	40.9	7	25	540	4823	7720.8	2705.7	5015.1	4321.7	86	5726
146	Cascadia	6.1	23.4	36.5	7	20	272	1453	4498.4	2232.5	2265.9	1190.3	53	2675
147	Hess Deep	3	12.8	43.7	2	13	57	3487	545	58	487	122.8	25	3874
148	Hole 504B	4.6	4.34	39.13	2	2	45	529	579.6	195.1	384.5	81.43	21	3474
149	Iberian Abyssal Plain	4.6	20	51.2	5	10	288	4834	3897.7	1210.9	2686.8	1531.81	57	5331
150	New Jersey Sea Level	3	19.2	38.5	5	11	515	4291	6044.8	1442.9	4601.9	4034.5	88	2709
151	Atl. Arctic Gateways	4.7	18	38.4	7	18	475	4307	4668.3	457.5	4210.8	3004.6	71	3330
152	East Greenland Margin	4.2	9.1	45.9	6	13	346	1644	3678.2	772.3	2905.9	1256.8	43	2100
153	MARK	5.3	9.9	47.8	5	15	100	2543	804.3	16	788.3	261.3	33	3343
154	Ceara Rise	4.5	12	43.4	5	19	653	2988	7015.2	854.2	6161	5808.3	94	4369
155	Amazon Fan	3.2	12.2	44.78	17	36	558	2265	5236.3	115.6	5117.3	4049.31	79	4148
156	N Barbados Ridge	3.9	2.7	54.6	3	8	54	652	3330.6	2862	468.6	267.1	57	5024
157	VICAP/MAP	3.3	13	44.3	7	12	438	3102	4958.7	867.4	4091.3	3089.9	76	5448.6
158	TAG	6.1	13.3	41	1	17	88	3228	636.3	200.5	435.8	51.59	12	3657
159	Eq. Atlantic Transform	1.31	12.77	43.92	4	13	366	3521.5	4122.5	955.1	3167.4	1877.8	59.3	1657
160	Mediterranean I	4.7	11.3	40.1	11	48	544	4048	5155.5	353.7	4801.8	3362.18	70	3710

Leg	Area	Port Days	U/W Days	Site Days	No. Of Sites	No. Of Holes	No. Of Cores	Dist. Trav. (nmi)	Total Penetration (m)	Drilling Penetration (m)	Coring Penetration (m)	Recovery (m)	% Recovery	Max Water Depth (m)
161	Mediterranean II	3.5	13.8	44.05	6	16	505	3060	5328.9	737.6	4591.3	3874.63	84.4	3469.7
162	Atl. Arctic Gateways II	5.14	13.58	42.18	9	30	828	1750	8637.3	968.9	7708.4	6730.74	87.3	2799.1
163	Southeast Greenland Margin	7.1	10.13	16.68	3	4	46	2787	480.3	186	294.3	204.6	69.5	541.5
164	Gas Hydrate Sampling	24.27	6.85	41.01	7	17	344	1645	4399.7	1613.8	2785.9	1974.31	70.9	2810.1
165	Cretaceous/Tertiary Boundary Event	2.9	12.7	44.7	5	13	453	3084	5952.4	1774	4178.4	3358.82	80.4	3259.6
166	The Bahamas Transect	4.63	6.8	41.29	7	17	572	2045	7452.4	2197.5	5254.9	2933.8	55.8	669.9
167	California Margin	1.6	12.85	43.4	13	52	840	3102	7709.5	0	7709.5	7501.5	97.3	4226.4

Public Information Materials

Videos

Windows to the Past—available in VHS, PAL, and SECAM video formats.

A Planet In Motion—available in VHS, PAL, and SECAM video formats.

Brochures

Ocean Drilling Program—gives a brief overview of the Ocean Drilling Program; available in English, French, Spanish, German, and Japanese.

Onboard JOIDES Resolution—describes ODP's drill ship, *JOIDES Resolution*, and its unique scientific laboratories.

Downhole Measurements in the Ocean Drilling Program—describes the downhole measurement technology used by ODP and available to scientists.

Guide to Third-party Tools—explains how outside contractors can submit their downhole tools for use by ODP.

Ocean Drilling Program: Engineering and Drilling Operations—describes ODP's drilling systems and plans for new, developing systems.

Opportunities for Scientific Research—gives a brief overview of ODP and explains how to apply for participation in a cruise aboard *JOIDES Resolution* and other types of participation.

Oceanus: Vol. 36, No. 4, Winter 1993/4 issue—contains various articles about ODP and work aboard or related to *JOIDES Resolution*.

Information Cards—two cards are currently available: (1) color photograph of the ship with a brief explanation of its purpose, and (2) black-and-white photograph of the ship with technical information about the ship on the other side.

Web sites

Ocean Drilling Program: http://www-odp.tamu.edu

National Science Foundation: http://www.nsf.gov

Lamont-Doherty Earth Observatory: http://www.ldeo.colombia.edu

Scripps Institution of Oceanography: http://sio.ucsd.edu

Woods Hole Oceanographic Institution: http://www.whoi.edu

Additional information

For additional information about the Ocean Drilling Program or the *JOIDES Resolution*, contact:

Aaron Woods, Public Information Coordinator
Ocean Drilling Program
Texas A&M University Research Park
1000 Discovery Drive
College Station, Texas 77845-9547
Voice: (409) 845-9322
FAX: (409) 845-1026
E-mail: aaron_woods@odp.tamu.edu

Price list for volumes

Volume Titles and Price List can be found at: http://www-odp.tamu.edu/publications

Publications Policy

I. ODP Publications, Legs 160 and beyond

A. Initial Leg Results

1. The *Initial Reports* (IR) volume is prepared by the shipboard scientific party during the leg. A representative group of 8 to 12 individuals meets 3 to 5 months post-cruise to complete the final editing of all IR material. The IR volume is scheduled to be published 1 year after the end of the cruise.

B. Post-Cruise Science Results

All shipboard and shore-based participants who receive ODP samples or data in the first 12 months post-cruise are required to publish a peer-reviewed manuscript related to leg objectives, or to a related discipline, in an internationally recognized peer-reviewed scientific journal that publishes in English, or the *Scientific Results* (SR) volume for the leg.

An Editorial Review Board (ERB) will be established for every leg. The primary purpose of the ERB is to maintain an independent and effective peer-review system. Each Board is composed of four persons: the two co-chiefs, the ODP staff scientist, and an external scientist/specialist.

1. General Conditions for Publishing Post-Cruise Science Results

a) A final table of contents that links sample or data requests to specific titles/manuscripts must be approved by the Editorial Review Board (ERB) at the science post-cruise meeting. Every paper intended to fulfill the scientific party's obligations must be identified at this time.

b) Additional manuscripts not listed in the table of contents may be submitted to the outside literature before the volume closes, provided that copies are supplied to the ERB for review (as outlined under Section 2.a.) at the time of journal submission.

c) Authors must acknowledge the receipt of data or samples from ODP and acknowledge the funding agency that supported their research.

2. Conditions for Publishing in the Outside Literature

a) The Editorial Review Board (ERB) is responsible for reviewing each manuscript for proper citation of site summaries and site chapters and for proper use of data and conclusions from other members of the scientific party. An author must submit a copy of his manuscript to the ERB at the same time that he sends his initial submission to an outside journal. If the ERB deems that there is improper usage of the data and conclusions of other members of the Scientific Party or failure to properly cite the *Initial Reports* volume, the ERB will contact the author and the journal editor with a recommendation that the manuscript be withdrawn or suitably modified.

b) An author has satisfied his obligation to ODP to publish post-cruise research results after the author has sent the ERB verification from the publisher that the paper was submitted and has been accepted for review. In addition, to meet obligation requirements, authors must submit their manuscripts to outside journals by the specialty revision deadline.

c) Authors are required to submit an electronic copy of the final citation, the abstract, and a reprint to ODP. ODP will maintain an electronic leg-related publication list on the World Wide Web.

d) Authors who wish to submit manuscripts to the outside literature before the 1-year post-cruise data moratorium has expired must receive prior approval in writing by a majority of the scientific party. This approval must be coordinated by the staff scientist who will circulate the manuscripts among the scientific party and notify the authors of approval. For all manuscripts submitted before 1-year post-cruise, authors must submit a copy of the final manuscript to the co-chiefs at the same time that they send their initial submission to an outside journal. The co-chiefs are responsible for reviewing each manuscript for proper citation of site summaries and site chapters and for proper use of data and conclusions from other members of the scientific party.

3. Conditions for Publishing in the *Scientific Results* Volume

a) Any author who chooses to submit a paper to the *Scientific Results* volume will be required to meet the submission deadlines established by ODP.

Manuscript submission schedule for Leg 164 and beyond:

Manuscript submission deadlines:

Initial submission, specialty papers: 28 months post-cruise

Revised submission, specialty papers: 33.5 months post-cruise

Initial submission, synthesis papers: 34.5 months post-cruise

Revised submission, synthesis papers: 39 months post-cruise

Volume Publication deadline: 48 months post-cruise

b) Upon submission, the staff scientist on the ERB must review all manuscripts to ensure they are complete and of reviewable quality. Manuscripts that do not meet ODP's standards will be returned to the author and will not go through the review process unless they are revised to meet ODP standards before the submission deadline.

c) An author has satisfied his obligation to ODP to publish post-cruise research results after he has submitted a data report, scientific paper, or synthesis paper deemed to be of reviewable quality by the ERB and that corresponds to the agreed topic as laid out in the table of contents.

d) The ERB is responsible for:

(i) Ensuring that all manuscripts are of reviewable quality before they are sent out for review.

(ii) Coordinating the review process for each manuscript.

(iii) Reviewing each paper for proper citation of site summaries and site chapters and for proper use of data and conclusions from other members of the scientific party.

(iv) Collecting manuscript reviews and making the final decision on manuscript acceptance or rejection of articles submitted for the SR volume.

II. Obligation to Publish

All scientists who receive samples or data from ODP within 1 year of a cruise are required to meet the publication obligations defined above. Any scientist who does not meet these obligations will be considered a nonperformer.

Notice of nonperformance will be forwarded by ODP to the author's member country office for action. This information will also be added to the ODP/TAMU application database and will be used in the decision making process for participation in future drilling legs for that scientist.

(See "Information Handling Panel (IHP)" on page 61, Recommendation 96-2-1.)

Proposed Distribution Dates of ODP FY97 Volumes

	Initial Reports Volumes	Post-cruise meeting	Date to printer	Date distributed	Months post-cruise
October					
November	163 164	3-18-96 5-13-96	9-29-96 9-29-96	11-22-96 11-22-96	13 11
December					
January					
February	165	7-8-96	12-96	2-97	12
March					
April	166	9-9-96	2-97	4-97	12
May					
June	167	11-4-96	4-97	6-97	12
July					
August	168	1-13-97	6-97	8-97	12
September					

Goal for IR volumes: 12 months post-cruise. * denotes production or review process delayed by shipboard party. (Date) indicates originally scheduled date prior to delays. Gray box indicates two separate volumes in one cover. ###/### indicates two voyages

	Scientific Results Volumes	Review process completed	Date to printer / indexer	Index to printer	Date distributed	Months post-cruise
October	150	(12-30-95) 5-10-96	8-29-96	8-29-96	10-30-96	39
November						
December	151	(3-6-96) 5-31-96	10-23-96	9-27-96	12-19-96	40
January						
February						
March	153	(6-30-96) 5-28-96			1-97	36
April						
May	154 155	(8-31-96) 9-9-96 (10-30-96) 10-21-96			5-97 5-97	38 36
June	152	(11-96)			6-97	43
July	150X 156	 (12-30-96)			7-96 7-97	 36
August						
September	157	(2-28-97)			9-97	36

Goal for SR volumes: 36 months post-cruise. * denotes production or review process delayed by shipboard party. (Date) indicates originally scheduled date prior to delays. Gray box indicates two separate volumes in one cover. ###/### indicates two voyages

Meeting and Event Schedule

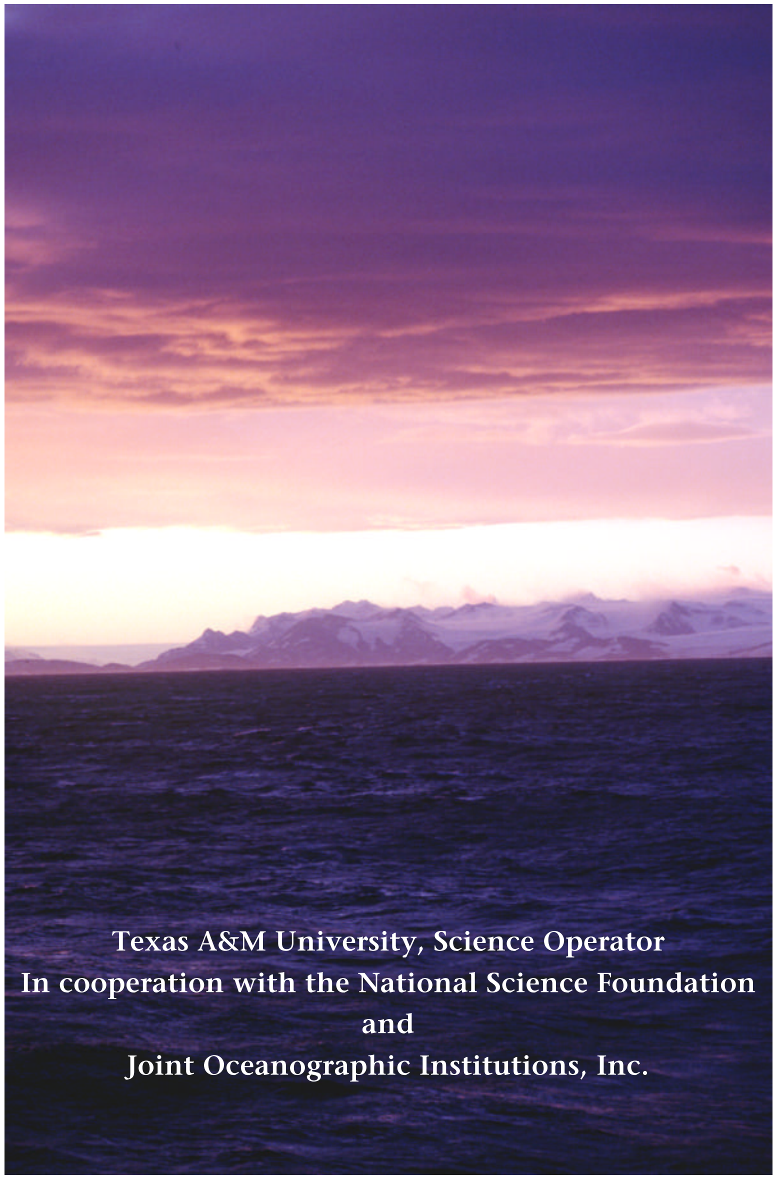
Event	Date	Location	Contact	e-mail
DECEMBER 1996				
DCS Subcommittee	5–6	College Station, Texas, U.S.A.	Brian Jonasson	brian_jonasson@odp.tamu.edu
Droplets	7	LDEO Biosphere 2, Arizona, U.S.A.		
Panel Chairs	8	LDEO Biosphere 2, Arizona, U.S.A.		
163 2nd Post-cruise	10–12	Kona, Hawaii, U.S.A.	James Allan	james_allan@odp.tamu.edu
PCOM	9–13	LDEO Biosphere 2, Arizona, U.S.A.	Tim Francis	tim_francis@odp.tamu.edu
JANUARY 1997				
JOI Proposal Deadlines	1			
164 2nd Post-cruise	8–10	Estes Park, Colorado, U.S.A.	Paul Wallace	paul_wallace@odp.tamu.edu
168 Post-cruise	13–17	College Station, Texas, U.S.A.	John Firth	john_firth@odp.tamu.edu
174A Pre-cruise	13–14	College Station, Texas, U.S.A.	Mitch Malone	mitch_malone@odp.tamu.edu
Interim SSEP	20–22	WHOI, Woods Hole, Massachusetts, U.S.A.	TBA	
Consider all active proposals and select scientifically mature ones for external review				
FEBRUARY				
EXCOM	10–13	JOI, Washington, D.C., U.S.A.	Jeff Fox	jeff_fox@odp.tamu.edu
Determine membership of SICOM and SSEPS				
169S Post-cruise	17–21	College Station, Texas, U.S.A.	John Firth	john_firth@odp.tamu.edu
PPSP	20–21	Scripps, San Diego, California, U.S.A.	TBA	
MARCH				
SciMP		College Station, Texas, U.S.A.	TBA	
SSBD	1	Data deadine to permit proponents of proposals selected for external mail review to submit supporting site survey data to DB		
SSP		Evaluation of proposals		
162 2nd Post-cruise	17–19	Long Island, Bahamas	Peter Blum	peter_blum@odp.tamu.edu
APRIL				
SSP	1–4	Tokyo, Japan	TBA	
OPCOM	11–12	College Station, Texas, U.S.A.	TBA	
If required, continue implementation and oversight role of PCOM; technology assessment				
PCOM	14–17	College Station, Texas, U.S.A.	Tim Francis	tim_francis@odp.tamu.edu
SciCom	14–17	College Station, Texas, U.S.A.	TBA	
Establishes PPGs and OPCOM membership. Conducts longterm science and technology planning				
169 Post-cruise	21–28	College Station, Texas, U.S.A.	Jay Miller	jay_miller@odp.tamu.edu

Event	Date	Location	Contact	e-mail
MAY				
SSEP		WHOI, Woods Hole, Massachusetts, U.S.A.		
Consideration of previous Thematic Panel reviews and first set external reviews of ODP proposals; formulate advice to SciCom				
PPSP	8–9	College Station, Texas, U.S.A.	TBA	
JUNE				
SSDB Data deadline*	15			
EXCOM		Brest, France	Jeff Fox	jeff_fox@odp.tamu.edu
JULY				
SSP		Focused review of proposals.		
TEDCOM		College Station, Texas, U.S.A.	Brian Jonasson	brian_jonasson@odp.tamu.edu
AUGUST				
SciCom**	18–22	Davos, Switzerland		
Ranks mature proposals and conducts long-term science and technology planning.				
OPCOM**		Formulates drilling schedule from FY 1999 onward, under logistical and budgetary considerations.		
OPCOM, Operations Committee; SciCom; Science Committee; SSEP, Science, Steering, and Evaluation Panel; SSDP, ODP/LDEO Site Survey Data Bank; and SSP, Site Survey Panel				
* SSDB Data deadline reverts to July 1 in 1998. **1998, SciCom and OPCOM scheduled to meet in September. TBA: Liasions for the new panel structure have yet to be announced.				

The hours are long and sometimes the entire world is encompassed in a sunset off the stern.

The images of the *JOIDES Resolution* are the work of John Beck, Roy Davis, Tim Fulton, and Randy Ball. The photographs taken at the hammer drill-in tests were supplied by Leon Holloway.

Compiled by Phil Rumford, Project Manager


Texas A&M University, Science Operator
In cooperation with the National Science Foundation
and
Joint Oceanographic Institutions, Inc.

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