JOI/USSAC
NEWSLETTER
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HEARD ON THE KERGUELEN PLATEAU

contributed by Millard F. Coffin

Yves Joseph de Kerguélen-Trémarac discovered *La France Australe* (today's Kerguelen Archipelago) in 1772 and claimed this "southern motherland" for France. Upon returning home, he rhapsodized eloquently to the French monarch about the region's agricultural and mineral potential and convinced the king to dispatch three ships and 700 men to colonize the territory in 1773. However, once there, 699 pairs of eyes couldn't lie, and upon Kerguélen's return to France, he was court-martialed, dismissed from the Navy, and sentenced to 20 years in prison (and then the king got angry...). In contrast, James Cook dubbed Kerguelen the "Isles of Desolation" after landing there in 1776. This may have been closer to the mark, for geologically, the Kerguelen Plateau is a massive, enigmatic, mafic, and heavily-structured large igneous province (LIP).

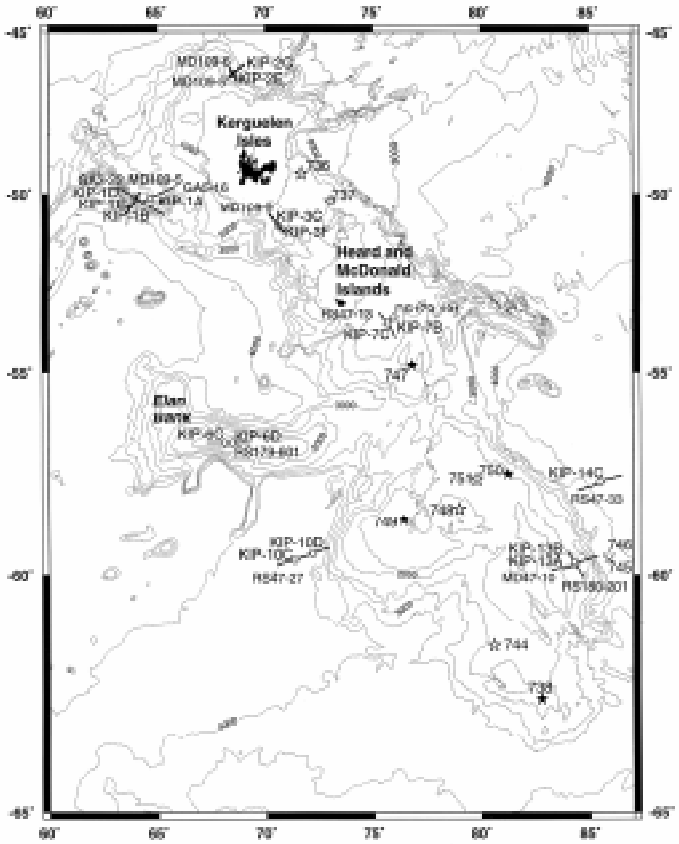

Fig. 1: The Kerguelen Plateau, a broad topographic high, stretches about 2300 km between 46°S and 64°S in the southern Indian Ocean in a southeast-trending direction toward the Antarctic continental margin. It is between 200 and 600 km wide, and rises 2 to 4 km above the surrounding deep ocean basins. Previous ODP drill sites where igneous basement was recovered are indicated by filled stars; sites that bottomed in sediment are shown as open stars. Drill sites (KIP) approved by the JOIDES Pollution Prevention and Safety Panel for Leg 183 are indicated by open circles; seismic lines used to select these are depicted by black lines with cruise identifiers (GA: *Gallieni*; MD: *Marion Dufresne*; RS: *Rig Seismic*). Primary sites (and alternates) for ODP Leg 183 are KIP-2, 3, 6, 7, and 13. Bathymetry is after Fisher [pers. comm.]; contour interval is 500 m.

Despite the challenging winds and seas of the Kerguélen "Triangle" (where two racing yachts capsized early last year), both Australia and France have mounted multichannel seismic campaigns of the region. In 1997, an Australian survey focused on the subsea territories around the Heard and MacDonald Islands (named for American John J. Heard and Briton William McDonald who discovered the islands in 1853 and 1854). A French expedition in 1998 concentrated on the Kerguelen Isles (Figure 1). The geophysical database resulting from these surveys is the most extensive of any oceanic plateau in the world, including the Ontong Java (see the article on page 6).

The seismic data from these surveys enabled scheduling of ODP Leg 183, which will venture to those isolated reaches of

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the Southern Ocean in late December 1998. This leg will address the mantle processes that form LIPs, the tectono-magmatic evolution of the LIPs, and the environmental consequences of voluminous mafic magmatism.

LIPs are a form of planetary volcanism that has been observed on the Moon, Venus, and Mars, in addition to Earth. They represent voluminous fluxes of magma, over relatively short periods of time, such as those expected from decompression melting of an ascending hot mantle plume. Terrestrial LIPs are dominantly mafic rocks formed episodically in Earth history, perhaps in response to fundamental changes in the processes that control energy and mass transfer from the Earth's interior to its surface. LIPs are important because they reveal information about mantle compositions and dynamics that is not reflected by volcanism at spreading ridges. For example, LIPs today account for only five to ten percent of the heat and magma expelled from the Earth's mantle, but giant LIPs may have contributed as much as fifty percent in the Early Cretaceous, thereby indicating a substantial change in mantle dynamics from the Cretaceous to the present.

Magma fluxes represented by oceanic plateaus are not evenly distributed in space and time. This episodicity contrasts markedly with the relatively steady-state production of crust at seafloor spreading centers. Intense episodes of igneous activity temporarily alter the flux of magma and heat from the mantle to Earth's crust, hydrosphere and atmosphere; likely resulting in global environmental change, such as excursions in climate and in the chemical and isotopic composition of seawater. In addition, because oceanic LIPs may resist subduction, they may be future building blocks of continental crust. Yet, despite their huge size and distinctive morphology, oceanic plateaus remain among the least understood features in the ocean basins.

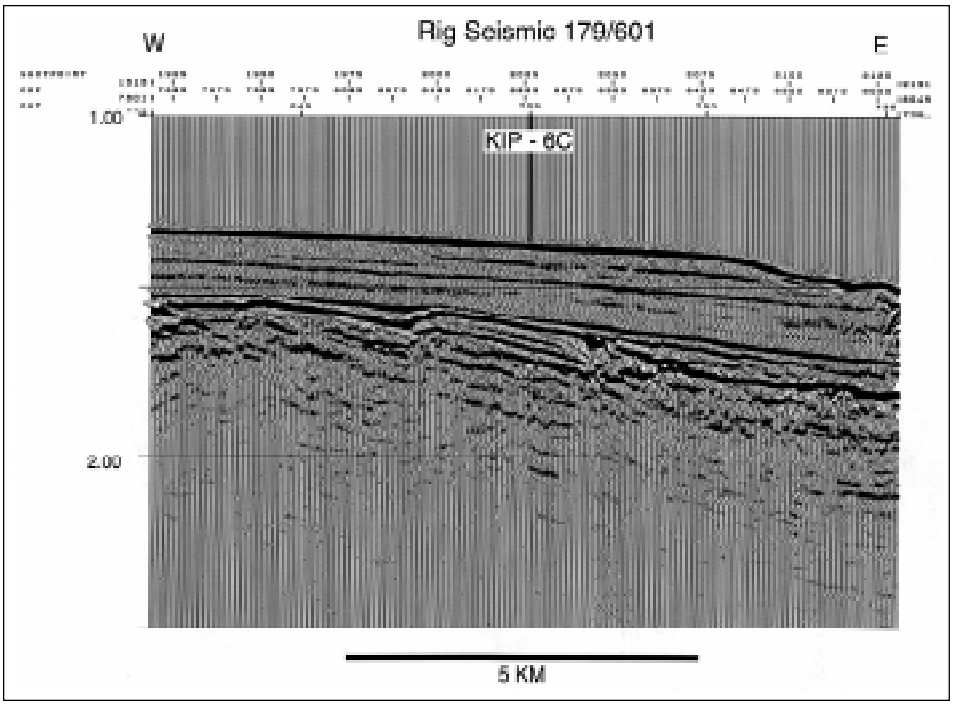

Fig. 2: Migrated, true amplitude MCS data acquired over Elan Bank (named for Dennis Hayes' daughter) during R/V *Rig Seismic* survey 179. The high amplitude reflection that occurs at 1.6 s two-way travel time at site KIP-6C (Figure 1) is interpreted as igneous basement; note the strong intrabasement reflections beneath, possibly representing subaerial basalt flows.

ODP Leg 183 will sample the Kerguelen Plateau/Broken Ridge LIP, which extends over two million square kilometers, to address four key objectives related to the characterization and quantification of mafic igneous crustal production during the Cretaceous and Cenozoic: 1) to determine the chronology of Kerguelen/Broken Ridge magmatism; 2) to constrain mineralogy, composition of mantle sources, melting processes, and post-melting magmatic evolution; 3) to evaluate the effects of LIP formation on the environment; and 4) to identify and interpret relationships between LIP development and tectonism. Two hundred meters of igneous basement penetration is planned at each of five primary drilling sites on the Kerguelen Plateau and at one site on Broken Ridge (Figure 1).

Leg 183 will build on results obtained by basement drilling at four sites on the central and southern Kerguelen Plateau during ODP Legs 119 and 120. Studies of basement basalt obtained from dredges and from previously collected ODP drill cores show that much of the southern Kerguelen Plateau formed at 110 to 115 Ma, whereas the central Kerguelen Plateau and parts of Broken Ridge are younger, having formed at about 85 Ma. However, basement ages from major morphological features, such as Elan Bank and the submarine northern Kerguelen Plateau, are unknown because they have not yet been sampled.

Austral summers 1997 and 1998 witnessed three marine geophysical surveys on the Kerguelen Plateau. Two Australian expeditions aboard R/V *Rig Seismic* in 1997, RS179 and RS180, focused on Elan Bank and the SE Plateau flank, respectively. A French campaign aboard *Marion Dufresne* in 1998, MD109, investigated the northern Plateau. High-quality multichannel seismic (MCS) data acquired during the three research cruises have been used to locate the primary ODP Leg 183 drill sites. The JOI/U.S. Science Support Program supported my participation on RS179 and processing of

ODP-relevant seismic data from RS179 and RS180 at the Institute for Geophysics, the University of Texas at Austin.

During the two six-week R/V *Rig Seismic* cruises, Australian, U.S., and Norwegian scientists acquired about 3,500 km of MCS and other geophysical data. The MCS acquisition system consisted of a 20-airgun, 3,000 in^3 source, and a 3,000 m, 240-channel digital streamer. RS179 concentrated on Elan Bank, a prominent salient extending westward from the main Kerguelen Plateau, and completed a transect across the Plateau from the Enderby Basin in the west to the Australia-Antarctic Basin in the east. RS180 focused on the Plateau's eastern flank. The MCS data show dipping intrabasement reflections on the Elan Bank (Figure 2), suggesting subaerial basalt flows. A deep MCS transect of the entire Plateau between 53°S and 58°S documents major tectonic events following plateau construction, including Cretaceous faulting and Tertiary reactivation of the Labuan Basin. Several MCS lines show thick sediment and sediment drifts in the Labuan Basin, where Antarctic Bottom Water flows along the Plateau's eastern flank.

The primary objective of both R/V *Rig Seismic* cruises was to define the extent of Australia's claim to "Legal Continental Shelf" (LCS, i.e., beyond the 200-nautical-mile Australian Exclusive Economic Zone (EEZ)) generated by the Heard and McDonald Islands. Both islands are active volcanoes inscribed on the World Heritage list last year based on their outstanding examples of biological and physical processes in an essentially undisturbed environment. Under the 1982 United Nations Convention on the Law of the Sea (UNCLOS), beyond the EEZ countries may claim LCS for which UNCLOS grants a nation sovereign rights to explore and exploit the resources of the seabed and subsoil. Subsequently, information is required on the physiography and sediment thickness of "continental" margins that extend beyond the EEZ. Data to support Australia's LCS claim need to be collected, interpreted, and presented to the recently elected UN Commission on the Limits of the Continental Shelf within ten years of UNCLOS entering into force (2004 for Australia). The Kerguelen Plateau surveys provide important data for Australia to meet its commitments under UNCLOS.

A secondary objective of the two cruises was to carry out geophysical site surveys for ODP Leg 183. Three dedicated site surveys, for KIP-6, KIP-7, and KIP-13, were completed (Figures 1 and 2). The KIP-6 site (Figure 2) will, for the first time, sample Elan Bank, a major morphotectonic component of the Kerguelen Plateau province. The site will constrain Elan Bank's age, composition, construction environment, and tectonic history.

The KERIMIS (KERguelen, Imagerie Multifasceau et Imagerie Sismique) campaign aboard *Marion Dufresne* (MD109) earlier this year acquired about 2,000 km of MCS data and dredged more than 1,000 kg of rock from the northern Kerguelen Plateau while investigating the feature's structure and geodynamics and conducting Leg 183 site surveys. The seismic acquisition system consisted of a 2,400 m, 96-channel digital streamer, and a 10-Generator-Injector (GI) airgun (G=1,050 in^3; I=960 in^3) source. Two major transects across the northern Plateau were completed, and three dedicated site surveys, for KIP-1, KIP-2, and KIP-3 were undertaken (Figures 1 and 3). The KIP-2 site will sample, for the first time, the Plateau north of the Kerguelen Archipelago to establish its age, composition, and construction environment, as well as to document tectonic events and to test plate reconstructions.

The MCS and other geophysical data acquired during the recent cruises have been critical to site selection for ODP Leg 183,

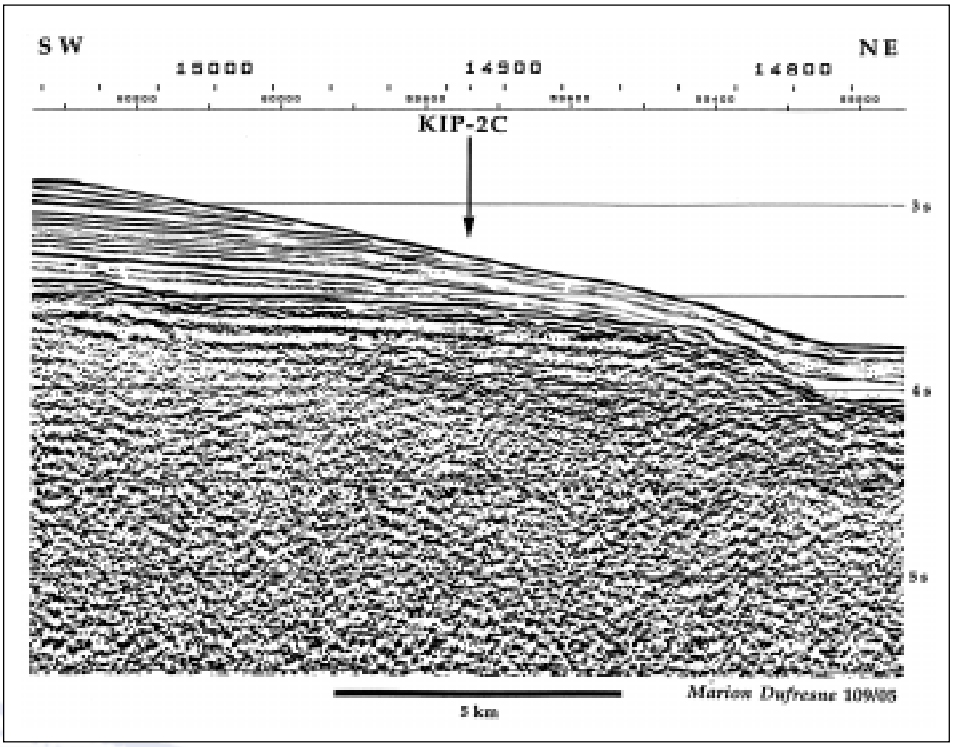

Fig. 3: Stacked MCS data acquired over the northern Kerguelen Plateau near its boundary with the Australian-Antarctic Basin during N/O *Marion Dufresne* survey 109. The prominent reflector at about 3.5 s two-way travel time at site KIP-2c (Figure 1) is interpreted to be igneous basement. Note the prominent angular unconformity formed by the seafloor; drilling at this site should allow recovery of the oldest sediment section on the northern Kerguelen Plateau.

and those countries' allocations of significant resources in support of ODP objectives on the Kerguelen Plateau are gratefully acknowledged.

Australia's site surveys aboard *Rig Seismic* were funded and conducted by the Australian Geological Survey Organisation (Project Leader Phil Symonds; Cruise Leaders Doug Ramsay and George Bernadel) in collaboration with the Institute for Geophysics, The University of Texas at Austin, and the Department of Geology, University of Oslo, Norway, with financial support provided by the JOI/U.S. Science Support Program. (N.B., the *Rig Seismic* was retired from AGSO service last month, representing a significant loss to the nonindustrial geophysical research fleet worldwide, and currently operates in the commercial sector.)

France's site survey aboard *Marion Dufresne* was conducted by the Ecole et Observatoire des Sciences de la Terre of the Université Louis Pasteur (Strasbourg 1; Chief Scientist Roland Schlich), in collaboration with the Département des Sciences de la Terre et de l'Environnement de l'Université Libre de Bruxelles, with the assistance of the Institut Français de la Recherche et de l'Exploitation de la Mer (IFREMER-GENAVIR) with multichannel seismic reflection, and the logistical and financial support of the Institut Français pour la Recherche et al Technologie Polaires.

THE AUTHOR

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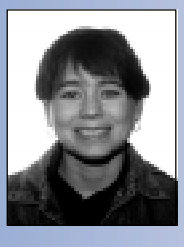
PLIO-PLEISTOCENE EVOLUTION OF NORTH ATLANTIC INTERMEDIATE AND DEEP WATER MASSES

KATE MCINTYRE



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The JOI/USSAC Ocean Drilling Fellowship Program funded my research to investigate temporal changes in subsurface water masses in the North Atlantic, and their links to basin-wide ocean circulation and climate. During glacial climate intervals of the late Pleistocene, and during the last glacial maximum in particular, production of North Atlantic Deep Water (NADW) appears to have fundamentally ceased, while the formation of intermediate-depth waters continued unabated. This pattern appears to have begun in the early Pleistocene (at about 1.65 Ma) and is inferred from a reduction in the benthic foraminiferal carbon isotopic gradient between cores from the deep Atlantic and Pacific. To examine the initiation of this pattern in greater detail, I generated a suite of stratigraphic "proxy" records of bottom water properties, that extends from 1.4 to 2.0 Ma, from two Leg 162 sites at intermediate depths in the high-latitude North Atlantic. The sites are ODP Site 981 (2173 m water depth) on the Feni sediment drift and Site 983 (1983 m water depth) on the Gardar drift.

My results indicate that circulation of intermediate and deep waters during interglacial intervals over this late Pliocene-early Pleistocene time span was similar to that of the modern interglacial — this similarity across time does not hold true for glacial periods. For example, during glacials between 1.7 and 2.0 Ma, Gardar drift benthic foraminiferal $\delta^{13}C$ was lower than Feni drift $\delta^{13}C$, while the opposite is observed during late Pleistocene glacials. Low $\delta^{13}C$ values in the North Atlantic are usually interpreted as reflecting the presence of nutrient-enriched water from the Antarctic. I consider this interpretation unlikely, for it would require a huge volume of Antarctic water to bathe both sites. Instead, I think the low glacial $\delta^{13}C$ values at Gardar can be attributed to nutrient-rich deep waters originating in a poorly ventilated region of the Nordic seas. My hypothesis is supported by evidence that drift sediment deposition at Gardar, which is driven by the overflows from the Nordic seas, continues during glacial intervals, while drifting at Feni is minimal during glacials. After 1.7 Ma, the glacial $\delta^{13}C$ values at Gardar converge towards those observed at Feni; the implications of which are described below.

When comparing my benthic foraminiferal data from the two drift sites to data from other sites throughout the North Atlantic (ODP Sites 929, 925, and 607, and DSDP Site 502) a three-dimensional picture of glacial deep water circulation emerges. Nutrient-depleted, high $\delta^{13}C$, glacial intermediate waters occupied a smaller area of the North Atlantic prior to 1.7 Ma while NADW formation continued (to a greater degree than in the late Pleistocene). After 1.7 Ma, NADW formation begins to shut down as $\delta^{13}C$ values converge toward values characteristic of Southern Ocean waters. But throughout the 1.4 to 2.0 Ma interval, there is no evidence for a high $\delta^{13}C$, low nutrient Glacial North Atlantic Intermediate Water mass at the depth of the two drift sites .

JOI GETS NEW CREW

As some of you may know, there have been quite a few personnel changes at JOI over the past half year. Winter and spring sped by in a blur of activity, and now JOI is once again fully staffed with highly skilled and energetic people. We offer fond farewells and many words of thanks to those who have moved on, and we extend a warm welcome to the newcomers. The chart below shows the current JOI/ODP technical personnel structure.

Foremost among the personnel changes at JOI was the resignation of Dr. David Falvey as Director of Ocean Drilling Programs, effective December 31, 1997. Dr. Nicklas Pisias of Oregon State University stepped in as the Interim Director during the first six months of 1998. Nick helped keep the Ocean Drilling Programs at JOI running smoothly during a challenging time. His calm demeanor, upbeat attitude, and tie-free chic will be missed.

June 19th marked Dr. Kathryn Moran's first official day on the job as the new Director of Ocean Drilling Programs at JOI. Kate came from the Bedford Institute of Oceanography where she was a Research Engineer for the Geological Survey of Canada since 1983. She is a leader in marine engineering research. Kate has participated on several ODP legs and JOIDES/JOI committees. Her enthusiasm, hard work, and familiarity with ODP and its scientific community is a great bonus to the ODP and a leg up for post-2003 planning.

Another major change in personnel began in January 1998, when Dr. Ellen Kappel, Associate Director of Ocean Drilling Programs and Director of USSSP for over eleven years, began a professional development leave. During this sabbatical, Ellen continues her work on the next USSSP-funded educational CD-ROM project titled, "Gateways to Glaciation."

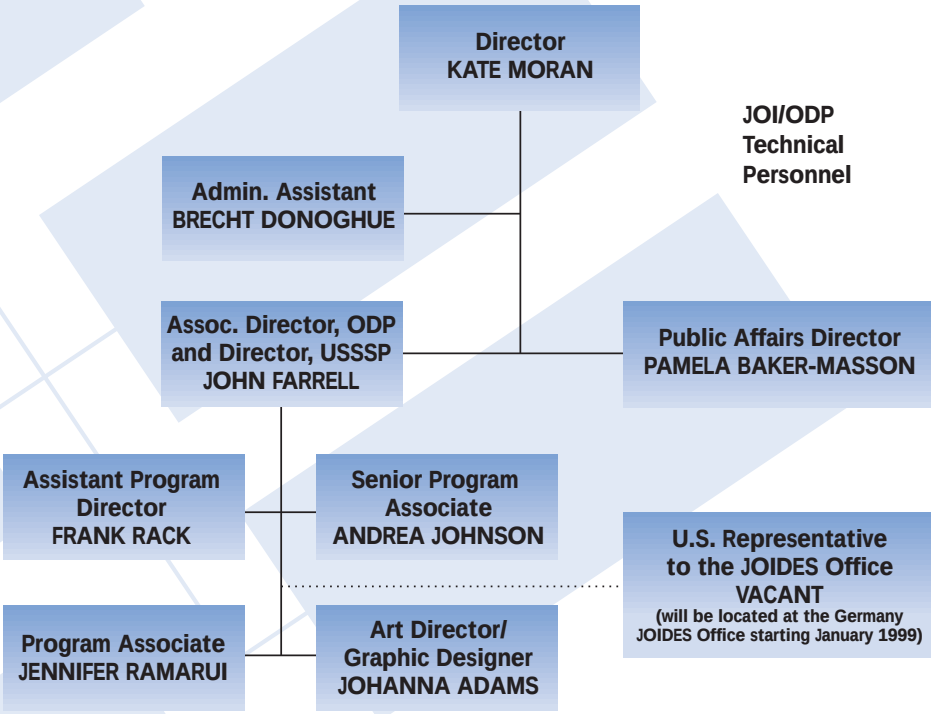
Dr. John Farrell, formerly Assistant Program Director, was named Associate Director of Ocean Drilling Programs and Director of USSSP effective January 1, 1998. John heroically managed activities at JOI/ODP and kept everything on course while assisting in the effort to fill the personnel vacancies.

On May 4th, Dr. Frank Rack joined JOI as the new Assistant Program Director, Ocean Drilling Programs (replacing John). Frank came to JOI from the Department of Geodesy and Geomatics Engineering, at the University of New Brunswick in Canada. As a past ODP/TAMU staff scientist and veteran of many ODP cruises, Frank is already very familiar with the Program.

Brecht Donoghue arrived at JOI in late March as the new Administrative Assistant for Ocean Drilling Programs. Brecht relocated from Vermont and is already a valuable asset, with her background in marine science and writing from Smith College.

One position remains unfilled, a two-year term as the U.S. Representative to the JOIDES office, beginning in January 1999. At that time, the JOIDES office will transfer from Woods Hole Oceanographic Institution, under the direction of Dr. Susan Humphris, to GEOMAR, in Kiel, Germany, under the auspices of Dr. William Hay. The ad for this position is posted on the JOI web site (www.joi-odp.org).

Finally, Susan Costilow is the new JOI/CORE Travel Coordinator/Conference Planner. Susan has several years of experience in this capacity. She was previously employed at the Harbor Branch Oceanographic Institution in Ft. Pierce, Florida; where she served as the Education and Conference Center Manager. Susan is clearly at home with marine institutions, and she looks forward to serving the JOI/CORE community.



MULTINATIONAL SURVEY OF EARTH'S LARGEST LIP

contributed by R.L. Larson, L.J. Abrams, M.F. Coffin, O. Eldholm, T. Gladczenko, G.T. Ito, L.W. Kroenke, P. Mann, M. Nakanishi, A. Taira, and E.L. Winterer

**"It was six men of Indostan to learning much inclined,
Who went to see the Elephant (though all of them were blind),
That each by observation might satisfy his mind."
— from "A Hindu fable" by J.G. Saxe**

The Ontong Java Plateau (OJP) was the focus of two legs of geophysical surveying (January through March, 1998) by scientists from Japan, the United States, Norway and Poland (Figure 1). Both legs were led by Asahiko Taira onboard the University of Tokyo's R/V *Hakuho Maru*. The expedition had several objectives. The most interesting goal to ODP-oriented scientists was obtaining seismic data in support of proposed ODP drilling by *JOIDES Resolution* during its upcoming campaign in the Indian and Pacific oceans.

The OJP is easily the largest of Earth's large igneous provinces (LIPs), being at least five times more voluminous than the Deccan Traps in western India. The plateau may have formed from a large mantle plume during the mid-Cretaceous, a hypothesis with profound geodynamic and geochemical implications. This timing (~120 Ma) also coincides with the Earth's transition into mid-Cretaceous "Greenhouse" climates, elevated sea levels, a change in seawater strontium isotope ratios, black shale events and extreme fluctuations in paleobiota. In the minds of many investigators, the formation of OJP is the prime suspect as the causal agent of these drastic changes in the global environment. However, this suspect has not been properly interrogated. Its igneous basement has been sampled at only five locations, three oceanic drill sites and two spots on the Solomon Islands. Basalts from these locales yield radiometric dates that fall into two distinct volcanic episodes, an initial and probably primary volcanic pulse from 124-120 Ma and a subsequent pulse at about 90 Ma. These few dates and their associated geochemistries are clearly a preliminary and inadequate characterization of this giant plateau.

Geophysical site surveying was conducted with multichannel reflection and refraction seismology: on the main plateau, on the transition from the main plateau to the Nauru Basin, within the Nauru Basin, and on the "Eastern Salient" of the plateau just north of Stewart Basin (Figure 1). In general, this multichannel reflection work was accomplished with two or three large airguns (17 and 20 liter) fired to a 48-channel seismic streamer. The refraction experiments were carried out by shooting to sonobuoys throughout the area and to a crossed array of 15 ocean-bottom seismometers (OBSs) on the crest of the main plateau. The OBS array was emplaced to record deeper crustal arrivals, both from our airgun sources and from more distant earthquakes. These data will be processed at several shore-based labs (OBSs at the University of Tokyo, multichannel reflection and most of the sonobuoys at the University of Texas, Austin and the remaining sonobuoys at the University of North Carolina, Wilmington).

The preliminary results from the shipboard work are encouraging. Basement was generally apparent throughout the survey area on the shipboard monitor records and on preliminary stacks of the multichannel data. Although refractions received by sonobuoys were difficult to collect in the notoriously reverberant Nauru Basin, good refractions were obtained over critical areas there, and excellent refractions were recorded over the OJP. Reflection records over the main plateau reveal smoothly-layered, undistorted sediments overlying a relatively smooth basement surface. This combined morphology is in marked contrast to the pervasive faulting and erosion present on the of crest of Earth's second largest LIP, the Kerguelen Plateau in the Indian Ocean (see the article on page 1). Moving down the OJP towards the Nauru Basin, the basement surface remains relatively smooth and unfaulted. This simplifies tracing crustal structure from the main plateau to the adjacent basin; a critical goal for model discrimination.

Much of the western Nauru Basin has a strongly reverberant acoustic character that drilling in the north proved to be mid-Cretaceous basalts at least 600 m thick. However, a "seismic window" through these basalts exists near the eastern end of our long east-west seismic line that probably reveals original, earliest Cretaceous basement (140-145 Ma).

In contrast to the main OJP, the crest of the Eastern Salient just north of Stewart Basin is characterized by faulting of the basement surface. The overlying sediments, only a few hundred meters thick, show angular unconformities that suggest block rotation and erosion. This suggests that the history of the Eastern Salient is different from the main part of the OJP, and that this area experienced major deformation subsequent to formation of the main plateau.

While the mid-Cretaceous formation of the OJP represents an enormous, multifaceted enigma, its potential destruction looms equally large in problems of subduction dynamics. The common wisdom is that buoyant objects as large as the OJP are "unsubductable," and would instead jam a subduction system and possibly rearrange the surrounding relative plate motions. Early researchers on this topic proposed the entry of the OJP into the North Solomon Trench at about 10 Ma or earlier, and sometime after this event, OJP subduction largely ceased. However, a previous U.S.-Japan expedition on R/V *Ewing* in 1995 — with many of the current investigators — revealed a nearly flat reflector 7 km deep in the OJP crust that ramps upwards at 20-30 degrees to a seafloor ridge. The reflector is interpreted as a décollement fault marking a delamination boundary. This feature, and the dominance of extrusive over intrusive oceanic crust obducted onto the adjacent Solomon Islands, led to the hypothesis that only the uppermost 6-7 km of OJP's extrusive basalts are being accreted to the Solomon Islands arc, while most of the underlying 20-25 km of lower oceanic crust is being actively subducted. These and other data also suggest that subduction of the thickened part of the OJP crust may have begun only 4-2 Ma ago and is ongoing.

During our expedition, a medium-sized airgun was shot to a 24-channel seismic streamer and used with the "Izanagi" side-scan system. The data revealed the structure within the delaminated crust and its surface expression at the detailed survey area, as shown in the box in Figure 1. Preliminary results suggest that faulting and initial trench formation is propagating to the northwest, approximately parallel to the survey-area trend. This trend may reflect a preexisting fracture zone that has been reactivated. Initial and diffuse seafloor faulting is documented to the northwest and evolves southeastwards into a ridge marked by a linear magnetic anomaly. The increase in ridge elevation and width to the southeast is accompanied by formation of a deeper trench and slope basin landward of the ridge. Thus, subduction dynamics are more prominent and mature to the southeast and are just beginning at the northwest end of the system.

The faulting and trench trends combined with the upramping décollement surface may form the basis for an interesting drilling proposal in subduction dynamics. There are few, if any, other examples of basalt-to-basalt thrust contacts along active faults in a marine setting. Most thrusts investigated by ODP consist of sediment-to-sediment contacts in sedimentary accretionary prisms. Drilling investigation of this area may lead to advances in understanding the mechanics and seismicity of hard rock thrust contacts that are normally found at depths too great for drilling.

Other programs carried out on the expedition include a magnetics survey over Lyra Basin to test whether the OJP was emplaced on an abandoned, Early Cretaceous spreading ridge. Early results suggest magnetic lineations increasing in age opposite from what was expected. More interpretative work is required for a definitive conclusion. Preliminary analyses of gravity data from the Eastern Salient of the OJP suggest that the observed gravity anomaly is too large to be due to Airy isostasy or to the loading of an elastic plate alone. Magmatic underplating or anomalously low-density mantle are possible sources of additional support of this topography.

All of this brings us back to the six learned men of Indostan, in the introductory poem,

continued on page 13...

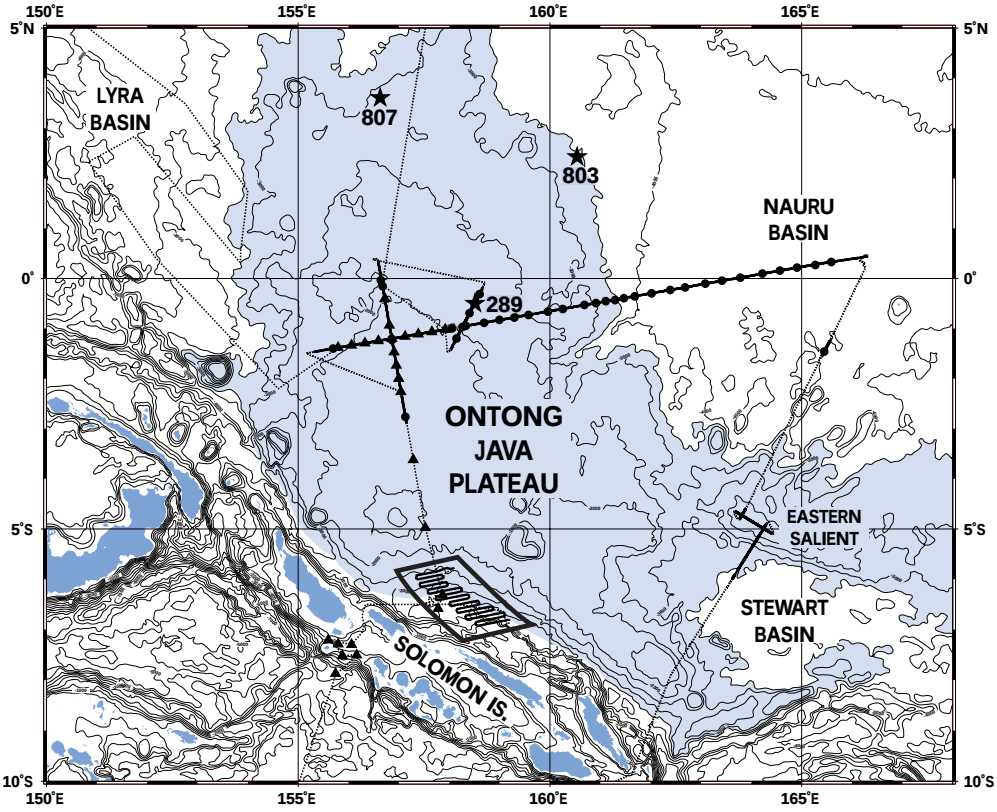


Fig. 1: Track of the R/V *Hakuho Maru* within the Ontong Java Plateau (OJP) region on Legs 1 and 2 of Expedition KH98-1 during January - March, 1998. Darkened area above 3,500 m outlines the OJP and stars show the locations of DSDP/ODP drill sites that have penetrated a total of 183 m of volcanic basement. Black dots are sonobuoys, black triangles are ocean-bottom seismometers, and heavier, solid sections of track show locations of seismic reflection surveys. The box delineates a detailed survey area where OJP is subducting.

DRILL BITS

SYDNEY PORT CALL

The Australian ODP Office and ODP Public Affairs have been planning events for the upcoming port call in Sydney, Australia, August 11-15, 1998. Activities will include VIP events, university and high school student tours, a scientific conference, and media outreach. In addition, Damon Shorter, a reporter with the Australian Broadcast Commission (ABC), will sail aboard the *JOIDES Resolution* during the last three weeks of Leg 181. He will transmit daily reports to the ABC network.

ODP TO EXHIBIT AT ICP

ODP is developing a display booth for the International Conference on Paleoceanography that runs August 23-28 in Lisbon, Portugal. The booth will showcase recent ODP-related scientific highlights appropos to the conference. ODP will use this opportunity to generate greater interest and participation from the scientific community, communicate ODP science, and publicize the Spring 1999 International Conference. The booth will be staffed by JOI, TAMU and ODP scientists.

ODP GOES INTERACTIVE

ODP Public Affairs collaborated with Canadian EXPO '98 officials and Robin Riddihough, Geological Survey of Canada, to complete a short, interactive ODP computer game that will be on display in the Canadian Pavilion at EXPO '98. The game is approximately 2 to 3 minutes long and includes ODP footage and animation.

CO-CHIEF REVIEW OF ODP

JOI will host an "ODP Co-Chief Scientist Review" in Washington, DC, this October 1-2. The purpose of the review is to examine ODP's performance since the last review in October 1996 in meeting the scientific objectives of the drilling legs. All facets of ODP will be discussed, including: Scientific Advice (JOIDES), Science Operations (TAMU), Logging Operations (LDEO), the Site Survey Data Bank (LDEO), and Management (JOI). Representatives from these organizations and the National Science Foundation will be invited to attend the review in order to provide information and to respond to the co-chiefs' comments and suggestions. The 23 co-chiefs from Legs 170 through 180 have been invited, and we are pleased to announce that over 70% plan to attend.

SITE AUGMENTATION FUNDS SHRINK

Site Augmentation (SA) funding is available from JOI/USSSP and has proved to be an important and cost-effective way to rapidly respond to the ODP planning needs of U.S. scientists. Of late, the demand for these funds has significantly exceeded the supply. In addition, recent external constraints on the U.S. Science Support Program budget have further limited SA funds. As a result, SA proposals received by JOI early in the USSSP fiscal year, which begins March 1, have a greater chance of being funded than those received later in the year. Please keep this in mind as you plan your requests for SA funding.

There are six categories of activities eligible for SA funding: 1) site-specific data collection on ships of opportunity; 2) U.S. scientists participation in non-U.S. shipboard programs; 3) innovative or non-routine downhole measurements and experiments; 4) reprocessing or reanalysis of existing data for proposal development or for sites already being considered and ranked by JOIDES; 5) expenses incurred assembling and reproducing original data for packages related to proposal development or that are requested by JOIDES panels; and 6) mini-workshops to bring together scientists to coordinate site-specific or regional data for integration into a mature drilling proposal or that would make a significant contribution to the overall ODP effort. For additional information on SA visit the JOI/USSSP web site at www.joi-odp.org/USSSP.

CELEBRATING 30 YEARS OF SCIENTIFIC OCEAN DRILLING

Many activities and events are being planned to celebrate the 30th Anniversary of Scientific Ocean Drilling, including:

30th Anniversary Calendar

A commemorative calendar is being created to highlight significant DSDP and ODP discoveries, scientific research, and the individuals who have made major contributions to ocean drilling. Calendars will be available in December; look for details in the next newsletter.

ODP/TAMU Staff Recognition Event

TAMU will host an employee recognition event in College Station, Texas, this September. The event will honor 12 ODP/TAMU staff who have worked for both DSDP and ODP Science Operations. Included among those honored will be Ted (Gus) Gustafson who sailed on DSDP Leg 1 and on many legs since! Congrats to the dozen stalwarts.

ODP at AGU

The American Geophysical Union has approved a request for a Union Session, in honor of the 30th Anniversary, at the Fall AGU meeting (December 6-10, San Francisco). The half-day oral session, possibly including a poster session, is titled "New Evidence for Rapid Climate Change from Ocean Drilling." Please submit your ab-

stracts to AGU with courtesy copies to the conveners, Larry Peterson (lpeterson@rsmas.miami.edu) and Eystein Jansen (eystein.jansen@ geol.uib.no). The exact date and time of the session will be available from AGU in late September and will be announced in the November issue of this newsletter. Rumor has it that there will also be a session titled "Ocean Drilling in Laminated Sediments for High-Resolution Paleoenvironmental Records."

METHANE HYDRATES AND ODP

The U.S. Senate Energy Committee held hearings in Washington on May 21, 1998, to discuss U.S. Senate Bill #1418, which seeks to establish a Methane Hydrate Research Program. Admiral James D. Watkins (President of JOI/CORE) and U.S. Senator Ron Wyden (D-Oregon) provided written testimony to the committee, while others, including Robert Kripowicz (DOE), Charles Paull (UNC-Chapel Hill), Timothy Collett (USGS), and Arthur Johnson (Chevron), gave oral testimony. Paull, Collett and Johnson are members of the JOIDES Gas Hydrate Program Planning Group. All testimony acknowledged the fundamental contributions made by the ODP to understanding gas hydrates and stressed the importance of including NSF and ODP as full partners in the exploration strategy discussions and science planning for gas hydrate research. On June 24, the Committee marked up and unamimously approved the bill following the adoption of an amendment to include NSF in the program. John Tarduno, Chair of the JOIDES Scientific Steering and Evaluation Panel for the Dynamics of Earth's Interior, has generously posted the testimony at: www.earth.rochester.edu/issep.

The Department of Energy (DOE) has produced a draft plan for a proposed Methane Hydrate Research Program that is available at: www.fe.doe.gov/oil_gas/methanehydrates/hydrateplan.html. In late May, JOI personnel attended a DOE workshop addressing this plan in Washington, DC, titled "Planning for the Future of Methane Hydrate Research and Resource Development," which was sponsored by the Office of Fossil Energy, DOE. The JOI office has gathered comments on this draft from the JOIDES community and forwarded these, with a synopsis, to DOE in July.

THE P.R.C. JOINS ODP

In late April 1998, the People's Republic of China (P.R.C.) became the first nation to join ODP as an Associate Member. The P.R.C.'s benefits as an Associate Member (1/6 the level of full members) include: participation of two scientists per year on ODP legs; invitations extended for co-chiefs proportionate to their contribution level; full voting membership on two panels with the right to have nonvoting observers at all JOIDES meetings; and access to engineering plans, data, research results, publications and other information.

ODP Leg 184 is of particular interest to the P.R.C. The expedition will examine the East Asian monsoon and its connection to global climate change. Dr. Pinxian Wang, a paleoclimatologist and paleoceanographer, has been selected as one of the Leg 184 co-chief scientists. Dr. Wang hails from the State Education Commission, Laboratory of Marine Geology, Tongji University in Shanghai. Dr. Warren Prell, from Brown University in Providence, Rhode Island, will serve as the other co-chief scientist on this leg.

JOINT ENGINEERING DEVELOPMENT

A Memorandum of Agreement (MOA) for joint engineering development between JOI and the Japan Marine Science and Technology Center (JAMSTEC) is being finalized. The goal of the MOA is to define a framework of cooperation between ODP and JAMSTEC for technology development needed for both ongoing and future scientific endeavors. Initial plans are to allocate resources towards the co-development of improved coring and long-term monitoring technologies.

BLAST FROM THE PAST

A "Blast from the Past" poster was developed by JOI in partnership with the Smithsonian Institution to complement an exhibit in the Natural History Museum in Washington, DC. The exhibit features the K/T boundary core (recovered during Leg 171B in 1997) which records the cataclysmic event that created the now-buried Chicxulub Crater. The original core had been displayed in the museum but has recently been replaced by a replica for permanent exhibit.

In Spring 1998, JOI/USSSP provided support for Len Sharp, the science chair at Liverpool High School in Liverpool, NY, to develop high school classroom activities to accompany the poster. The poster and activities were distributed in the May 1998 issue of *The Science Teacher,* a magazine published by the National Science Teachers Association with a circulation of 27,000. The poster and accompanying article and activities are available from JOI (send e-mail requests to joi@brook.edu).

EARTH SCIENCES WEEK

October 11-17, 1998, has been declared Earth Sciences Week by the American Geological Institute and its member societies. This is a grass roots effort to promote the earth sciences within individual communities and is a good opportunity to spread the word about past and future ODP science. Find out how to get involved at: http://www. earthsciweek.org/.

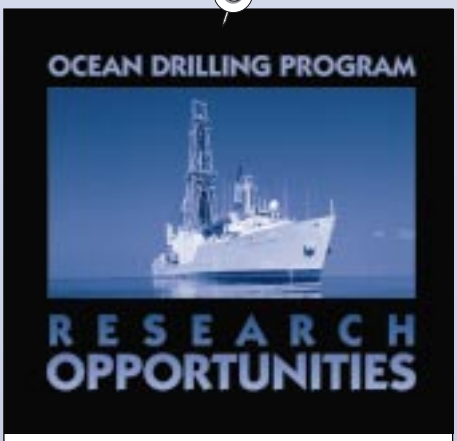
LEASING THE *JOIDES RESOLUTION*

A contract amendment to extend operation of *JOIDES Resolution* through September 30, 2003, was agreed upon after extensive negotiations between the ship operator, Overseas Drilling Ltd., and Texas A&M Research Foundation on behalf of the ODP. The agreement went into effect on June 24, 1998.

CORRECTION!

We failed to acknowledge Dr. Earl Davis (Geological Survey of Canada Pacific) as the coauthor of two articles in the last issue: the Workshop Report titled "Advanced CORKs for the 21st Century" and the Borehole Report titled "CORK reveals huge fluxes in off-axis hydrologic circulation." Our apologies Earl.

ANNOUN



ODP needs shipboard and shore-based participants! Do you want to do research at sea? ODP research opportunities are available for scientists, including graduate students. No seagoing experience is required. Do you want to do research on shore? Samples and data are available for shore-based research.

For more information visit the JOI web site at www.joi-odp.org or contact: Joint Oceanographic Institutions, 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102, USA; (202) 232-3900; joi@brook.edu.

A flyer announcing these ODP research opportunities is available. Please help ODP by posting the flyer at your institution – contact the JOI office for copies.

A New Vision for Scientific Ocean Drilling

COMPOST-II: the U.S. Committee for Post-2003 Scientific Ocean Drilling

The COMPOST-II report is available on the JOI web site at www.joi-odp.org. Hard copies of the report are available upon request from the JOI office at: JOI/U.S. Science Support Program, Joint Oceanographic Institutions, 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036-2102; e-mail: joi@brook.edu; tele: (202) 232-3900.

JOI/USSSP Supported Shipboard Participants

LEG 180: WOODLARK BASIN
U.S. Co-Chief: Brian Taylor, U of Hawaii
ODP Staff Scientist: Adam Klaus, TAMU
Eric DeCarlo, U of Hawaii
Gina Frost, U of Hawaii
Andrew Goodliffe, U of Hawaii
Garry Karner, LDEO
Brian Monteleone, U of Arizona
Johanna Resig, U of Hawaii
Elizabeth Screaton, U of CO at Boulder
William Siesser, Vanderbilt U
Shannon Stover, U of Colorado

LEG 181: SW PACIFIC GATEWAYS
ODP Staff Scientist: Carl Richter, TAMU
LDEO Logging Scientist:
David Handwerger, U of Utah
Sara Harris, Oregon State U
Leah Joseph, U of Michigan
Eddy Lee, TAMU
Lynn Millwood, U of Texas, Arlington
Gerald Smith, SUNY Buffalo
Gary Wilson, Ohio State U
Shouyun Hu, UC Davis

JOI/USSAC Ocean Drilling Fellows

Peter Selkin
Scripps Institution of Oceanography
Magnetization and remagnetization of seafloor extrusives: Paleointensity, CRM and VRM experiments (one-year, shore-based)

Deborah Thomas
U of North Carolina, Chapel Hill
Reconstruction of Latest Paleocene Thermal Maximum deep-water circulation from neodymium isotope records (one-year, shore-based)

Robert Valentine
Washington University, St. Louis
Crustal Recycling at the Izu-Bonin-Mariana convergent margin: Constraints from B-, Li-, Be-, and Pb- isotopes and trace element systematics (one-year, shipboard)

CALL FOR NOMINATIONS TO USSAC

JOI is seeking nominations for U.S. positions on the U.S. Science Advisory Committee (USSAC). USSAC provides guidance to JOI in managing the JOI/U.S. Science Support Program (JOI/USSSP) which in turn provides support for U.S. involvement in ODP. Four new members of USSAC will be appointed by the JOI Board of Governors in late 1998. The three-year term for the new USSAC members will begin October 1, 1999.

If you are interested in serving on USSAC, please send a CV (no more than two pages) and a letter of interest to Dr. John Farrell, Director, JOI/U.S. Science Support Program, Joint Oceanographic Institutions, 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036-2102. Scientific leadership and a keen interest in ODP science and related activities must be demonstrated. The deadline for nominations is October 16, 1998.

For more information about JOI/USSSP and USSAC duties and responsibilities visit the JOI web site at www.joi-odp.org or contact Dr. Michael Arthur, USSAC Chair, at arthur@geosc.psu.edu or (814) 863-6054.

C E M E N T S

Schedule for ODP Legs 180-187

LEG	REGION	CO-CHIEFS	DEP. PORT	DATE	SCIENTIFIC OBJECTIVES
180	Woodlark Basin	Taylor Huchon	Darwin	6/98	To investigate lithosphere extension, specifically the role of low-angle, normal faulting in continental breakup, and the evolution of conjugate rifted margins.
181	SW Pacific Gateway	Carter McCave	Townsville	8/98	To reconstruct the stratigraphy, paleohydrology, and dynamics of the Pacific's Deep Western Boundary Current and related water masses since the early Miocene.
182	Great Australian Bight	Feary Hine	Wellington	10/98	To document this carbonate platform's evolution since 65 Ma in response to oceanographic and biotic change and to study global sea-level fluctuations, physical and chemical paleocean dynamics, biotic evolution, hydrology and diagenesis.
183	Kerguelen LIP	Coffin Frey	Fremantle	12/98	To investigate the origin, growth, compositional variation, and subsidence history of the Large Igneous Province (LIP) formed by the Kerguelen Plateau and Broken Ridge.
184	E Asian Monsoon	Wang, Prell	Fremantle	2/99	To investigate the interrelationships between uplift, monsoon evolution, and global cooling.
185	Mariana-Izu	Ludden Plank	Hong Kong	4/99	To investigate crustal recycling by determining the net fluxes of material at the Mariana-Izu subduction zone by mass balance of inputs and outputs.
186	W Pac Seismic Net/Japan Trench	Sacks Suyehiro	Tokyo	6/99	To establish long-term borehole geophysical observatories areas in the western Pacific to provide information about subduction zone earthquakes and the mechanics of the subduction process.
---	Dry dock	----------	----------	8/99	----------
187	Aus-Ant Discordance	Christie TBN	TBN	10/99	To investigate relationships of crustal and mantle composition, spreading, and magma supply rates in an area suspected to have unusual mantle dynamics and profound magma supply differences.

USSAC ROTATION

OCTOBER 1, 1998

ROTATING ON:
Tim Byrne, U of Connecticut
Mike Underwood, U of Missouri, Columbia
Gregor Eberli, RSMAS, U of Miami
Nick Christie-Blick, LDEO
John Armentrout, Mobil R&D Corporation

ROTATING OFF:
Carolyn Mutter, LDEO
Jamie Austin, UTIG
Bill Curry, WHOI
Terry Plank, U of Kansas
Missy Feeley, Exxon Exploration Co.

JOI/USSAC OCEAN DRILLING FELLOWSHIP PROGRAM

JOI/USSAC is seeking graduate students of unusual promise and ability who are enrolled in U.S. institutions to conduct research compatible with that of the Ocean Drilling Program. Both one- and two-year fellowships are available. The award is up to $22,000 per year to be used for stipend, tuition, benefits, research costs, and incidental travel, if any. Masters and doctoral degree candidates are encouraged to propose innovative and imaginative projects. Research may be directed toward the objectives of a specific leg or to broader themes.

DEADLINES:
Shore-based work (regardless of leg):
11/15/98

MORE INFORMATION:
Andrea Johnson
JOI/USSAC Ocean Drilling Fellowship Program
Joint Oceanographic Institutions
1755 Massachusetts Ave., NW, Suite 800
Washington, DC 20036-2102
Tel: (202) 232-3900 x213
Fax: (202) 232-8203
E-mail: ajohnson@brook.edu

OCEAN SEISMIC NETWORK PILOT EXPERIMENT IS A SUCCESS!

contributed by John A. Orcutt

The Ocean Seismic Network (OSN) is off and running with an excellent start on the experimental phase of its program to establish global observatories in the oceans. From January 3 to February 11, 1998, scientific and engineering teams from the Scripps and Woods Hole oceanographic institutions deployed a broadband seismometer (3 mHz – 5 Hz) in ODP Reentry Hole 843B (also known as OSN-1) in 4,407 m of water 225 km southwest of Oahu, Hawaii. This pilot experiment is the first in a series of twenty deployments of similar systems to be distributed in the world ocean during the next five to ten years.

The goal of the recent pilot experiment was to determine the optimal method for installing broadband instruments for the OSN. For comparison, three systems were deployed. A Teledyne KS54000 broadband seismometer, identical to seismometers used in the IRIS/IDA and IRIS/USGS Global Seismic Network (GSN), was installed in a titanium sonde in the OSN-1 hole using the SIO/MPL/JOI Control Vehicle (CV). This entire borehole package is referred to as the BroadBand Borehole Seismic System (B3S2). In addition, two BroadBand Ocean Bottom Seismographs (BBOBS), both of which employed a broadband Guralp CMG-3T seismometer, were deployed in the immediate vicinity. One of these packages was inserted fully into the sediments using a special deployment frame. The second was simply set on the seafloor where it was subject to direct interactions with bottom currents.

The pilot experiment used the R/V *Thomas Thompson* operated by the University of Washington. This highly capable vessel was navigated throughout the experiment using dynamic positioning controlled by the Global Positioning System (GPS). Both the ship and GPS worked extraordinarily well at all times; the navigation was accurate enough to ensure that all deployments of the CV were within a few meters of the seafloor target.

Minor problems (broken connectors, for example) plagued the first deployments of all the packages using the CV. Manipulating the individual large packages, comprising the B3S2 and BBOBS, in the deep ocean poses special problems in getting the systems over the side and emplacing them in sediments and in the borehole. While all the individual mechanical systems worked exceptionally well, the combined system did not work smoothly when checked. An acoustic modem was used to communicate between the ship and the BBOBS packages and establishing links — at even 300 baud — proved to be a substantial challenge. We learned a great deal from this experience and finally, after two deployments of each system, all were working perfectly as we returned to Honolulu.

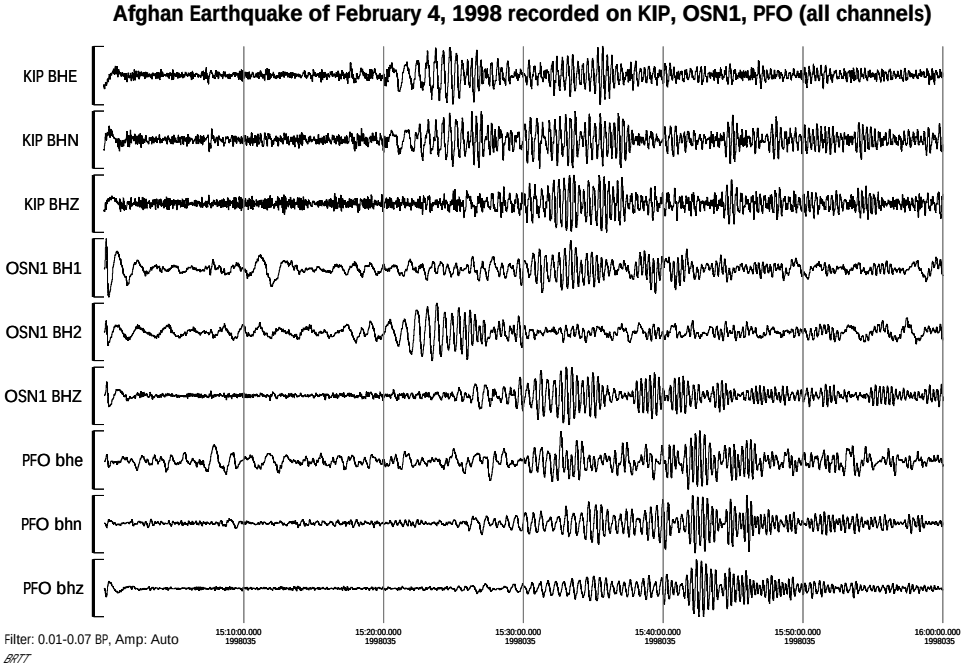


Fig. 1: Recording of the February 4, 1998 Afghan earthquake. BH1 and BH2 are, for example, the two horizontal components while BHZ is the vertical. KIP refers to the seismometer at Kipapa, Oahu and PFO is the Cecil and Ida Green IGPP Pinon Flat Observatory GSN station. The high frequency noise levels at OSN-1 site are significantly lower than at KIP and comparable to the inland site at PFO.

The deployment of the B3S2 system in OSN-1 included a recording period (a bit more than a day) during which the sensor remained connected to the ship via the CV. After the seismometers had been unlocked and leveled, we were delighted to find that we had recorded a magnitude 6.1 earthquake in Afghanistan on February 4. Later, our enthusiasm was dampened when we learned that several thousand people in remote villages had been killed by the event when their homes collapsed. Recording this relatively small event at a great distance did, however, demonstrate clearly that our new station was a viable, though temporary, member of the Global Seismic Network. Figure 1 compares the OSN-1 borehole record with records written at the IRIS/USGS station at Honolulu (KIP) and that at the IRIS/IDA site at Piñon Flat (PFO) near Palm Springs.

For seismic aficionados, the Love wave is very clear on the second horizontal (BH2) while the Rayleigh wave is very pronounced on the first horizontal (BH1) indicating that BH1 points at Afghanistan while BH2 is nearly perpendicular to the path of propagation. Additional data from later earthquakes will provide the information needed to orient the seismometer in the borehole with high accuracy.

As this article is being written, the recovery of instruments is underway from the R/V *Melville*. The CV has recovered the instrument from the borehole, the buried BBOBS has been returned to the ship, and the unburied seafloor BBOBS is on its way to the surface. A few seismograms have been extracted from the BBOBS recording system and are being compared to a library of events carried to sea by the PIs. The data and information needed to design the global network of seafloor seismic stations appear to be in hand. Everyone involved is looking forward to learning what the data from the extraordinary OSN experiment can tell us about the structure of Earth and the seismic sources which excite these distant elastic waves.

The Principal Investigators for this program were John Collins (WHOI), John Hildebrand (SIO), John Orcutt (SIO), Ken Peal (WHOI), Fred Spiess (SIO), Ralph Stephen (WHOI), and Frank Vernon (SIO). Ralph Stephen served as Chief Scientist for the deployment leg. This work is sponsored by the National Science Foundation with additional support from Incorporated Research Institutions for Seismology (IRIS); the U.S. Science Support Program (USSSP) at Joint Oceanographic Institutions, Inc. (JOI); and the Scripps Institution of Oceanography (SIO).

THE AUTHOR

John A. Orcutt is Director, Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics.

EARTH'S LARGEST LIP, CONTINUED FROM PAGE 7...

who suggested in turn that their Elephant resembled a wall, a spear, a snake, a tree, a fan, and a rope when each of them touched a different part of the animal. The poet concluded that "each was partly in the right, and all were in the wrong." Like those blind seekers, we each have our own opinions about the OJP, the "Elephant" of volcanic provinces, but we shall not know its true nature until systematic sampling replaces geophysical groping in the dark as a means of investigating this huge "beast."

Eight U.S. scientists participated in the KH98-1 expedition. They were Paul Mann and Edward L. Winterer on Leg 1; Lewis J. Abrams, Millard F. Coffin, Garrett T. Ito, Loren W. Kroenke, Roger L. Larson and Mark Wiederspahn on Leg 2. Funds from the U.S. Science Support Program helped support five of the U.S. scientists. The R/V *Hakuho Maru* is a 100-m long, well-equipped research vessel that transits routinely at 15 knots and is staffed with highly professional officers and crew. All of the non-Japanese scientists were impressed with the efficiency of operations and with the hospitality of the Japanese crew and scientific parties. These characteristics and good weather combined to allow more than 90% of the pre-expedition goals to be accomplished.

THE AUTHORS:

- R.L. Larson, Graduate School of Oceanography, University of Rhode Island;
- L.J. Abrams, Department of Earth Sciences, University of North Carolina, Wilmington;
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- O. Eldholm, Department of Geology, University of Oslo;
- T. Gladczenko, Department of Geology, University of Oslo;
- G.T. Ito, Department of Geology and Geophysics, University of Hawaii;
- L.W. Kroenke, Department of Geology and Geophysics, University of Hawaii;
- P. Mann, Institute for Geophysics, University of Texas, Austin;
- M. Nakanishi, Ocean Research Institute, University of Tokyo;
- A. Taira, Ocean Research Institute, University of Tokyo; and
- E.L. Winterer, Scripps Institution of Oceanography, University of California, San Diego.

SCAT REFLECTANCE: SHEDDING LIGHT ON SEDIMENT MINERALOGY

contributed by J.D. Ortiz, S.E. Harris, A.C. Mix, and the Leg 177 shipboard scientific party

Enhanced site surveys, improved coring technology, and other developments have enabled significantly greater core recovery in the ODP, such as on Leg 175 (Benguela Current), when a record 8,003 m of core were recovered. Lithologic description of such vast amounts of mud is a daunting task and has spurred scientists to develop and depend on automated tools to assess sediment variability. Such "remote sensing" tools are rapid, quantitative, non-invasive, and cost effective. ODP routinely measures sediment physical properties with the whole-core multi-sensor track (MST) and sediment color with a hand-held reflectance meter, the Minolta CM-2002 (400-700 nm wavelengths, 10 nm resolution). Additional instruments have been deployed on the *JOIDES Resolution*, on an *ad hoc* basis, depending on the specific objectives of the leg.

This article describes the development and the application of one such instrument, the automated Split Core Analysis Track (SCAT). Developed at Oregon State University, with funding from JOI/USSSP, SCAT measures diffuse reflectance spectra from the surfaces of split sediment cores. These data can be used to infer bulk sediment composition, including carbonate, opal, organic carbon, oxide and oxyhydroxide content [*Balsam and Deaton,* 1991; *Mix et al.,* 1995; *Harris et al.,* 1997; *Ortiz et al.,* 1998]. To date, this system has been used to measure sediments from Legs 138, 154, 162, 167, and most recently, 177. Interestingly, each of these legs (except 177), established, in succession, records for core recovery.

Although the SCAT system does not acquire data as rapidly as the MST, shipboard use of the SCAT on high recovery legs demonstrates that it works well under high-recovery conditions. The SCAT system was used more extensively than the Minolta system on Leg 177 because the SCAT generates higher-resolution data, over a greater spectral range. ODP is in the process of installing a split-core system that includes a Minolta CM-2002 [*P. Blum,* personal communication].

BACKGROUND

The heart of the SCAT system is a 1024 pixel reflectance spectrometer that measures ultraviolet, visible, and near infrared radiation (250 to 950 nm wavelengths) at a spectral resolution of 0.68 nm. This measurement system shines light of known spectral quality on the surface of a split core and measures the diffuse reflective component that is collected within an integrating sphere brought into contact with the sediments.

The current configuration of the SCAT, which was first used during post-cruise operations on ODP Leg 154 [*Harris et al.,* 1997], has undergone considerable technological advancement from the original version that was deployed on Leg 138 [*Mix et al.,* 1992]. Reflectance measurements

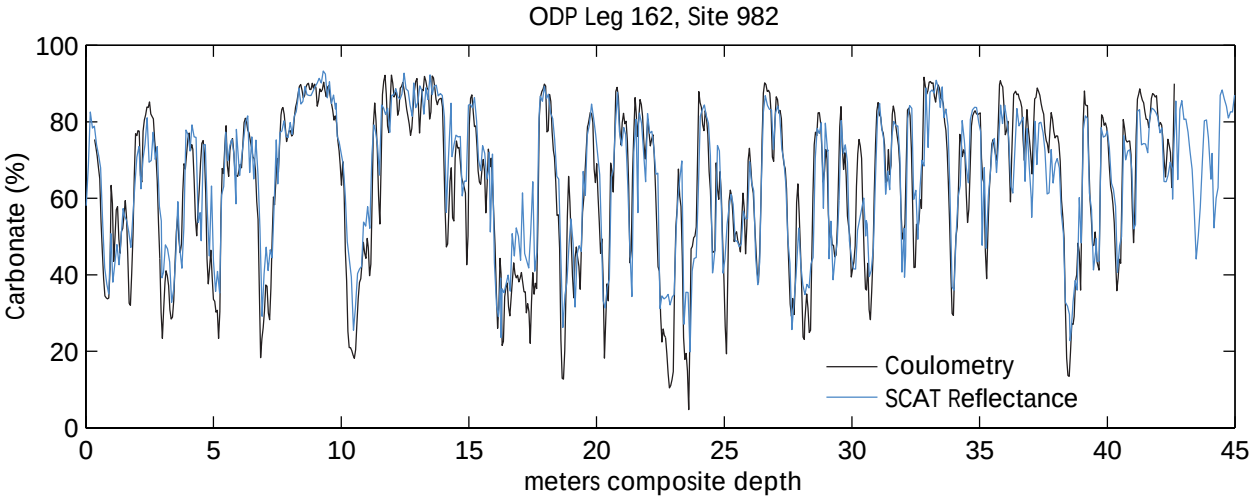

Fig. 1: Comparison of coulometric and reflectance-derived percent carbonate estimates at Site 982 (ODP Leg 162). Coulometric percent carbonate data from Venz et al. [1998]. Reflectance-derived carbonate is from Ortiz et al. [in press].

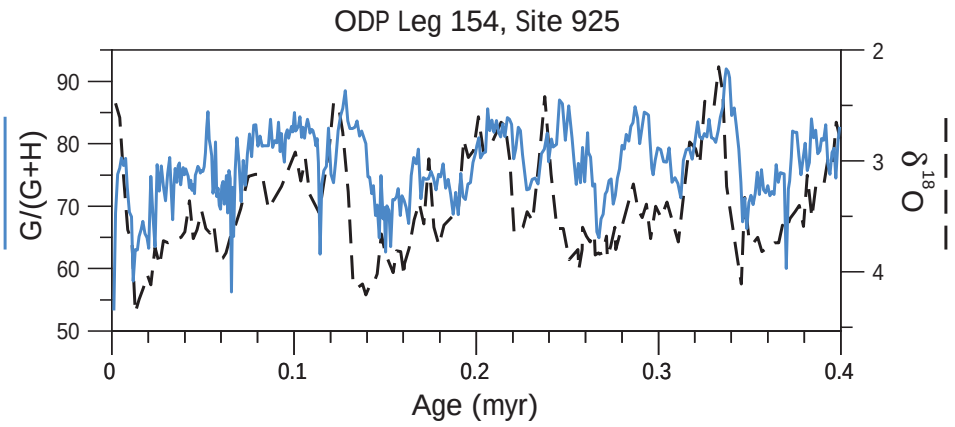

Fig. 2: Percentage of goethite relative to goethite plus hematite in sediments from Site 926 (Leg 154) compared to global ice volume. (Isotopic data from Bickert et al. [1997]; Reflectance data from Harris and Mix [in press]).

with the current version have a signal-to-noise ratio that is an order of magnitude greater than the Leg 138 prototype. This was achieved by adding an integrating sphere to better measure the diffuse component of reflectance, modifying the fiber optics and light supply system, and by lowering the instrument package to the sediment surface. The final modification is important because it ensures constant measurement geometry between samples, and it allows for the deployment of additional sediment property sensors. In addition to diffuse spectral reflectance, the instrument now measures sediment resistivity, which can be related to porosity via Archie's Law [*Boyce,* 1968]. A version of the instrument that includes a Bartington magnetic susceptibility loop has been placed on UNOLS vessels.

SCIENTIFIC HIGHLIGHTS

The SCAT system has played an increasingly important role in ODP expeditions. Results from Leg 138 demonstrated the ability of the instrument to monitor a wide variety of sedimentological environments [*Mix et al.,* 1992]. Results from Legs 154 and 162 showed that the instrument can provide routine and accurate percent carbonate estimates at high resolution (Figure 1). In Leg 154 sediments, the reflectance-derived ratio of goethite/(goethite+hematite) serves as a proxy for continental climate because in tropical soils, this ratio increases with increasing precipitation and soil organic carbon [*Kampf and Schwertmann,* 1983]. Based on this proxy, late Pleistocene moist climate periods in the Amazon lowlands occur during transitions from glacial to interglacial stages and precede Northern Hemisphere ice volume changes (Figure 2; [*Harris and Mix,* in press]).

With Leg 162 sediments, shipboard reflectance data proved extremely helpful as a correlative tool for hole-to-hole splicing. Correlation by frequency-mapping the spliced, reflectance-based, proxy carbonate record from Sites 980 and 981 (Leg 162) onto those from Site 926 (Leg 154) provided an effective means to generate a detailed age model for Site 980-981 [*Ortiz et al.,* in press].

Exciting results are also expected from Leg 177 data. SCAT reflectance and resistivity data were used for hole-to-hole correlation, to describe the physical and litho-

continued on page 20...

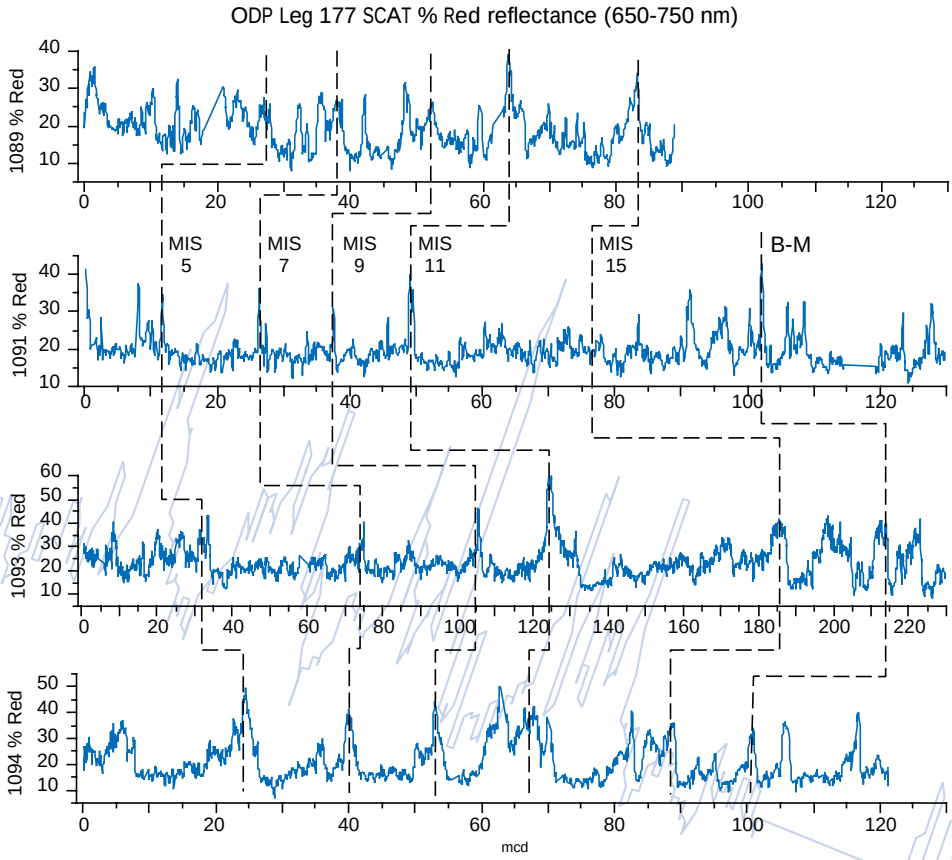

Fig. 3: Preliminary marine isotope stage boundaries inferred from percent red reflectance, bio- and magnetostratigraphic age datums at sites drilled during Leg 177 [*Gersonde et al.,* in press].

ASK NOT WHAT ODP CAN DO FOR YOU...

Michael Arthur is Professor, Department of Geosciences, Pennsylvania State University

If you're reading this, it means you already know and likely appreciate ODP's impact on your research and teaching. It also suggests that you've made important contributions to scientific ocean drilling by submitting drilling proposals, participating on research cruises, generating and interpreting data, publishing results, and, yes, perhaps even voluntarily serving the JOIDES committee structure that's charged with science planning.

But, there's yet another thing you can do. If scientific ocean drilling is important to your science, it's now time to help ensure the presence and vitality of scientific ocean drilling for the future. We need your input for a new program. Just to the right of this column (yup, feast your eyes on that ad), you'll see a call for one-page "statements of interest" that will form the basis of an upcoming conference to define the scientific objectives for a future, multi-platform ocean drilling program. We are asking you, members of the U.S. community, to share your thoughts. Your ideas will be critical to the survival of scientific ocean drilling. Please read on.

Central to ongoing, international discussions about a new drilling program is the assumption of multi-platform operation; no longer will there be just a *JOIDES Resolution*-type ship. One model for a new program has a drilling vessel equipped with a riser and well-control capabilities, to drill deep holes into oceanic crust, passive and convergent margins, and a second vessel with *JOIDES Resolution*-like capabilities. Other platforms (e.g., jack-up rigs, geotechnical vessels, and ice-strengthened barges) have been envisioned as well.

In Tokyo, in July 1997, attendees of CONCORD (Conference on Cooperative Ocean Riser Drilling) assessed the need and use for riser drilling and also considered current and anticipated technical capabilities. In the U.S., discussions coordinated by JOI/USSAC are addressing how our national community should structure itself to support scientific ocean drilling beyond 2003. Specifically, we are considering the scientific issues and priorities that will drive the proposed program. In early 1997, JOI/USSAC sponsored a small workshop in support of ODP called COMPOST II (Committee on Post-2003 Drilling) that was co-chaired by Nick Pisias and Jamie Austin. The workshop report was printed in June and distributed to over 1000 individuals throughout the world (the report is posted at www.joi-odp.org). Further planning will occur at a small USSAC "retreat" that I am hosting this July at Penn State.

A coordinated international effort is obviously needed to define the future of scientific ocean drilling. As a result, the international conference I mention above, will be held on May 26-29, 1999. The conference venue will be Vancouver (University of B. C.), British Columbia, Canada, and about 300 scientists from around the world are expected. This conference will be central in formulating the justification for a new, multi-platform program. Therefore, the organizing committee has requested that members of the scientific community submit one or more, one-page written "statements of interest" as solicited in the conference notice which has recently been advertised in *Nature, Eos, Geotimes, GSA Today, SEG Newsletter, AAPG Explorer*, and elsewhere.

Because CONCORD determined, in part, the scientific objectives that bear on the need for riser capabilities, the upcoming conference will largely focus on non-riser scientific objectives. Nevertheless, submissions are not restricted to riser-less science. We need fundamental scientific considerations for drilling, not specific drill site proposals. Your submissions should briefly outline the scientific problem, and how it might be accomplished by ocean drilling. At this point, no idea is too outrageous for consideration, and we urge our colleagues who have no previous experience with ocean drilling to provide scientific input as well. The "statements" will be posted on the JOIDES web site (www.whoi.edu/joides) as they are submitted.

Remember, as I outlined in a previous column, the Ocean Drilling Program ends in 2003. There is no guarantee that a new program will arise, but it's clear that the actions we take as a community during the next few years will determine the future of scientific ocean drilling. This is a key opportunity for you to participate. If you have read this far, you may also receive a "bonus." The JOI/USSSP will provide limited travel funds to send U.S. submitters of "statements of interest" to the conference. Will that be you? Stay tuned.

Michael A. Arthur
Chair, USSAC

SCIENTIFIC OCEAN DRILLING NEEDS YOU!

CALL FOR STATEMENTS OF INTEREST

NOTICE: To all members of the earth sciences community.

The Ocean Drilling Program will end on October 1, 2003. International scientific cooperative efforts for deep-earth sampling in the marine environment will cease unless our community comes together now to plan a new program for scientific ocean drilling. We've done it before (ODP is the successor to the 1968-1983 Deep Sea Drilling Project) — we can do it again.

INT'L CONFERENCE: To be held on May 26-29, 1999, at the University of British Columbia in Vancouver, Canada, to define the scientific objectives for a future, multi-platform ocean drilling program with two major vessels. This conference will target the scientific goals of non-riser drilling and will complement the recent Conference for Cooperative Ocean Riser Drilling (CONCORD). CONCORD defined the scientific initiatives for use of a riser-equipped drilling vessel (the CONCORD report is available at http://mstip1.jamstec.go.jp/jamstec/OD21/CONCORD/result.html).

WANTED: Brief (approximately 1-page) statements of interest that describe a scientific objective, its importance, and the necessity for drilling. Technical details are not necessary. These statements will be used to organize the conference. This is your opportunity to influence the scientific direction of the new program and to show your support for future scientific ocean drilling.

DEADLINE: October 1, 1998.

SUBMIT TO: JOIDES Office, Department of Geology & Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA; (508) 289-3481; joides@whoi.edu.

NOW ACCEPTING U.S. APPLICATIONS FOR

ODP PANELS & COMMITTEES

The Joint Oceanographic Institutions/U.S. Science Advisory Committee is seeking applications to fill U.S. positions over the next year on the following Ocean Drilling Program-related panels and committees within the JOIDES Advisory Structure:

- Science Steering & Eval. Panels (SSEPs)
  - Dynamics of Earth's Interior (ISSEP)
  - Dynamics of Earth's Environment (ESSEP)
- Scientific Measurements Panel (SCIMP)
- Technology and Engineering Development Committee (TEDCOM)
- Site Survey Panel (SSP)

SSEPs foster and evaluate scientific proposals for Ocean Drilling Program field programs. SCIMP advises on scientific measurements and sampling policies. TEDCOM provides advice on drilling tools and techniques. SSP reviews and evaluates site survey information relating to proposed drilling targets. For more information about the responsibilities of these groups see the JOIDES Office web site at www. whoi.edu/joides, or contact the JOIDES Office at tel: (508) 289-3481 or e-mail: joides@whoi.edu.

If you are interested in serving on one of the committees or panels, please send a CV (no more than two pages) and a letter of interest to Dr. John Farrell, Program Director, JOI/U.S. Science Support Program, Joint Oceanographic Institutions, 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036-2102, USA.

Applications are due September 15, 1998. Membership is three years.

1998-99 JOI/USAC

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- Beloit College, Beloit, WI

THE WORD FROM WASHINGTON

contributed by J. Paul Dauphin, Associate Program Director, NSF/ODP

The ODP Council, the consultative body that represents the funding entities of the ODP, met on June 25, in Bonn, Germany, immediately after a meeting of the ODP Executive Committee (EXCOM). The Council — which reviews financial, managerial, and other ODP matters — welcomed the People's Republic of China as the first Associate Member of ODP. NSF has signed a Memorandum of Understanding with China and has already received funds for China's participation at the 1/6 level for fiscal year 1998.

Of particular interest at this year's Council meeting was the status of partner commitment for Phase III of ODP (1999-2003). Germany, Japan, the U.K. and the U.S. expect to participate as full members for Phase III. The European Science Foundation also announced its intention to remain as a full partner but is in the process of adjusting to changes within its consortium. For example, Italy has reduced its participation from 25% to 20%, Portugal has recently joined the consortium, and ESF believes that Ireland too, may join soon. The "PacRim Consortium" (Australia, Canada, South Korea, and Chinese Taipei) continues to seek ways to increase its participation from 11/12 to a full membership. France, on the other hand, announced that it would relinquish full participation and would commit only to a 2/3 membership. EXCOM discussed this decision and revisited the larger issue of the terms and conditions of Associate Membership. EXCOM established, and the Council endorsed, a new policy regarding various levels of Associate Membership. Based on the new policy, France's diminution in partnership will result in a loss of voting privileges on ODP's Executive and Science Committees as well as a proportionate decrease in shipboard participation.

The International Working Group (IWG) of the Integrated Ocean Drilling Program (IODP) for scientific drilling post-2003 convened after the EXCOM and Council meetings. A continuing concern of the IWG is the timing of events leading to a new program that will be centered on two drilling vessels (non-riser and riser). A timetable of these events was presented in the previous issue. The IWG asked the JOIDES advisory structure to help develop and evaluate cost projections for drilling operations of the IODP. This includes drilling operations and support services; engineering and technical development; shipboard and shore-based technical, scientific and logistical support; core and data archiving; and management and administrative support. It also sought recommendations for an efficient and viable implementation of the IODP.

The IWG has been co-chaired by Mike Purdy at NSF and Tsuyoshi Maruyama of the Science and Technology Agency (STA) in Japan. At this meeting, the co-chairs reaffirmed the commitments by NSF and Japan to proceed as equal partners in seeking the needed funding for a post-2003 drilling program. This was Mr. Maruyama's last meeting as co-chair, because he will be moving to the position of Director of Policy Planning for the Science and Technology Bureau at STA. We wish him well and look forward to working with his successor, Masakazu Murakami.

On another note, based on the May MG&G/ODP proposal panel, NSF/ODP will support the following field programs:

- A high-resolution, multi-channel, seismic reflection study of the Canterbury Basin, off the eastern margin of South Island, New Zealand under the direction of Craig Fulthorpe (UTIG) with Cliff Frohlich (UTIG) and Paul Mann (UTIG);
- Retrieval in 1999 of long-term continuous fluid samplers deployed by *JOIDES Resolution* in boreholes on the eastern flank of the Juan de Fuca Ridge on Leg 168. Miriam Kastner (SIO) and Geoff Wheat (Univ. of Alaska, Fairbanks) will lead this effort.
- Participation of Charles Lesher (UC Davis) in the Danish Lithosphere Center drilling cruise to the southeast Greenland volcanic rifted margin.
- A geophysical survey of the fast spreading oceanic crust of the south-central Cocos Plate region led by Doug Wilson (UCSB), Alistair Harding (SIO), and Graham Kent (SIO).

In other news, NSF Director, Neal Lane, has been asked by President Clinton to replace John Gibbons as Science and Technology Advisor to the President and to head the office of Science and Technology Policy. The President has nominated Rita Colwell, currently the President of the University of Maryland Biotechnology, to replace Lane.

With regard to other personnel changes, we send our thanks and best wishes to Nick Pisias for stepping in as interim Director for JOI/ODP. As usual, a job well done, Nick. We welcome Kate Moran as the new JOI/ODP Director. She has a challenging task ahead of her in accepting the reins of this complex and sometimes unruly program. All indications are that she is well up to the task. Best of luck, Kate. Frank Rack has also been hired recently by JOI as the new Assistant Director for ODP. Frank knows the program well; he was formerly a staff scientist at ODP/TAMU and has sailed on several drilling legs. Welcome, Frank.

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SCAT REFLECTANCE, CONTINUED FROM PAGE 15...

logic properties of recovered sediments, and as an aid to stratigraphic age determination when used in conjunction with the bio- and magnetostratigraphic age estimates. Because of strong, climatically driven variations in Southern Ocean sediment lithology, we were able to infer the position of major glacial-interglacial transitions. As such, we tentatively assigned Marine Isotope Stage boundaries back to stage 17 (beginning of Brunhes Chron) at many of the sites drilled (Figure 3). Data from the instrument will be featured in almost all sections of the *Leg 177 Initial Reports* volume [*Gersonde et al.,* in press].

LOOKING AHEAD

We hope to improve SCAT performance by: 1) increasing data acquisition rates; and 2) extending wavelength measurements further into the infrared bands so we can better estimate common terrigenous minerals in marine sediments. The SCAT system provides the capability to deliver sensors to split core surfaces. This will open many opportunities to make additional measurements of sediment properties using other automated instruments.

We thank JOI/USSSP for funding development of this instrumentation, and ODP for accommodating deployment of the system on many drilling legs over the past seven years. It has been a positive learning experience for all involved.

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