JOI/USSAC NEWSLETTER

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SUPPORT FOR U.S. PARTICIPATION IN THE INTEGRATED OCEAN DRILLING PROGRAM

The Conference on U.S. Participation in IODP (CUSP), an activity of the U.S. Science Advisory Committee (USSAC), was held in June 2002. This report was submitted to the U.S. National Science Foundation by the CUSP Steering Committee and USSAC in November 2002.

EXECUTIVE SUMMARY

The initial science plan *Earth, Oceans, and Life* of the Integrated Ocean Drilling Program (IODP) proposes bold new themes and initiatives that focus on: environmental change, processes, and effects; the deep biosphere and the subseafloor ocean; and solid earth cycles and geodynamics. IODP will have a major impact on marine-related science over the next decade. The current international Ocean Drilling Program (ODP) is already one of the most successful and pervasive scientific activities in the geosciences, and U.S. scientists have been leaders in all aspects of the program. The leadership and broad participation of U.S. scientists in ODP have enhanced our fundamental knowledge in the geosciences. IODP holds even greater promise.

We emphasize from the outset that an essential component of U.S. success in scientific ocean drilling has been the consistent and flexible financial support directly from the National Science Foundation (NSF) and through the U.S. Science Support Program (USSSP). Given the broad participation and impact of scientific ocean drilling on the U.S. geosciences community, the U.S. Science Advisory Committee (USSAC) seeks to ensure that U.S. scientists are adequately supported to participate in the new IODP and to enable the U.S. science community to take full advantage of the many scientific opportunities envisioned for IODP.

In this context, the CUSP report, based on the Conference on U.S. Participation in IODP (CUSP) and on follow-on discussion and activities (e.g., web-based questionnaire), addresses the support needs of U.S. scientists to fully participate in the international IODP. The report describes the indispensable elements of support for U.S. scientists to be administered by the NSF and defines the characteristics and structure of the anticipated successor to the current USSSP, which has supported U.S. participation in the ODP.

We discuss the goals of providing support, summarize the programmatic and organizational changes, both international and national, that impact U.S. participation in IODP, and then summarize views of the U.S. scientific community and USSAC on a number of activities and issues concerning the support required at NSF and in a USSSP-successor program. We conclude with a series of specific recommendations. These recommendations focus on the policy and principles of participation and support, rather than on the details of implementation and budgets. The recommendations identify new, emerging, and ongoing activities that need to be supported by NSF and a USSSP-successor program. The ocean-drilling community, responding to the online questionnaire, has expressed strong support for the CUSP recommendations.

U.S. support for participation in IODP should engage the broadest possible range of U.S. scientists, enabling them to participate completely and successfully in all aspects of the international program. We should continue to ensure that all aspects of support foster high-quality, peer-reviewed science, producing comprehensive data sets that address scientific goals and objectives of fundamental importance and providing a visible and coherent scientific legacy.

Warren Prell
Peggy Delaney

Co-Chairs, CUSP
For the Members of the CUSP Steering Committee and the 2002-2003 USSAC

INSIDE

Scientific Ocean Drilling in the 21st Century: The IODP and U.S. Participation

The current international Ocean Drilling Program (ODP) is one of the most successful and pervasive scientific activities in the geosciences. The ODP's scientific themes range from the composition of the mantle and dynamics of the lithosphere to fluid transport through the oceanic crust to geochemical and environmental history recorded in marine sediments. U.S. scientists have been leaders in all aspects of ODP and their broad participation in ODP has enhanced our fundamental knowledge in the geosciences. Quantitative information[1] about U.S. scientists' participation in ODP and the relationship to NSF funding document part of this impact. Of the nearly 600 U.S. scientists receiving NSF Marine Geology and Geophysics (NSF/MG&G) funding from 1988-2002, ~30% have participated in an ODP expedition at least once. U.S. scientists have filled >1200 shipboard berths for ODP Legs 100-201, with >650 individual U.S. scientists having been shipboard scientists at least once during that time. Of these >650, nearly three out of ten have received NSF/MG&G funding at least once during the 1988-2002 interval. U.S. graduate students and postdoctoral scientists have had significant participation as integrated members of the international ODP science parties, representing ~25% of total U.S. berths. Over 1,000 individual U.S. scientists have had a total of nearly 5,000 sample requests filled since program inception. A critical element in the U.S. success has been the consistent and flexible financial support from NSF and USSSP.

The U.S. Science Advisory Committee (USSAC) consists of volunteer scientists who advise Joint Oceanographic Institutions (JOI) on the operation of the U.S. Science Support Program (USSSP) associated with ODP. USSSP, which is funded by the NSF Ocean Drilling Program[2] (NSF/ODP) through a cooperative agreement with JOI, directly supports U.S. participation in ODP. NSF/ODP also provides funding for highly ranked, unsolicited proposals generally in support of activities affiliated with scientific ocean drilling including regional geological and geophysical studies and drill site characterization. USSSP supports the participation of U.S. scientists in drilling expeditions, and includes travel to expeditions, salary support for expedition participation, and relatively modest post-expedition funding[3] targeted at fulfilling immediate science obligations[4]. Although most of the budget is focused on these direct participation activities, USSSP also sustains a broad range of affiliated activities that enable wide and successful U.S. participation in ODP (Table 1).

Compelling scientific objectives continue to require ocean drilling as a means of acquiring samples of sediments, rock, biota, and fluids from beneath the seafloor, of deploying instruments for down hole measurements in boreholes, and of conducting sub-seafloor experiments and establishing observatories to address questions of fundamental significance in the geosciences. The needs for continued scientific ocean drilling and for a multi-platform approach within an international framework have been recognized explicitly in a number of U.S. and international planning documents over the past decade, culminating in planning for the Integrated Ocean Drilling Program (IODP). The scientific and organizational framework for IODP's first decade is described in its Initial Science Plan (ISP): *Earth, Oceans and Life: Scientific Investigations of the Earth System Using Multiple Drilling Platforms and New Technology* (see www.iodp.org). U.S. leadership in this program begins with U.S. provision of a principal drilling vessel for the program, a continuous coring, non-riser drilling vessel, supported by multi-year U.S. funding contributions to IODP's annual, international operating costs. U.S. scientific achievement in the international IODP, also depends on strong national programs to support the participation of U.S. scientists, building on the successes of past support and addressing newly identified needs defined by the new era of scientific ocean drilling. This report addresses scientific support needs for U.S. scientists for future scientific ocean drilling, identifying areas to continue and areas to modify or improve, along with new types of support needed.

1 We compiled information on NSF/MG&G awards from 1988-2002, inclusive, from the NSF Fastlane Database. There have been 1,711 grants to 589 unique principal investigators (PIs) in that time interval, totaling $311M. Of the 589 unique NSF/MG&G recipients, 181 (or 31%) have been a member of an ODP scientific party at least once for Legs 100-201 inclusive (1985-2002). NSF/MG&G awards to these PIs from 1988-2002 total $114M, although not necessarily on ODP-related science, representing 37% of total NSF/MG&G funding over that time interval. A review of JOI/USSSP and ODP/TAMU databases identified 1,204 U.S. shipboard berths total, including U.S. ODP Staff Scientists and U.S. Borehole Research Group (BRG) Logging Scientists, for Legs 100-201 inclusive. At the time of sailing, ~209 berths were identified as being filled by graduate students and ~92 by post-doctoral fellows or postdoctoral research scientists, representing ~25% of total U.S. berths. There were 659 unique U.S. participants filling these berths for Legs 100-201, with the majority sailing only once. Comparison of the NSF/MG&G and list of U.S. shipboard scientists indicated that ~27% of U.S. shipboard scientists (181/659) received NSF/MG&G funding in the 1988-2002 time interval. ODP/TAMU records document 4,957 total sample requests from U.S. scientists from program inception through August 2002, from 1,101 individual scientists (i.e., some scientists had more than one sample request during that interval).

2 In the Marine Geosciences Section of the Ocean Sciences Division at NSF, "Ocean Drilling Program" is the name of the NSF program that supports unsolicited proposals related to scientific ocean drilling, primarily for investigations of potential drilling regions, especially by means of regional geological and geophysical field studies; the feasibility and initial development of down hole instruments and techniques; and down hole geophysical and geochemical experiments. To distinguish this from the international Ocean Drilling Program referred to as ODP, this will be identified as NSF/ODP. The statistics given in Footnote 1 do not include scientists uniquely supported by NSF/ODP. Many scientists contribute to site characterization efforts related to scientific ocean drilling, but do not necessarily participate as shipboard scientists in drilling expeditions.

3 For example, for twenty recent ODP legs (Legs 175-194), the average USSSP post-cruise science award to individual PIs was $22,461, with a range of award size from $5,027 to $47,607. This average excludes awards to multiple PIs submitting proposals with single, combined budgets.

4 The obligation of any U.S. scientist as an invited participant on an ODP cruise, in addition to fulfilling shipboard responsibilities to the scientific objectives of the cruise, is to use samples or data from the leg s/he participated in to conduct post cruise research and to publish associated results in (a) a peer-reviewed scientific journal or book that publishes in English or (b) the *Scientific Results* volume (data report or paper) by specified times after cruise completion. We anticipate similar obligations in IODP.

TABLE 1. USSSP YEAR 18: MARCH 1, 2002 TO FEBRUARY 28, 2003

Activity*	Percent of Total Yr 18 Budget ($6.4 M)
Scientist Support Includes travel to/from vessel, salary for expedition time, initial post-expedition science grants for science party members (shipboard participants and designated shore-based scientists)	65%
Program Administration Includes support for USSAC travel, USSAC Chair's office, ODP Science Operator's costs for administering elements of scientist support, JOI office	23%
Planning Activities Includes support for workshops, travel for U.S. participants in JOIDES Advisory Structure (ODP) and interim Science Advisory Structure (iSAS) for IODP, JOIDES Panel Chair support	8%
Educational and Outreach Activities Includes Schlanger Ocean Drilling Fellowship Program, JOI/USSAC Ocean Geoscience Distinguished Lecturer Series, curriculum enrichment activities	3%
Site Development Activities Includes site augmentation activities, data syntheses, and mini-workshops	<1%
ODP Enhancements Includes results symposia	<1%

* Special Engineering Development is a program element in the USSSP Program Plan, but there has been no funding in this item since the wireline reentry system activity concluded in USSSP Year 14.

GOALS IN PROVIDING SUPPORT FOR U.S. PARTICIPATION IN IODP

U.S. support for participation in IODP should engage the broadest possible range of U.S. scientists, enabling them to participate fully and successfully in all aspects of the international program. We should continue to ensure that all aspects of scientific ocean drilling science support foster high-quality, peer-reviewed science, producing comprehensive data sets that address scientific goals and objectives of fundamental importance and providing a visible and coherent scientific legacy. To that end, the total U.S. program must accomplish the following:

- Support efforts of U.S. scientists to plan, initiate, and formulate drilling proposals, to participate across the full range of IODP activities, and to meet their obligations as international IODP participants;
- Support efforts of U.S. scientists to produce and contribute to comprehensive data sets that document core/sample, logging, and geophysical measurements associated with specific sites, geographic regions, and thematic areas, along with other relevant measurements;
- Support efforts of U.S. scientists to develop regional, thematic, and other syntheses of ODP and IODP data and results;
- Support and leverage efforts of U.S. scientists in publication, education, and outreach; and
- Support participation and leadership of U.S. scientists in national and international scientific ocean drilling advisory structures.

To help achieve these goals, USSSP provides a flexible funding mechanism that can respond rapidly to evolving program needs (such as rapid staffing of multiple expeditions), to a variety of small and non-traditional requests, while retaining a high level of community involvement and review.

PROGRAMMATIC AND ORGANIZATIONAL CHANGES THAT IMPACT U.S. SCIENTIST PARTICIPATION IN IODP

IODP will deploy multiple drilling platforms. Operation modes, staffing needs, and the very nature of participation will vary among the riser drilling vessel (the Japanese-funded vessel *Chikyu*), the continuous coring, non-riser drilling vessel (the U.S.-funded vessel replacing the *JOIDES Resolution*), and mission-specific platforms (see Joint European Ocean Drilling Initiative [JEODI], www.jeodi.org). The U.S. programs must accommodate the increased scope and complexity of the IODP and the greater level and range of participation by U.S. scientists in field programs associated with these multiple platforms. Preparing mature drilling proposals for multiple platforms requires timely and adequate funding for regional site characterization studies. Oversight and management of U.S. participation in the IODP will be more complex and will require additional resources.

Table 2. CUSP Steering Committee

Member	Institution
Warren Prell CUSP Co-Chair (current USSAC Chair)	Brown University
Margaret Delaney CUSP Co-chair (former USSAC Chair)	University of California, Santa Cruz
Nathan Bangs	The University of Texas at Austin
Bob Duncan	Oregon State University
Earl Doyle	Industry Consultant
Terry Quinn	University of South Florida

ODP/IODP drilling proposals are receiving increased levels of peer review by the scientific advisory structure and by external evaluators.
IODP, like ODP, is fundamentally a proposal-driven program, with drilling proposals evaluated within the context of its overall science plan. Given the level of international panel and external peer review of drilling proposals and the scope of the proposed science goals and objectives, approved drilling programs are scientific/thematic program plans that have been given high priority by the international ocean drilling community. In this context, U.S. funding agencies should recognize the high-priority science objectives of these drilling programs and support highly ranked U.S. proposals that address the international program's scientific goals.

Multi-leg proposals from organized scientific groups/programs and complex drilling programs (CDPs) are becoming more common.
U.S. scientists, as individuals and as groups of proponents, must be able to compete successfully with other national and disciplinary group drilling proposals. They will need funds for site characterization and development to be successful in preparing mature drilling proposals for the international science advisory structure. As larger and more organized programs emerge, such as Complex Drilling Programs (CDPs), which anticipate the use of multiple platforms and multiple legs, the U.S. must encourage broad, community-based participation in these long-term efforts and active participation in all stages of proposal preparation.

U.S. partnership in IODP will likely be 33%, versus >50% in ODP.
The fully operational IODP will have an annual, international operating budget of approximately $160 M, three times that of ODP, with an estimated annual U.S. contribution to the international program operating costs estimated to be ~$50 M, primarily for operation of the non-riser drilling vessel. The relative proportion of U.S. participation in expedition parties, as co-chief scientists, and in the advisory structure, will decrease in the transition from ODP to IODP. The absolute number of U.S. participants, however, will likely increase because of the opportunities afforded by the multiple platforms of IODP. This reduction in the proportion of U.S. participation of each science party will have implications for staffing of IODP projects (expeditions). For example, selection of U.S. participants should no longer be used to "balance" or "buffer" the disciplinary needs of scientific parties. U.S. scientific community oversight and coordination of scientific staffing issues will be needed to insure the effective participation of U.S. scientists in IODP. The U.S. national committee may need to review U.S. participant applications and provide advice to the international program on U.S. staffing.
The ODP publication policy has changed substantially, with electronic publications and with publication in the external literature for scientific results. Assuming that similar policies will be adopted by IODP, the goal is to have all scientists publish their post-cruise science results in the open literature, rather than in scientific results volumes published by a program entity. Currently, the support associated with U.S. ODP scientist shipboard participation is inadequate, in most cases, to meet fully the labor needs and analytical demands associated with publication in leading national and international journals, the obligation incurred by the participant. If appropriate support is not provided, scientists will likely meet their obligations by publishing gray literature (e.g., data reports in program-published journals), rather than scientific papers in respected journals. Although publication of post-cruise data reports addresses the goal of ensuring complete and accessible data sets, it does not address the larger issue of scientific accountability and visibility for U.S. participation.

Educational and outreach requirements of the program will increase in IODP.
Although USSSP has undertaken modest and targeted educational efforts, these areas, in both the national and international programs for ODP, have not been developed as widely as many view appropriate. These are expected to be priority activities of the international program. Effective approaches will differ by national context, and the U.S. support programs need to address these in partnership with the international program and with other national sources of support for education and outreach.

NSF has created a new Marine Geosciences Section that unites the previously separate Ocean Drilling Program and the Marine Geology and Geophysics Program as co-equal partners.
This reorganization, with Bruce Malfait as the recently named section head, places NSF/ODP within a research section (rather than in facilities) and should establish a funding base to support IODP-related science at levels more appropriate to the science proposed.

NSF anticipates outsourcing of some parts of the U.S. program for scientist support in IODP.
Entities similar to USSSP and USSAC will be integral parts of the U.S. IODP support effort, complementing support programs housed at NSF Marine Geosciences. We anticipate that NSF will fund these entities through an agreement with a management organization similar to JOI.

CUSP: Charge to USSAC, Workshop Structure, and Report Preparation and Format

In response to these programmatic and organizational changes, USSAC has been considering the elements of support that will be required at NSF and in a USSSP-successor program for U.S. participation in IODP. In a dialog with NSF, we defined the charge for this task as follows:

- Formulate the characteristics, elements, and tasks of the entire U.S. program required to foster and sustain the full range of research and educational activities needed for successful U.S. participation in IODP.
- Identify and describe the optimal structure and resources for this program as well as the key entities, their connections, and their respective sets of authority, responsibility, and accountability.

To carry out this charge and to augment the ongoing USSAC discussions, we held an open invitation, community-based workshop June 11-14, 2002 in Washington, D.C. The steering committee for this workshop consisted of the current and incoming USSAC chairs and four other members, including two scientific community members who are not current USSAC members (Table 2). Workshop attendees provided a brief statement of interest with respect to U.S. support needs for IODP participation. As background material, workshop attendees were provided with copies of various documents or web links to them. At the meeting, we also discussed the timelines and transitions in drilling programs and U.S. support programs from ODP to IODP (Table 3).

Workshop attendees were also provided with a CUSP Philosophy Statement document on Support for U.S. Participation in IODP, that provides much of the introductory content and overall structure of this report. In particular, this document posed a series of questions about U.S. support activities in various areas, asking for responses indicating the relative priority of each activity, whether the activity should be managed at NSF or in a USSSP-successor program, defining the required level of review for that activity, and asking how proactive USSAC should be in that activity.

The workshop opened with an evening session summarizing the background and goals, with presentations from USSAC, NSF, and JOI. During the workshop, we divided the >60 participants (50 workshop attendees, 15 liaisons/guests/observers) into four groups for focused discussions of U.S. support needs in these areas over the course of two days, with each discussion followed by plenary sessions reporting on the discussions in the individual groups. In addition, a "seismic needs breakout group" met in the evening of the first full day, reporting on the final day. On the final day, we also discussed the preliminary overall outcomes of these discussions and mechanisms to solicit broader community input on our recommendations. Outcomes from these discussion groups and plenary sessions were used to draft this report, which was discussed in preliminary form at the July 2002 USSAC meeting and subsequently reviewed in complete draft form by the CUSP Steering Committee members and by USSAC members during August 2002. The revised version presented here has been circulated to CUSP attendees and posted to the web for community comment via response to a questionnaire based on the report. The responses to the questionnaire have been summarized, and they are available at www.joiscience.org/USSSP/iodp/cusp.html.

Table 3. Timelines and Transitions: ODP to IODP

<table>
<tr><th colspan="2">Drilling Programs</th><th colspan="3">U.S. Support Programs</th></tr>
<tr><th>ODP</th><th>IODP</th><th>NSF/ODP</th><th>USSSP</th><th>USSSP Successor</th></tr>
<tr><td>Drilling operations end 9/30/03</td><td></td><td rowspan="6">Continues throughout, focus of activities will evolve</td><td rowspan="2">Budget decreases in Yr 19, beginning 3/03, to reflect shorter drilling operation year*</td><td rowspan="2"></td></tr>
<tr><td rowspan="5"></td><td>Program initiates 10/1/03</td></tr>
<tr><td>Mission-specific platform drilling may begin in 10/03-9/04 time window</td><td rowspan="2">Annual budgets from 3/04 to program end are minimal, solely close-out activities</td><td rowspan="2">Goal: 3/04 start, spin-up activities from ODP/USSSP and initiate new activities as needed by platform operations</td></tr>
<tr><td rowspan="2">Non-riser vessel operation begins ~10/04-3/05 time window</td></tr>
<tr><td rowspan="2">Continues in reduced form through 2/06</td></tr>
<tr><td>Wind-up activities continue through 2007 (U.S. NSF Funding)</td><td>Riser vessel Chikyu in international operation ~10/07</td></tr>
<tr><td colspan="5">* Budget for Yr 19 will include planning, education, site development, scientist support and other activities.</td></tr>
</table>

The CUSP workshop and this report divided the anticipated IODP activities into five broad categories reflecting the cascade of activities associated with proposing, planning, implementing, and publishing the field results and most immediate scientific achievements of a drilling program. In each of these categories, we identify activities and issues that need to be evaluated and prioritized in light of their contribution to effective U.S. participation in IODP. In general, these activities should be applicable to all IODP drilling platforms. The categories are:

- Program Development and Pre-Platform Activities,
- Platform Participation Activities,
- Post-Expedition Activities,
- Publication of IODP Results, and
- Education and Outreach Activities.

In the following, we identify a variety of planning, operational, and research activities and issues facing U.S. scientists and offer recommendations to address the anticipated need in IODP. We use USSSP in the recommendations to mean the USSSP-successor program, USSAC to mean the successor to USSAC, and NSF to mean the equivalent of existing NSF programs (e.g., NSF/ODP or NSF/MG&G). Where appropriate, we identify the relative priorities of these activities, the level of review required, and the degree to which the U.S. national committee should be proactive in addressing that activity/issue. We characterize whether views at CUSP and among USSAC members were relatively unanimous on the recommendation or more mixed, and summarize the range of opinions on topics for which broad consensus was not reached.

Introduction to the CUSP Recommendations

USSSP has been a critical and successful component of U.S. participation in the ODP. USSSP has enabled and assisted U.S. scientists in planning, implementing, and pursuing ODP-related research on a wide variety of topics. NSF/ODP has been critical, providing support for site characterization efforts needed to formulate drilling proposals and to interpret their results. The NSF/MG&G community of scientists has greatly benefited from the support available from USSSP and NSF/ODP. These CUSP/USSAC recommendations provide community guidance on the issues/activities that need to be addressed in the USSSP-successor program and recommend principles and policy to NSF Marine Geosciences for its continued support of U.S. scientific ocean drilling. This report is not an implementation plan that seeks to define specific levels of activity and funding. Rather, it is a community statement on the need to support various activities by U.S. scientists in the IODP and for flexibility to address the evolving and more complex activities in the IODP.

Mechanisms for providing IODP support: NSF and USSSP

The CUSP recommendations reflect two mechanisms for providing support to U.S. scientists in IODP: direct NSF support and indirect NSF support through USSSP. From nearly 20 years of experience, the U.S. scientific community has recognized the value and effectiveness of this two-component system to support U.S. participation in the international ODP. The first component is direct support from NSF for certain activities, such as regional geophysical studies that are necessary to plan drilling campaigns, and large-scale resources for post-drilling scientific research. The second component is indirect support, in the form of a focused and long-term support program that is managed by an entity external to the NSF. Specifically, the U.S. Science Support Program (USSSP) affiliated with the Ocean Drilling Program managed by JOI. through a cooperative agreement with the NSF.

Why should the NSF outsource a support program to a corporation, such as JOI, Inc.? In brief, JOI/USSSP has a structure and governance that enables cohesive program management in a rapid and flexible manner, yet remaining under the auspices of NSF and responsive to community advice. A support program for ODP and IODP must manage many aspects of participation in a timely manner relative to cruise participation, ranging from travel logistics, personnel support, planning activities, educational activities, publication, and communication, to "back-office" activities such as subcontracting, purchasing, financial oversight, and audit compliance. Many of these activities are administrative and logistical in nature and often require rapid responses. Additionally, many of these actions, on an individual basis, involve small amounts of funds, often smaller than the standard NSF grant. As such, we think that JOI/USSSP support, rather than direct NSF support, is better suited to manage these aspects of IODP. Also, JOI/USSSP works with flexible proposal deadlines necessitated by the ongoing nature of the research expeditions, can respond rapidly to funding requests, both solicited and unsolicited, and is flexible in its response mechanisms. All these characteristics make JOI/USSSP an efficient, flexible and appropriate mechanism for supporting many of the operational aspects of U.S. participation in IODP.

Although much of the success of large-scale international scientific research programs, like the ODP and IODP, is based upon long-term planning, equal importance should be given to the flexibility and agility with which a support program is managed. As program plans evolve into operations, flexibility is needed in order to take advantage of rapidly changing conditions, altered staffing plans, and evolving opportunities. In this partnership, the support program activities managed by JOI complement the direct support managed by the NSF. We recommend continuation of this two-component system in the IODP. This program, which will likely be significantly more complex than ODP, given the multiple-platform approach, and will continue to require a balance between long-term planning and support from the NSF, and rapid, flexible response from a USSSP.

We offer a series of specific recommendations, summarized below, about the total U.S. support program for IODP, including those elements to be housed at NSF and those in a USSSP-successor program. Some recommendations reflect widespread, nearly

unanimous agreement and therefore reflect group consensus. Other recommendations represent topics on which a much broader range of opinions were expressed, and the recommendations are not necessarily unanimously supported. The discussion presented in the text of the report with each recommendation therefore summarizes the range of views expressed as context.

Program Development and Pre-Platform Activities

Activity/Issue: How should USSSP use workshops to initiate and facilitate a range of intellectual activities related to scientific planning?

CUSP/USSAC Recommendation 1. USSSP should increase its support of U.S. workshops to help foster the planning required for innovative drilling-related themes and approaches. Workshops should enhance the scientific vitality of the IODP, help maintain the flow of high-quality U.S. drilling proposals to the IODP, and encourage broad participation of the U.S. scientific community in all phases of scientific ocean drilling.

Workshops are viewed as a cost-effective mechanism to address a number of planning issues in IODP. They can be used to define new thematic areas and to fill out details in already identified drilling objectives. They can serve as venues for initiating complex drilling campaigns (see Recommendation 2). The complexity of multiple drilling platforms and multiple leg drilling programs will require more community coordination and interaction to fully exploit these opportunities. In this context, workshops might be used as proposal planning groups. USSSP support should allow U.S. scientists to be assertive in proposing new topics and in planning drilling objectives. In general, workshops should be community-based planning activities open to broad U.S. national participation. They should be open to international participation (with other sources of funding required for the international participants) and, in some cases, should be jointly funded by IODP. The flexibility of USSSP and its ability to quickly respond to small proposals makes it an ideal mechanism to fund workshops and to promote broad participation by the U.S. scientific community.

Activity/Issue: The long-term nature and complexity of some IODP programs will require new approaches and new funding mechanisms to provide the continuous scientific planning, technological development, and monitoring of scientific progress.

CUSP/USSAC Recommendation 2. USSSP should develop mechanisms for planning and monitoring U.S. scientific community interests in multi-year, multi-platform, and multi-leg programs. For example, this could include support for small teams of U.S. scientists focused on the scientific, technological, and engineering aspects of complex drilling programs to promote community-based planning activities.

The anticipation of large-scale or complex drilling programs that will use multiple platforms, multiple legs, and other activities over a number of years will require new management tools for the planning, implementation, monitoring, and evaluation of these programs. One possibility is the creation of small, long-term planning/monitoring groups to follow a program from its planning through its implementation and publication. Such groups would not duplicate or replace IODP advisory groups, but would provide a mechanism for U.S. interests to be developed and nurtured. Such a long-term commitment and the level of effort likely involved will require some salary support and travel funds and administrative support for a small number (perhaps two to four) of U.S. principal investigators. USSSP should be responsive to the U.S. community in identifying the programs that require such support and in enabling several long-term planning groups. Planning activities may often need to be initiated well in advance of anticipated drilling to develop proposals sufficiently mature to be highly ranked and scheduled by the IODP. USSSP's efficient management of such small-scale but long-term efforts make it an appropriate support mechanism to support these planning and monitoring activities.

Activity/Issue: How should USSSP use workshops to initiate and facilitate a range of intellectual activities related to IODP scientific assessment, synthesis and legacy development?

CUSP/USSAC Recommendation 3. USSSP should increase its support of efforts to assess and synthesize drilling results by U.S. scientists, and to promote interaction with scientists from allied disciplines. This could include thematic symposia on drilling-related topics that produce peer-reviewed publications.

Documentation of the legacy of scientific ocean drilling is key for assessing progress and accountability, for defining the impact of scientific ocean drilling results on the broader geosciences, and for defining new activities. Support should be made available for U.S. scientists to initiate and participate in activities focused on synthesis and evaluation of IODP results. These efforts should be open to the broad U.S. scientific community, and should include international collaboration whenever possible (although other sources of funding will be required for international participants). Interaction with allied U.S. scientists from affiliated disciplines will ensure that scientific results from ocean drilling can appropriately impact multidisciplinary work, and that multidisciplinary approaches can be more effectively melded into future program planning. The ability of USSSP to quickly review proposals and to assist with the administrative and logistical aspects makes it an ideal mechanism to support synthesis activities.

Activity/Issue: The requirements for site characterization, including syntheses and various levels of geophysical surveys, for multiple drilling platforms in IODP will be more comprehensive and expensive overall.

CUSP/USSAC Recommendation 4. NSF/ODP should continue to support regional geological and geophysical characterization and sur-

vey proposals for potential drilling regions. The U.S. funding needs for regional site development and characterization are anticipated to be greater in the multiple-platform IODP than in the ODP. Early and appropriate support of these regional studies is critical to the preparation of competitive drilling proposals.

Site characterization will need significant additional resources in NSF/ODP, USSSP, and IODP, and new approaches are needed especially in support of geophysical site characterization for riser drilling. Although site-specific safety studies for identified drilling sites are an IODP responsibility, scientific characterization of potential drill sites is the responsibility of individual national programs, and is a key component in bringing a drilling proposal to scientific maturity. The needs for scientific site characterization will be significantly greater in IODP, given multiple platforms operating in a broad range of environments that were previously inaccessible to scientific ocean drilling in ODP (e.g., deep passive margins, Arctic Ocean, shallow epeiric seas, deep convergent margins). Full stand-alone regional surveys should be administered by NSF/ODP, as in the current structure. Given the increase in site characterization effort required, the U.S. community needs to better link initial, maturing, and mature scientific drilling proposals with site characterization efforts to adequately identify the scientific issues at proposed drilling sites and to best integrate drilling results with geophysical surveys. Timely and appropriate support of these activities is necessary to best define drilling targets and interpret their scientific results. Given the size and long lead time of these ship-based studies, direct NSF support is the most appropriate funding mechanism.

CUSP/USSAC Recommendation 5. USSSP should continue to support small to moderate size proposals from U.S. scientists for drill site development efforts including those linked to maturing drilling proposals and therefore requiring relatively rapid response. USSSP funding needs for these efforts are anticipated to be larger in the IODP than in the ODP.

USSSP is viewed as an efficient mechanism to support small to moderate studies that augment identification or characterization of specific drilling targets. The cutoff for "small to moderate" varied somewhat in discussion, but these programs would have total budgets typically <$100,000 and often <$50,000. Often, these proposals will be responding to specific questions from the science advisory structure, especially with regard to site survey/pollution prevention and safety requirements. USSSP provides the flexibility to fund proposals with short timelines and therefore requiring flexibility in submission deadlines. USSSP can also support small to moderate proposals by U.S. scientists that address special experiments related to ocean drilling (e.g., tools, sampling, monitoring). The existing USSSP categories for site augmentation efforts, distinct from the full-scale regional studies supported by NSF/ODP, are viewed as appropriate starting points for this USSSP activity in IODP. This aspect of the USSSP program needs to have flexibility and responsiveness, as these proposals are often specific to particular challenges of specific regions and sites and a wider range of U.S. activities related to IODP may require support. The U.S. needs in this category, as in the regional site characterization efforts funded by NSF/ODP, are anticipated to be larger in the IODP.

Activity/Issue: What role should USSSP play in the development of new technology and in the application/modification of existing technology in support of IODP drilling objectives, regardless of platform?

CUSP/USSAC Recommendation 6. USSSP should support small conceptual or "seed" money proposals from U.S. investigators to develop or adapt new technology for scientific ocean drilling. USSAC should work with IODP advisory panels to identify technology needs in the service of drilling objectives where U.S. support could be appropriately focused. The NSF Marine Geosciences Section should be a source of funding for major technology development related to scientific ocean drilling.

USSSP is not viewed as the prime resource for technology development issues in the IODP. Recognizing that technology development for IODP is not solely a national issue, USSSP can provide "seed" money to initiate new technological developments by U.S. scientists for IODP. Major technology development proposals are more appropriate for the NSF Marine Geosciences Section or IODP.

Activity/Issue: The complexity of planning and implementing the IODP (multiple platforms, multiple operators, and U.S. participation ~one-third of total) will require greater coordination between the U.S. drilling community and the IODP planning, advisory, and management structures.

CUSP/USSAC Recommendation 7. The USSAC-successor should operate as the U.S. national committee for ocean drilling-related activities (National Committee for Ocean Drilling, NCOD). NCOD activities should include coordination of scientific staffing nominations for drilling legs and science advisory panels, mentoring U.S. drilling proposals, and initiating opportunities for U.S. scientists to participate in IODP.

Given the more complex IODP, the increased total, but lower relative, participation of U.S. scientists, and the expanded education and outreach activities, the USSAC-successor (NCOD) will need to take a more active part in the initiation, support, and oversight of U.S. participation in the IODP. NCOD will need to foster communications between U.S. members of international advisory panels and the U.S. national committee. NCOD will need to be more active in tracking and mentoring U.S. proposals within the advisory structure. Many CUSP participants thought the NCOD should have a strong role in coordinating and prioritizing the U.S. nominations for scientific staffing for drilling expeditions, but some thought that the NCOD should have no such role and that the platform operators and co-chief scientists should be free to choose any U.S. scientist applicants as expedition members. The final science party selections will always lie with the platform operators, but the

U.S. should put forward the strongest and most appropriate slate of U.S. scientists for each expedition. CUSP participants favoring a role by the NCOD in U.S. scientific staffing also noted that increased resources at the JOI-successor would be necessary to help manage this process

Activity/Issue: How should USSSP support the participation of U.S. scientists in national and international advisory structures related to the IODP, including as chairs of panels and committees?

CUSP/USSAC Recommendation 8. USSSP should compensate U.S. scientists chairing advisory panels and committees through appropriate salary or honorariums, and should provide appropriate administrative support funds to chairs.

CUSP/USSAC Recommendation 9. USSSP should support the travel needs for U.S. scientists to participate in meetings of the national and international science advisory structures for IODP.

As the planning, advising, and monitoring of IODP activities becomes more complex and time consuming, U.S. scientists are being asked to volunteer substantial amounts of time as panel chairs and as participants of standing and ad hoc national and international committees. In many cases, the amount of time causes hardships for both hard and soft money scientists. In some cases, appropriate individuals decline to serve as chairs because of the significant uncompensated time commitment. The issue of compensation for panel/committee chairs was raised at the CUSP workshop by a number of participants who noted the increasing time commitment of accepting a national or international leadership role in IODP. In the interest of having the best and most appropriate U.S. scientists serve as chairs in the national and international advisory structures, some salary support or honorarium was thought critical by many participants. Administrative support funds will allow chairs to accomplish required tasks and responsibilities (e.g., preparing meeting minutes, communicating with members and other bodies, photocopying, mailing, etc.) The travel should be funded for U.S. scientists to participate in national and international advisory bodies affiliated with IODP. USSSP's efficient management of small projects and its logistical support make it the appropriate support mechanism for these advisory activities.

Platform Participation Activities

Activity/Issue: In IODP, which will have multiple platforms and drilling scenarios, what will constitute participation in the science party?

CUSP/USSAC Recommendation 10. Platform participation in IODP should be defined as on-site (platform or onshore) activities by scientists for the initial documentation of cores, samples, and boreholes resulting in contributions to an *Initial Reports*-like volume. The definition of participation must be flexible to account for the different times, extents, and nature of activities conducted on different IODP platforms.

Staffing models for riser drilling campaigns and mission-specific platform expeditions are unclear relative to the more familiar continuous coring, non-riser vessel expeditions of ODP. The operational definition of participation in the scientific party will need to be flexible so that the U.S. support program can adapt to the different drilling modes. However, the concept of participation in the scientific party must imply significant shipboard or equivalent shore-based activity that results in a contribution to the initial documentation and report of the expedition. For purposes of participation-based support, these activities would be distinguished from shore-based party members who merely work on post-expedition samples. The intent is to define a range of participation that reflects expedition and post-expedition responsibilities. These definitions of participation are similar to recent interim Scientific Measurements Panel (iSCiMP) resolutions which considered the Shipboard Party to be "All scientists selected by IODP to produce initial, openly shared data associated with the project." The Auxiliary Party was considered to be "All other scientists selected by IODP that receive samples or data within the moratorium period."

Activity/Issue: What level of USSSP salary support should U.S. scientific party members receive for expedition participation?

CUSP/USSAC Recommendation 11. USSSP salary support for U.S. scientific party members in IODP drilling expeditions should reflect their platform-related responsibilities and time commitments to the expeditions. Greater pre- and post-expedition responsibilities should be reflected in greater salary support and a range of salary support may exist within a scientific party. As a general rule, the minimum support package for a U.S. scientific party member should reflect time on the drilling platform (including travel to and from the platform) plus an increment to meet pre- and post-expedition responsibilities related to characterization and description of drilling results for an *Initial Results*-type volume.

Definitions of appropriate salary support for a U.S. scientist participating in an IODP drilling expedition varied significantly. Consensus was clearly reached that salary support for time spent on the drilling platforms (or in equivalent drilling-related expedition activities for mission-specific platforms with limited on-platform capabilities) was required, including for time traveling to/from platforms. U.S. scientific party members may also spend time in pre-expedition activities (e.g., training for shipboard responsibilities) and in post-expedition activities (e.g., archiving data, refining composite sections, editing of Initial Results-type volumes, sampling parties) that are directly related to their shipboard responsibilities and to fully characterizing and documenting the materials recovered. A wider range of opinion was expressed about how much salary support, in addition to expedition time, was required for this component. Models include support for time-on-platform plus 50% (e.g., a total of 3 months for a two-month expedition) to time-on-plat-

form plus 100% (e.g., a total of four months). Flexibility will be required in these definitions to accommodate the different expedition definitions for different drilling platforms. For example, for mission-specific platform drilling, some were recommendations to define a minimum time increment (e.g., two weeks) for these programs even if drilling time is only a few days.

The wider range of opinion on this issue partially reflected perceptions that current models of support for U.S. scientists were, at least at times, inadequate to meet expedition obligations. This issue also had interplay with discussions about the funding of scientific research carried out after the expedition to meet the obligations of participation (see Recommendation 14). Clearly, USSSP needs to integrate the issues of participation-based salary support and the salary support available from post-expedition science grants. This recommendation, however, deals exclusively with support for expedition participation. In general, participants wanted the level of salary support to reflect the actual time commitments and responsibilities of the scientific party participants for expedition participation, with the recognition that these may vary among scientific party members in IODP and across different IODP platforms. A number of participants noted that the current salary levels for expeditions may not be enough for university academics to "buy out" teaching time for one term and thus limit their expedition participation to summers or sabbaticals. We anticipate that 60 to 100 U.S. scientists will participate in IODP each year and that their roles will be diverse and that many will be selected on relatively short time scales. Hence, the USSSP mechanism is very appropriate for the logistics and support for this critical element of U.S. participation.

Activity/Issue: What level of USSSP salary support should U.S. co-chief scientists receive for expedition participation?

CUSP/USSAC Recommendation 12. USSSP salary support for expedition participation for U.S. co-chief scientists should reflect the level of effort and responsibilities for the planning, implementation, research coordination, and synthesis and publication of IODP expedition results over the multi-year time span of commitment to the expedition.

A number of past ODP co-chief scientists indicated that the co-chief responsibilities were long-term and the current salary support model did not reflect the effort required to plan the drilling legs, edit the *Initial Results* volume, coordinate and edit the *Scientific Results* volume, and complete the required and desired synthesis papers. Although some participants felt no increase was needed over the present funding level (i.e., time on platform +200%, typically six months of support for a two-month non-riser leg), some thought that increased support was appropriate. Some noted that soft-money participants were at a disadvantage because they spent so much unfunded time on the pre- and post-expedition activities. IODP may have a longer pre-cruise planning cycle, with an earlier commitment by the co-chief scientists. Some suggested phased salary support over several years would address the long-term commitment by co-chief scientists.

Activity/Issue: What role should USSSP play in the long-term support, routine maintenance and data collection from seafloor observatories that are associated with scientific drilling?

CUSP/USSAC Recommendation 13. USSSP should support small proposals from U.S. scientists to coordinate appropriate seafloor observatories with IODP drilling plans. Implementation and long-term operational and maintenance support for these facilities should come from NSF or other agencies.

Seafloor observatories are recognized as an important new initiative in ocean and earth sciences. The planning and implementation of these observatories may involve ocean drilling and face many of the same needs for rapid responses and flexible timelines as site augmentation activities. In this context, USSSP should consider small proposals to coordinate seafloor observatories with drilling-related plans and activities. USSSP is not the appropriate source for funding data collection and long-term maintenance of these seafloor facilities. Several participants suggested that JOI might propose an USSSP-like structure that could efficiently manage both short-term and long-term support for seafloor observatories and facilities. USSAC encourages JOI to develop a proposal for a program for the management of seafloor observatories that could be submitted to the NSF or other appropriate agencies. The establishment and operation of seafloor observatories will entail significant equipment, implementation and operational funds that will generally have long lead times. Direct NSF funding for these larger projects with some coordination by USSSP is thought to be the appropriate balance of support activities.

Post-Expedition Activities

Activity/Issue: The level of post-expedition science support is considered inadequate to complete the obligation of a peer-reviewed publication or to accomplish the science objectives of the program. Further, the similar size of many post-expedition awards and high funding rate are perceived to be at odds with extensive peer review of these post-expedition proposals.

CUSP/USSAC Recommendation 14. USSSP should develop a tiered system for post expedition science support for U.S. scientists, with the goal of providing appropriate, adequate, and timely funding to promote high-quality research related to expedition objectives. Flexibility in how funding is allocated is needed in all tiers of USSSP support.

The issue of post-expedition science support is probably the most contentious and widely debated topic, and recommendations 14 and 15 both deal with this issue. Almost all scientists indicate that the level of participation-based support currently available is not adequate to bring the science to the level of a peer-reviewed contribution, the obligation

incurred to the international program by a U.S. participant, or to address the scientific objectives of each cruise in a timely manner. They also note a significant time delay (usually a year or more after the expedition) before funds can be obtained through the normal NSF proposal route. The financial resources are required in a timely manner to meet the scientific expectations of competitive, peer-reviewed, high-quality science. The losses to U.S. science as a consequence include reduced number/quality of peer-reviewed articles published in a timely fashion on scientific ocean drilling results and a limited ability to synthesize and integrate drilling-related results. In addition, insufficiently funded research must then be subsidized by other, unrelated programs. This is in stark contrast to some non-U.S. scientists who arrive at the drilling platform with research funds in hand, and are thus in stronger negotiating positions when sample allocation discussions occur on drilling platforms.

To address the problems of level and timing of post expedition support, almost all CUSP participants suggested some variation of a multi-tiered support system. The first tier of post-expedition support would be funding available to essentially all expedition participants submitting reasonable proposals. The next tier or tiers would have larger awards, based on proposals from U.S. scientists eligible to receive samples or data in expedition moratoria intervals, and would require significantly greater review. Consensus was clear that adequate, appropriate, and timely post-cruise research support was needed to allow U.S. IODP science to flourish. However, a considerable range of opinions was expressed about what should constitute the different tiers and the distinction between USSSP and NSF funding, although both types of funding are clearly required. The discussion of the level of post-expedition support was often mixed with discussion of the level of salary support for participants discussed in Recommendation 11, although we have attempted to separate them clearly here. Discussions assumed that IODP expedition participants would incur post-cruise research obligations similar to those in ODP, and that there would be moratoria in which only expedition participants would be eligible to receive IODP data/samples. Definitions of these protected time windows will be more complex for the full range of IODP drilling platforms.

The first tier of USSSP research support received relatively unanimous endorsement. This was defined as participation-based research support to allow U.S. scientists to meet their post-cruise research obligations to the expedition. The possible definitions of obligation ranged from a data report to a fully peer-reviewed journal contribution. Suggestions for the average size of these awards ranged from $20K to $40K, with most participants wanting a more competitive process that resulted in a wider range of award sizes within a scientific party and from expedition to expedition. Opinions on the review process for these post-expedition participation USSSP awards ranged from essentially internal review (JOI program manager, U.S. co-chief scientist or other lead U.S. scientist, and USSAC) to full peer review of the package of proposals or of individual proposals. Those participants suggesting internal review only mostly considered this level of funding as part of the expedition package that is intended to meet the obligations incurred by participation, and noted that the drilling program and its objectives had already undergone extensive external review. In addition, some tied this to more extensive national screening and review of expedition applicants by the NCOD. Many participants preferred larger post-expedition research awards than at present, noting that current typical awards of $22K are not adequate in all fields to produce a peer-reviewed paper. All agreed that there should be as few restrictions as possible on how funds can be budgeted. USSSP is the best mechanism for this support due to its ability to rapidly respond to proposals once the expedition is complete and the relatively small amount of individual funds (below the average NSF/MG&G grant).

The proposal for a second tier of USSSP post-expedition support was more controversial. This tier seeks to provide larger amounts of funding on a timely basis for a more limited number of U.S. scientists who are actively pursuing the scientific objectives of the expedition on a sustained basis. Many participants suggested that these proposals would receive full peer review, much like NSF proposals, with more competition for these funds, with perhaps only one to three of these proposals funded per expedition. These would compete for USSSP funds that were dedicated to the objectives of IODP, and this funding would be timelier relative to expedition participation than possible for NSF funding. In this context, some participants suggested that USSSP should allocate different amounts of post-expedition research funds depending on the complexity and level of U.S. participation. Definition of the size of these second tier proposals ranged, with some participants thinking that any proposal larger than $50K should be handled at NSF, and others anticipating a USSSP "Tier Two" award size range up to $100K.

An alternative solution to larger post-expedition research funding in USSSP Tier Two is to request that the NSF Marine Geosciences Section adopt a rolling submission basis and more timely review for post-expedition or even pre-expedition proposals. This would help address the problem of receiving funds for post-expedition research in a timely manner relative to drilling. This suggestion anticipates NSF Marine Geosciences funds that are broadly allocated to the science objectives of IODP expeditions and that are available for competition immediately after each expedition. This concept is still Tier Two funding on a timely basis and is separate from the more general objective-based IODP research discussed in Recommendation 15.

Activity/Issue: Many U.S. scientists perceive that ODP/IODP-related proposals submitted to NSF/MG&G do not receive a balanced review that takes into account the degree of review and prioritization inherent in the JOIDES review of the science, at least in some areas of the field. Also, the perception that NSF/MG&G funds are biased toward "hot" topics is thought to decrease the funds available for

many ODP/IODP-based proposals. Finally, a significant increase in funds is needed to accommodate the increase in proposals related to the expansion of U.S. scientific interests in the IODP.

CUSP/USSAC Recommendation 15. Significant post-expedition science support for U.S. scientists beyond the tiered USSSP structure should be funded by NSF, primarily through the Marine Geosciences Section. The budget anticipated for IODP-related science should be significantly increased to adequately and appropriately fund the expanded levels of participation, the wider scope of science, the increased analytical demands, and the more complex science programs planned for IODP.

As program-based proposals have broader goals and higher funding needs, the U.S. IODP funding structure needs to insure that highly ranked science is being adequately and appropriately funded across the broadest sweep of disciplines. With the expansion in the scope of IODP and multiple drilling platforms, the funding levels need to drastically increase if U.S. scientists are to fully participate in the science of IODP, rather in just the drilling expeditions. Proposals for program-based research should be directly funded through the NSF Marine Geosciences Section. As proposal objectives and funding levels increase, the U.S. IODP community recognizes the need for competitive proposals with full peer review and community involvement. In this context, proposals that reflect the science objectives of successful ODP/IODP reviewed drilling proposals should be considered as part of a community accepted program plan (similar to RIDGE or MARGINS program plans). Several participants suggested a scientific ocean drilling related panel to provide a knowledgeable resource for advice to NSF on scientific ocean drilling related proposals.

Publication of IODP Results

Activity/Issue: What publication mode for the *Initial Reports* and *Scientific Results* volumes are most useful to researchers, students, and legacy issues?

CUSP/USSAC Recommendation 16. The *Initial Reports* volume is highly valued by the U.S. scientific community, and IODP *Initial Reports* should be published electronically and in traditional print media. The *Scientific Results* volumes should be electronic compilations of all papers published on a particular expedition, including those published in the external literature.

Publication policy is probably the second most debated issue in ODP/IODP. Many scientists thought that publication of both traditional print form and electronic versions of the *Initial Reports* volumes would be beneficial to many activities in both research and teaching. Suggestions were made for an electronic IODP journal that would publish all IODP-related papers or a virtual *Scientific Results* volume that would collect or link to all published IODP-related papers and data reports.

Education and Outreach Activities

Activity/Issue: What role should USSAC/USSSP play in developing and producing educational materials for K-12, undergraduate, and general outreach audiences?

CUSP/USSAC Recommendation 17. USSAC/USSSP should increase its efforts to initiate and foster educational activities and should partner with educational agencies and researchers to conduct the detailed development and production of educational materials.

Many CUSP participants think the current level of USSSP activity in the fields of education and outreach is inadequate and should be increased in the new IODP. However, participants also indicated that education activities should occur via partnerships with appropriate educational researchers and agencies to leverage the small "seed" money grants the USSSP could provide. CUSP strongly supported USSAC's role in identifying educational opportunities and initiating educational materials based on the ODP/IODP operations and results. Several discussion groups noted that one or more specialists in education/outreach would be needed at the JOI-successor to develop contacts with educational researchers and agencies, generate educational and outreach products based on IODP results, and seek funding for educational efforts. Additional suggestions were that USSAC should have a standing committee on education, and that a workshop on ODP/IODP-related education and outreach should be supported by USSSP.

Activity/Issue: What should be the level of Schlanger fellowships for ODP/IODP graduate student support in IODP?

CUSP/USSAC Recommendation 18. USSSP should continue support for the Schlanger fellowships during the ODP/IODP transition and should, in the IODP, at least double the number of fellowships currently awarded by USSSP for the ODP.

CUSP discussions strongly supported the Schlanger Fellowships as a successful and cost-effective outreach and development of the next generation of IODP researchers. Suggestions were made to both increase the number of fellows each year and to lengthen the tenure to two years. Some participants felt that the fellowship program should be modeled after the NSF or NASA fellowship programs and that both external review and USSAC review were needed. Other participants asked that the goals and objectives of the fellowship program be clarified for the community. Is it to recognize excellent ODP/IODP-related science, to recruit new ODP/IODP researchers, or as general scientific ocean drilling outreach?

Activity/Issue: What should be the level of effort in the USSSP-funded U.S. Distinguished Lecturer Series in the IODP?

CUSP/USSAC Recommendation 19. USSSP should continue support for the U.S. Distinguished Lecturer Series during the ODP/IODP transition and in the IODP.

CUSP participants thought that the U.S. Distinguished Lecturer program was a cost-effective mechanism for getting the ODP/IODP message out to parts of the broader academic community. Participants also felt that this program was important during the transition between ODP and IODP, regardless of whether new drilling platforms are yet in operation, so that the levels of interest in the new program would not lag behind the needs of IODP.

CUSP QUESTIONNAIRE

A 26-question survey was developed from the CUSP report and the recommendations therein. The survey first solicits demographic information, and then seeks opinions on the CUSP report and recommendations. The final question solicited text responses (versus multiple choice) regarding any other pertinent comments about ODP, USSSP, or the CUSP document. The questionnaire was distributed electronically in the following manner.

1. On October 11 and 21, email messages were sent from JOI, on behalf of the CUSP co-chairs, to two large groups of people. The first includes scientists intimately involved with the ODP and USSSP, such as: (a) U.S. members of JOIDES and iSAS panels, committees, and groups; (b) USSAC members; (c) participants in the CUSP workshop; and (d) members and alternates of the JOI Board of Governors. The second includes over 1600 individuals on the JOI/ODP electronic listserver, most of whom are located in the U.S.

2. The listserver messages directed the recipients to a JOI web site (www.joiscience.org/USSSP/iodp/cusp.html) that contained the CUSP report, background materials, and a brief description of the CUSP initiative. The JOI web site directed respondents toward the online survey, which was hosted on a website managed by SurveyLogix. This survey was active, or "live," in the sense that respondents could answer questions, and data were collected, for a three-week period ending October 31.

3. The survey was also announced directly on the JOI website (www.joiscience.org).

Demographic profile of respondents

The first seven questions in the survey focused on demographic information. The survey indicated that over 95% of the 149 respondents were affiliated with a U.S.-based organization. Most (80%) were very familiar with the ODP and, in each of the following cases, over 50% of the respondents had: (a) used ODP samples and/or data; (b) been a proponent on a JOIDES drilling proposal; (c) served on a JOIDES advisory panel; and (d) been a member of an ODP scientific party. With regard to shipboard experience, the respondents showed a wide range, spanning from 32% with no prior experience, to 33% having sailed more than twice. The remaining third had sailed once or twice. Regarding experience with USSSP, in each of the following cases, over 50% of the respondents: (a) are included on the JOI/ODP electronic listserver; (b) had used a USSSP educational product (e.g., CD-ROM); (c) are included on the *JOI/USSAC Newsletter* mailing list; (d) have participated in a USSSP-sponsored planning workshop; and (e) attended a talk given by a JOI/USSAC Distinguished Lecturer. In short, survey respondents are scientists closely affiliated with the ODP and USSSP. Nevertheless, based on text comments, a few respondents were not familiar with the ODP and are not professionally associated with marine geology and geophysics.

Opinions expressed on the CUSP report

The survey next presented the 19 CUSP recommendations and provided respondents five choices (Agree Strongly, Agree, Neither Agree nor Disagree, Disagree, and Disagree Strongly) to express their opinion. The survey results reveal strong support for each of the CUSP recommendations. The percentage of respondents that "agree" and "agree strongly" with each recommendation ranges from 71% to 97%; in other words, the U.S. ocean-drilling community strongly supports the CUSP recommendations. Details are available at www.joiscience.org/USSSP/iodp/cusp.html.

The 26 text responses provide a revealing cross-section of supplemental opinion. These comments are provided, unedited (except for anonymity) and unabridged, at www.joiscience.org/USSSP/iodp/cusp.html. Some argue for greater resources, others for the same amount as is currently available. Some of the respondents expressed a view or mentality of abundance, in that they perceive that greater resources for IODP will not come at the expense of other activities in the NSF Ocean Sciences Division. Others were less sanguine; believing that expansion of one scientific endeavor requires contraction in another. Other comments were contributed on the topics of: (a) the scope of responsibilities for the new U.S. National Committee; (b) publications (e.g., electronic vs. paper); (c) educational activities; and, among others (d) the two-tiered system of post-cruise funding.

SUMMARY

The sum of these recommendations and the response to the questionnaire conveys the sense of the U.S. ocean drilling community on the importance of various participation issues and support activities to the full participation of U.S. scientists in the IODP. These recommendations are intended to serve as the basis for more specific program plans, for the structure of the USSSP-successor program, and for implementation plans that will define the specific levels of effort and support for the various activities.

ANNOUN

Interplay of Collisional Tectonics and Late Cenozoic Glacial Climate in Alaska and the Northeastern Pacific Ocean

A Workshop Sponsored by:
OI/USSSP and Continental Dynamics/NSF

April/May, 2003
Date TBD
Austin, TX

Purpose:

To develop a science plan to study the links between tectonics, orogenic processes, glacial landscape modification, and continental margin sedimentation in southeast Alaska and the northeastern Pacific Ocean. The workshop will focus on the interplay of late Neogene collisional tectonics and climate in the Gulf of Alaska's mini-orogen. Here sediment transport from the nearly closed mountain range to the ocean allows for tectonic, climatic, geodynamic, and surficial processes to be studied in a natural setting nearly devoid of human impact.

Goal:

A comprehensive terrestrial and marine science plan to foster synergistic collaboration between the continental dynamics and ocean drilling communities in this exciting natural laboratory .

Participation:

Scientists representing the fields of tectonics and geodynamic modeling, terrestrial and marine observational geophysics, GPS-based geodesy, glaciology, marine geology and glaciomarine sedimentation, micropaleontology, palynology, paleomagnetics, paleoclimatology and paleoceanography are encouraged to apply.

To apply, contact John Jaeger, University of Florida (jaeger@geology.ufl.edu) or Sean Gulick, University of Texas, Institute for Geophysics, Jackson School of Geosciences (sean@ig.utexas.edu). Greatest consideration will be given to those who express interest before March 1, 2003

Limited JOI/USSSP support is available to U.S. participants.

Ocean Geoscience Lectures

The JOI/USSAC Distinguished Lecturer Series brings the results of ODP research to students at the undergraduate and graduate levels, and to the earth science community in general. JOI/USSSP is pleased to announce its list of lecturers for the 2003-2004 season. JOI will soon begin accepting applications from U.S. colleges, universities, and nonprofit organizations to host talks given by the speakers listed below in the upcoming the 2003-04 season. The lecture topics and applications are available online at www.joiscience.org/USSSP/DLS/DLS.htm or from JOI (For more information contact Margo Cortes, phone: 202-232-3900 x224, email: mcortes@joiscience.org). Application deadline: **April 4, 2003**.

2003-2004 Lecturers

Ruth Blake, Yale University
Steve Clemens, Brown University
Fred Frey, Massachusetts Institute of Technology
Mitch Lyle, Boise State University
Julia Morgan, Rice University
Paul Wallace, University of Oregon

JOI Welcomes Two New Corporate Members:

University of South Florida (September 2002)
The Pennsylvania State University (September 2002)

The Joint Oceanographic Institutions:

Florida State University (2001)
Columbia University, Lamont-Doherty Earth Observatory (1976)
Oregon State University, College of Oceanic and Atmospheric Sciences (1976)
Rutgers, The State University of New Jersey, Institute of Marine and Coastal Studies (1998)
Stanford University (2001)
Texas A&M University, College of Geosciences (1976)
University of California, Santa Cruz (1999)
University of California, San Diego, Scripps Institution of Oceanography (1976)
University of Florida (1999)
University of Hawaii, School of Ocean and Earth Science and Technology (1976)
University of Miami, Rosenstiel School of Marine and Atmospheric Science (1976)
University of Michigan, College of Literature, Science, and the Arts (1999)
University of Rhode Island, Graduate School of Oceanography (1976)
University of Texas, Institute for Geophysics (1980)
University of Washington, College of Ocean and Fishery Sciences (1976)
Woods Hole Oceanographic Institution (1976)

CEMENTS

IODP Science Proposals

The Integrated Ocean Drilling Program needs you!
Pre-proposals are encouraged.
For details, visit:
www.isas-office.jp

Next deadline: April 1, 2003

Schlanger Ocean Drilling Fellowship

JOI/USSAC is seeking outstanding graduate students to conduct research compatible with ODP. Research may be directed toward the objectives of a specific leg or to broader themes. The award is up to $23k per year to be used for stipend, tuition, benefits, research costs, and incidental travel.

Next fellowship application deadlines:
April 15, 2003
November 15, 2003
For information: www.joiscience.org/USSSP/fellowship/fellowship.html

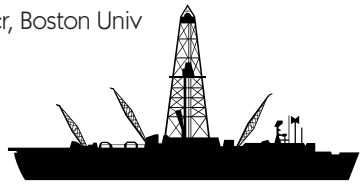
U.S. Shipboard Science Participants

Leg 203: Eq. Pac. ION Site
U.S. Co-Chief: John Orcutt, Scripps Inst
TAMU Staff Scientist: Thomas Davies
Richard Carlson, Texas A&M Univ
Ralph Moberly, Univ of Hawaii, Manoa
Xixi Zhao, Univ of CA, Santa Cruz

Leg 204: N.E. Pacific Gas Hydrates
U.S. Co-Chief: Anne M. Tréhu, Oregon State Univ
Staff Scientist: Frank R. Rack, JOI
LDEO Logging Staff Scientist: David S. Goldberg
LDEO Logging Staff Scientist: Gilles Guèrin
Nathan Bangs, Univ of TX, Austin
Walter Borowski, Eastern Kentucky Univ
George Claypool, Consultant
Timothy Collett, USGS, Denver
Mark Delwiche, INEEL
Gerald Dickens, Rice Univ
Joel Johnson, Oregon State Univ
Philip Long, PNNL, Battelle Foundation
Alexei Milkov, Texas A&M Univ
Melanie Holland, Univ of Arizona
Marta Torres, Oregon State Univ
Jill Weinberger, Scripps

Leg 205: Costa Rica Margins
U.S. Co-Chief: Julie Morris, Washington Univ
TAMU Staff Scientist: Adam Klaus
Dawn Cardace, Washington Univ
Peter Clift, WHOI
Miriam Kastner, Scripps Inst
Demian Saffer, Univ of Wyoming
Cara Santelli, WHOI
Elizabeth Screaton, Univ of Florida
Evan Solomon, Scripps Inst

Leg 206: Fast Spreading Crust
U.S. Co-Chief: Douglas Wilson, UC, Santa Barbara
TAMU Staff Scientist: Gary Acton
Jeffrey Alt, Univ of Michigan
Kari Cooper, CA Institute of Tech
Shijun Jiang, Florida State Univ
Marcie Jo Kerneklian, Univ of Utah
Thorvaldur Thordarson, Univ of Hawaii, Manoa
Christa Ziegler, Boston Univ



Drill Bits

Workshop Funds in Action

JOI/USSSP funds will support a planning workshop on drilling Indian Ocean fan systems that Peter Clift and Peter Molnar are co-convening during the first half of 2003. This workshop is likely to be held in Woods Hole. JOI/USSSP funds will also be used to support the participation of six U.S. scientists in a European-hosted workshop titled, "Preparing for Scientific Ocean Drilling in the Arctic: The Site Survey Challenge." This workshop, which will be held in Copenhagen on January 13-14, 2003, is being organized by Jan Backman, Willfried Jokat, Yngve Kristoffersen, Jörn Thiede and Naja Mikkelsen as part of the Joint European Ocean Drilling Initiative (JEODI).

New Faces at JOI/USSSP

JOI/USSSP welcomes two new staff members to JOI's Washington, DC office: Margo Cortes, Program Associate, and Robert "Bob" Burger, Assistant USSSP Program Director. Margo recently came to JOI from the hydrogeological consulting world and Bob arrived from a doctoral program at The University of Texas in Austin. Margo (mcortes@joiscience.org) is the person to contact if you have questions about the Distinguished Lecturer Series and Bob (bburger@joiscience.org) is one to contact if you have questions about post-cruise science support. JOI/USSSP also wishes Brecht Donoghue, Margo's predecessor, well in graduate school at Johns Hopkins University.

The Database Awaits You

The online DSDP and ODP Citation Database is at your disposal. To access it, visit www-odp.tamu.edu/publications/cite/index.html. This database contains over 18,000 citations related to the Deep Sea Drilling Project and the Ocean Drilling Program, research spanning from 1969 until the present. Approximately 40% of these citations are from publications produced by the drilling programs (e.g., *DSDP Initial Reports* and *ODP Proceedings* series), and 60% are from serial publications, abstracts, conference proceedings, maps, etc. This database is a product of the GeoRef Information System, housed on the American Geological Institute server, and is updated weekly from entries to the GeoRef database.

This database operates on Macintosh, PC-compatible, and UNIX based systems and can be viewed using an Internet browser such as Netscape or Internet Explorer. To conduct a database search, you may choose individual fields, multiple fields, or all fields at once. Field categories are: title, author, affiliation, volume title, volume author, source, year of publication, research program, and key words. The results of your search can be displayed in one of three formats: table, full record or brief record. The database format includes a download feature that imports the information from the database diretly into EndNote, a bibliographic software program. The data may also be downloaded into other bibliographic programs, or citations may be copied from the screen and pasted into word processing or spreadsheet programs. For more information, read the user guide on the database website.

Education Workshop

In response to discussion at the Conference on U.S. Participation in IODP (CUSP, see page 12), USSAC established an Education Steering Committee co-chaired by USSAC members, Al Hine and Ellen Thomas. The steering committee, represents a range of expertise including both education professionals and scientists. The other members include: Susan Haynes (VIMS), Sara Hickox (URI), Susan Humphris (WHOI), Ellen Prager (StormCenter Communications), Sarah Schoedinger (CORE), and Sharon Walker (USM). The committee, along with several guests and liaisons, met in Washington, DC on November 12 to begin planning for a full education workshop to be held during spring 2003. The purpose of the workshop will be to obtain recommendations for developing an effective U.S. educational program and strategy to accompany IODP. The workshop will identify the products, activities, and opportunities that educators need which can be uniquely contributed by a future scientific ocean drilling program. Other topics will include identifying what educational communities can most benefit from IODP and how scientific drilling can benefit from greater involvement with the educational community at large.The workshop will also explore implementation strategies. Once plans are finalized, a full workshop announcement will be distributed via the JOI/USSSP listserver. For more information or to express interest in this effort, contact Andrea Johnson (ajohnson@joiscience.org)

Ridge 2000

Ridge 2000 is a new research initiative sponsored by NSF to understand Earth's spreading ridge system, from its inception in the mantle to its manifestations in the biosphere and water column. Although its overall goals have been defined, there are exciting opportunities for investigators to plan program details during Ridge 2000's anticipated 12-year run. The Science Plan aims for a comprehensive understanding of the relationships between the geological processes of plate spreading and the seafloor/subsurface ecosystems that mid-ocean ridges support. A whole-system approach encompassing a range of disciplines and techniques will be used.

There are many potential links between Ridge 2000 and the Ocean Drilling Program. For example, drilling may be the only way to explore the subsurface biosphere in the spreading center environment. These links provide excellent opportunities for the ODP and Ridge 2000 communities to merge their efforts toward understanding ridge processes.

To join the Ridge 2000 mailing list, call the Ridge office at 814-865-RIDG or visit the website at: www.ridge2000.bio.psu.edu/

In Memorium: Mahlon Ball

Following a rich career, including an active role in JOIDES, Mahlon Ball passed away at age 71 on October 4, 2002. Mahlon served on numerous JOIDES panels over 35 years, but in recent years, he dedicated himself to the Pollution Prevention and Saftety Panel (PPSP), of which he was a long-time Chair. After obtaining a B.S. (Geological Engineering), M.S. (Geology) and a Ph.D. (Geophysics) from the University of Kansas, Mahlon spent his professional career with Shell Oil Company, the University of Miami, and the U.S. Geological Survey. Marilyn, Mahlon's wife of 50 years, passed away in September 2002. We are deeply saddened by this loss and offer our condolences to the Ball family.

Industry Brochure Available

An important IODP goal is to incorporate the expertise of industry scientists and engineers in developing ideas and techniques for solving earth science problems. In turn, through its sampling and research efforts, IODP results may be used to enhance industry's understanding of resource potential, hazards, and reservoir characteristics in deep water areas. To encourage industry involvement in IODP, the Industrial Liaison Working Group, co-chaired by John Armentrout and Kate Moran, has developed the brochure, *Opportunities for Scientific and Industry Cooperation in the Integrated Ocean Drilling Program*. Access the brochure at www.iodp.org or request copies by contacting: info@joiscience.org.

Correction!

The projected science operating costs (SOCs) for the IODP's non-riser drilling vessel were incorrectly listed in Table 1 on page 3 of the Summer 2002 *JOI/USSAC Newsletter*. A corrected version of this issue of the newsletter is available as a pdf file on the JOI website (www.joiscience.org). The correct non-riser SOC numbers per U.S. fiscal year follow: $5M (2004), $15.5M (2005), $15.5M (2006), $15.5M (2007), and $18M (2008).

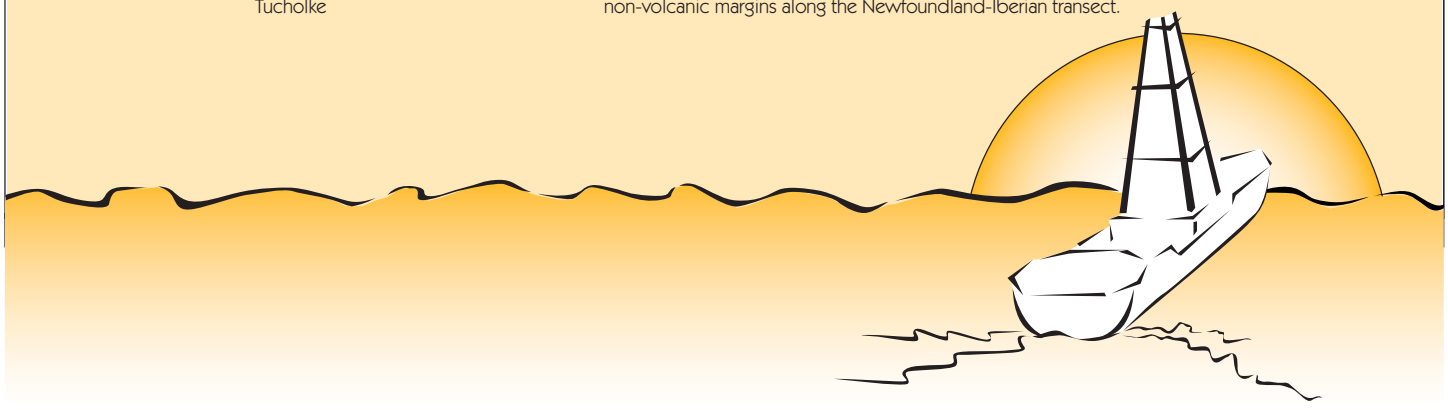
ISAS Website

For the latest scoop on IODP's interim Science Advisory Structure, visit: www.isas-office.jp. You'll also find membership, meeting minutes, and information on submitting proposals.

Operations Schedule for ODP Legs 205-210

For more information: www.oceandrilling.org/Cruises/Cruises.html

LEG	REGION	CO-CHIEFS	DEPARTURE PORT	DEPARTURE DATE	SCIENTIFIC OBJECTIVES
205	Costa Rica	Morris Villinger	San Diego	9/02	Test fluid flow and subduction flux models, and understand the processes associated with the seismogenic zone and workings of the subduction factory.
206	Fast Spread Crust	Teagle Wilson	Balboa	11/02	Penetrate a complete upper crustal section to gabbro in 15 Ma oceanic crust on a superfast spreading ridge in the eastern Pacific Ocean (the first of a proposed two-leg program).
207	Demerara Rise	Erbacher Mosher	Barbados	1/02	Recover cores from a transect of sites to study extinctions linked to massive perturbations of the global carbon cycle and extreme changes in Earth's climate in the Cretaceous and Paleogene.
208	Walvis Ridge	Kroon Zachos	Rio de Janeiro	3/02	Obtain high-resolution cores for reconstructing paleoceanographic characteristics of South Atlantic deep and surface waters during prominent episodes of early Cenozoic extreme climate change.
209	MAR Peridotite	Kelemen Kikawa	Rio de Janeiro	5/02	Sample the upper mantle in a magma-starved area of a slow spreading ridge and characterize mantle deformation patterns, residual peridotite composition, melt migration and hydrothermal alteration.
210	Newfoundland Marg	Sibuet Tucholke	Bermuda	7/02	Obtain a stratigraphic sequence (to basement) to study cross-rift asymmetries between conjugate non-volcanic margins along the Newfoundland-Iberian transect.



BROADER-BAND REFLECTANCE SPECTROSCOPY

contributed by Richard Jarrard and Michael Vanden Berg

Color is a clue to a rock's composition, and as the geosciences become more quantitative, even this simple observation is being reduced to numbers. The experimental technique is straightforward, nonintrusive, and nondestructive: illuminate a rock surface, record the spectrum of reflected light, and extract any spectral responses that are sensitive to mineralogy. Reflectance spectroscopy can be used on the archive halves of cores, and measurements take only seconds. These advantages make the technique particularly attractive for core intervals that are depleted (e.g., many basalts) and for climate proxies which require thousands of high-resolution measurements.

Most ODP applications of reflectance spectroscopy have concentrated on the visible light wavelengths (~430-960 nm). Alan Mix was the first to develop and use a prototype split-core analysis track (SCAT) on Leg 138 for automated core scanning (Mix et al., 1992, 1995). A revised SCAT, with an improved signal-to-noise ratio and wider frequency band (250-950 nm vs. earlier 455-945 nm) was used for Legs 154 and 162 (Harris et al., 1997; Ortiz et al., 1999). The demonstration of quantitative mineral determination from visible light spectroscopy (Balsam and Deaton, 1991; Deaton and Balsam, 1991; Balsam and Deaton, 1996) set the foundation for routine shipboard core scanning with the Minolta spectrophotometer (400-700 nm) on Leg 155 and subsequent legs (Schneider et al., 1995; Balsam et al., 1997). This technique has been most successful for estimating carbonate content.

For visible wavelengths, wet or dry cores can be analyzed with minimal sample preparation: slight surface scraping or covering with plastic wrap. In contrast, infrared spectroscopy (often ~2600 to 20,000 nm), which is capable of much more precise and versatile mineral determination, requires time-intensive sample preparation such as polishing or forming sediment into pellets (Herbert et al., 1992).

To capitalize on the advantages of visable and infrared spectroscopy, we have been exploring a middleground—visible and near-infrared spectroscopy (VNIS)—using wavelengths of 350-2500 nm, similar to that of remote sensing spectroscopy. This frequency band extends beyond the visible range that responds mostly to electronic processes and encompasses the near-infrared which responds to normal modes of characteristic vibrations of OH bonds (Clark et al., 1990; Clark, 1995). Water, Mg-OH, Al-OH, and Fe-OH absorption bands are useful in identifying minerals. Unfortunately, the spectral signature of pore water in the near-infrared dominates many spectral features of mineralogical origin. Therefore, samples should be dried prior to analysis.

For dried cores, no sample preparation is necessary; measurements simply involve placing the light probe, with its internal fiberoptic detector, directly on the split core surface. We have used this technique to determine clay mineralogy of the mid-Tertiary CIROS-1 core from Antarctica (Vanden Berg and Jarrard, 2001), as well as for analysis of ODP basalts. Before measuring Leg 199 sediments and calibration standards, we dried them in a 105°C oven and crushed them into powder. Powdered samples are not necessary, as VNIS also works well on cut or irregular surfaces.

When used for mining exploration or airborne geophysics, VNIS analysis is usually confined to identifying the presence of spectrally significant minerals. Determining quantitative mineral concentrations is possible, if characteristic absorption features can be calibrated by a suite of local ground-truth measurements (e.g., X-ray diffraction). The first step in analyzing the ground-truth calibration spectra is to identify about a dozen potentially useful spectral features (e.g., depth of the 1930-nm water trough, Figure 1). Next, spectral response is calibrated by either matrix inversion or simple multiple regression. These approaches are likely to work for rocks with two to four spectrally significant minerals; however, they may not succeed in rocks with more complex mineralogies.

The additional spectral information found in the expanded near-infrared region greatly improves identification of paleoclimatically sig-

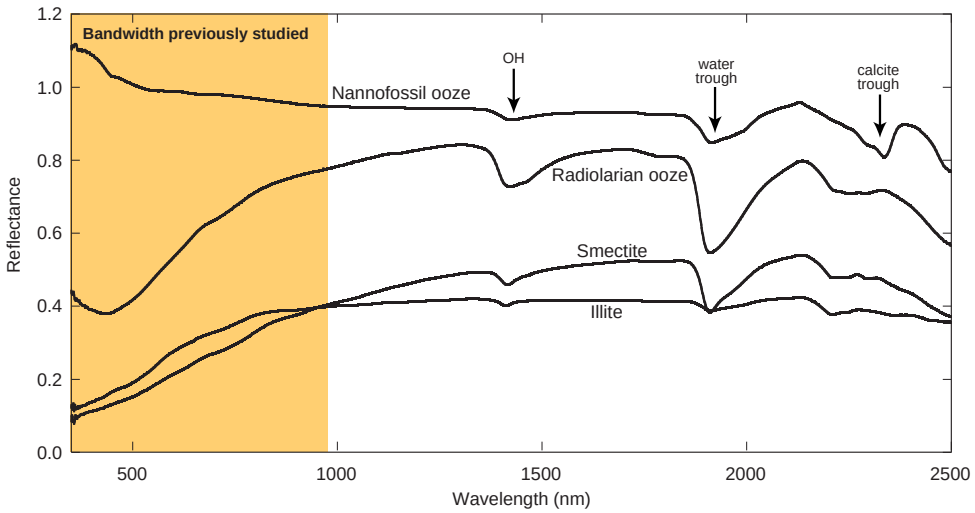


Figure 1: Reflectance spectra from four climatically sensitive minerals found in the equatorial Pacific. Differences in the various peaks and troughs (e.g., the water trough located at ~1930 nm) are used to calculate mineral concentrations. Previous studies on marine sediment involved only the bandwidth in the high-lighted area. The additional spectral information found in the expanded near-infrared region greatly improves identification of minerals with paleoclimatic interest.

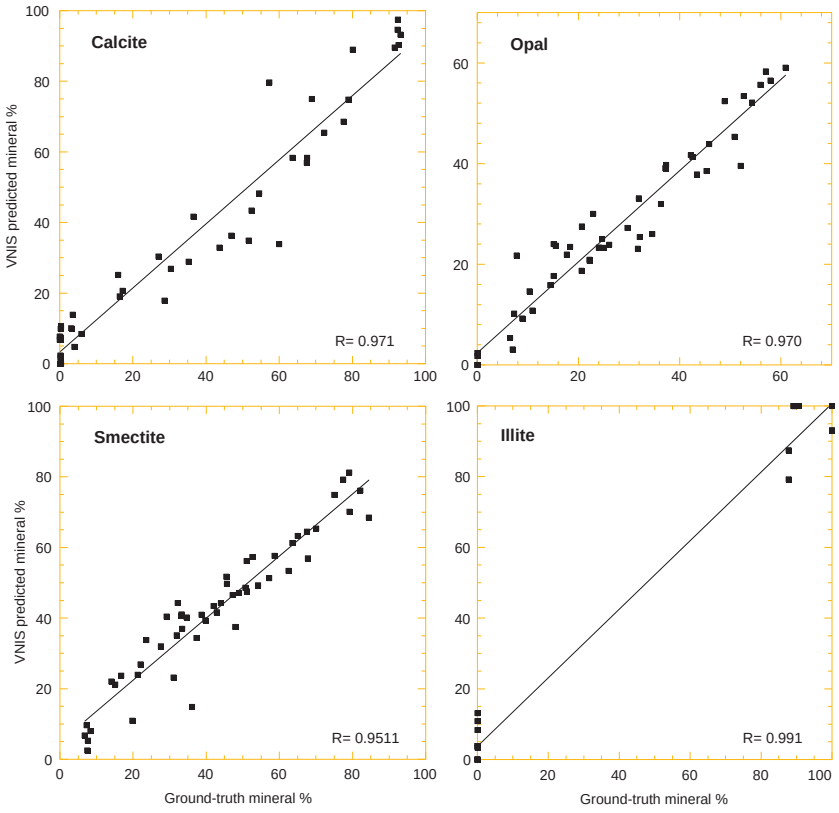


Figure 2: Cross-plots comparing VNIS predicted mineralogy with ground-truth mineralogy.

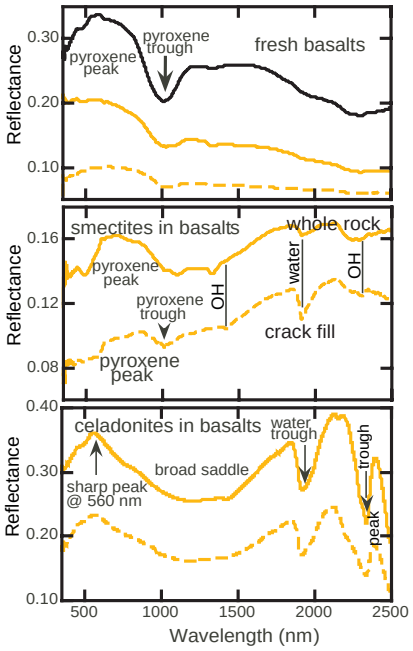


Figure 3: VNIS spectra from basalts. Top: Fresh basalts exhibit pyroxene peak and trough. Center: Crack fill is mostly smectite, with strong water and OH absorptions, and weak basalt pyroxene; altered whole rock has intermediate signature of smectite and fresh-rock pyroxene. Bottom: Celadonite is distinguished from smectite by peak at 560 nm and trough/peak at 2400 nm.

nificant minerals. For instance, in the equatorial Pacific region, four of these minerals—opal, calcite, smectite, and illite—are detectable with VNIS (Figure 1). On board Leg 199, the Paleogene equatorial Pacific transect, VNIS provided preliminary percentages of these four minerals for ~1000 samples (Vanden Berg and Jarrard, in press). Previously, only calcite could be measured on-board by other methods. Figure 2 illustrates the accuracy of the VNIS technique used for equatorial Pacific sediments. Post-cruise analyses refined the mineral percentages and used their detailed downcore variations to calibrate the conversion of MST records (GRAPE density, magnetic susceptibility, and Minolta color) to even higher-resolution mineralogy.

VNIS also produces responses in basalts. The volumetrically dominant minerals in the basalts shown in Figure 3 are pyroxene and plagioclase, but plagioclase is spectrally featureless and therefore undetectable by VNIS. The dominant spectral signature in these fresh basalts is from the pyroxene mineral pigeonite. Smectites, with an OH absorption band at 1400 nm and a strong water absorption band at 1930 nm, are spectrally distinct from a second major alteration mineral, celadonite, as well as from pyroxene.

We have just begun to apply VNIS to investigate alteration in basalts. Alteration of dried physical properties samples from ODP Hole 801C was estimated with VNIS, then used to detect how alteration impacts geophysical properties (Jarrard et al., in press). The nondestructive VNIS measurements can be undertaken on archive-half cores rather than on dried core plugs, thereby determining total structural water ($H_2O^- + H_2O^+$) rather than just H_2O^+. The core surface must be dry enough to avoid confusing pore and structural water; DSDP and ODP basalts satisfy this need. Feasibility studies of determining basalt hydration via direct VNIS measurement on archive-half cores are promising, but require further tests.

Because of these results, we recommend that reflectance spectroscopy—both VNIS for discrete measurements and SCAT or Minolta for core scanning— be a routinely available shipboard tool for IODP. In the meantime, potential visitors to the University of Utah should know that VNIS measurements are so fast that our instrument usually sits idle.

The Authors

Richard Jarrard and Michael Vanden Berg are in the Department of Geology and Geophysics at the University of Utah.

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The JOI of Sailing: Surveying the Gulf Of Mexico for Gas hydrate drill sites

contributed by Jennifer Anziano

When I became a JOI/USSSP Intern in Washington, DC last July, I had very limited knowledge of JOI and ODP. I spent the first few weeks trying to remember what all the different acronyms meant, and more importantly, how they all work together. In addition, I was curious about what exactly went on during one of those mysterious two-month ODP cruises. Fortunately, JOI is one of those special organizations that aims to benefit the lowly interns at least as much as the interns benefit the organization. In my case, that meant looking for the opportunity to send me on a research cruise. To me, this meant going on an adventure.

My opportunity to go to sea on a research cruise came recently, thanks to Carolyn Ruppel, a geophysics professor at the Georgia Institute of Technology. Funding for this cruise came from the Ocean Drilling Program in the Division of Ocean Sciences at NSF. The cruise was both a site survey for future scientific hydrates drilling in the Gulf of Mexico as well as an adjunct to the Life in Extreme Environments project. While I was enthusiastic about the opportunity, I was also very nervous. What am I going to do on a research cruise? Since I went to school at Macalester College in St. Paul, Minnesota, the closest I came to doing ocean research was visiting the local wastewater treatment plant for a class field trip. I was not sure how I was going to contribute to the science on the cruise. However, Carolyn and others reassured me that everything would fall into place.

My voyage began in Gulfport, Mississippi. I met up with Carolyn and a few others in Atlanta, and we took a small plane down to Gulfport. When we arrived, we went directly to the port where the R/V *Seward Johnson*, a University-National Oceanographic Laboratory System (UNOLS) vessel out of Harbor Branch

JOI/USSSP Intern Jennifer Anziano caps a core on a research cruise aboard the R/V *Seward Johnson*.

Oceanographic Institution, was docked and ready to welcome us. As soon as we were aboard the ship, we began unpacking the equipment. As the other members of the group arrived, I soon realized that this was not the typical science party as there were several scientists who had not sailed before. Many of us spent our first night speculating about our next two weeks aboard the ship. The next day, the ship steamed to our first site, Bush Hill-Green Canyon 185. During this time, Carolyn held a science meeting to explain what would happen during the next couple weeks. The purpose of the cruise was to examine the distribution of free gas and gas hydrate and to understand how this distribution relates to energy, fluid, and gas flux variations. The science plan included imaging flow pathways with a towed seismic instrument, conducting high-resolution heat flow surveys, and acquiring both gravity and piston cores at several potential drilling sites. This all sounded very exciting, yet I still felt unsure about exactly what my role would be.

When we began coring at our first site, my duties began to take shape. Aside from my daily two-hour watch, I took the job of being the core recorder. When a core came on deck, I took note of the length, whether hydrate was visible with JOI's infrared camera (the same camera that was used on ODP Leg 204), the plan for sectioning the core, and who received each section of the core. In addition, I helped Bill Gilhooly and Grace Castellini (graduate students of Steve Macko from the University of Virginia and Jerry Dickens from Rice University, respectively) in the chemistry lab. Their projects involved squeezing subsections of the core and analyzing the pore water for the concentration and isotopic composition of various chemical species.

Even when we were not coring, my days were jam-packed. Whether it was enjoying one of the magnificent dinners prepared by Bobby and Tom (the ship's chefs), getting to know the other scientists, catching up with former JOI intern Micah Nicolo (now a graduate student at Rice University), looking at the water and wishing I were swimming, or gazing at the stars and pretending I knew what I was looking at, there was always something to do. Every day felt like an adventure, and I constantly wondered what would happen next. Will the next core be better than the last? How many cores are we really going to recover today, the two that we planned, or will there really be six? Will the heat flow be successful tonight? What will happen next?

Unfortunately, due to mechanical problems on the ship, we had to return to port a few days earlier than scheduled. While we were out at sea, it seemed that we had been (and would be) there forever, but now we were actually going home. Nobody was quite ready for this adventure to end. My shipmates and I began reflecting on the events of the previous week

Micah Nicolo, former JOI/USSSP Intern, and Jennifer Anziano aboard the R/V *Seward Johnson*.

and a half. There was an overwhelming opinion that the cruise was a success. While not everyone received the amount or quality of data they originally hoped for, everyone had a great time retrieving the data. Suddenly, I realized that I would really miss this ship, the crew, and my fellow science party, for I experienced many great, new things. I learned about gas hydrates and their current importance in the ocean sciences. I saw Jerry set fire to methane captured within the core. I was amazed at the number of oil rigs scattered throughout the Gulf and impressed by how much oil exists in the Gulf. I learned about and saw my first waterspout. I spent time with Chris, the second mate, learning about the navigational equipment on the ship. I even learned a handful of new acronyms, like "DP" (dynamic positioning), to add to my vocabulary. With all these great experiences, how could I not miss everything and everyone? When we arrived back at port, we all said goodbye as long-time best friends. It is amazing how close quarters for ten days can bring a group of people together.

Now I am back at JOI, and glad to be at work and walking on land again. I am grateful for my experience and thank Carolyn Ruppel, John Farrell, and Andrea Johnson for the opportunity. Not only did it give me the chance to see first-hand what life is like aboard a research vessel, but also I received some excellent advice and encouragement about my future in the geological sciences. I now fully understand the importance of an organization like JOI. While being close to the research again was very exciting, it has strengthened my desire to choose a path of helping scientists pursue their own research dreams. This research cruise was a great adventure—I know I will often look back at it and say to myself, "I wish I were still on that boat."

WANTED

JOI/USSSP INTERNS

Joint Oceanographic Institutions (JOI) is seeking qualified U.S. applicants for a one-year internship, beginning summer 2003, at the JOI Office in Washington, DC. The JOI/US Science Support Program (USSSP) Internship Program's goal is to introduce recent science graduates to science program management. This internship is ideally for spring 2003 graduates seeking experience with a scientific non-profit organization before continuing their education. Interns will work full-time, dedicating half of their effort to special projects and the remainder to other tasks in support of USSSP. For the term appointment, the intern will be a salaried JOI employee with full benefits. Specific start and end dates will be negotiated. Interested applicants should submit a cover letter, resume, and the names of three references to the JOI Office by March 14, 2003. Interviews with finalists will be scheduled in late March/early April, and a decision will be made by mid-April.

JOI manages worldwide cooperative research programs, including the scientific Ocean Drilling Program (ODP) and USSSP. For more information about JOI and the science programs it manages, please visit www.joiscience.org. Please direct questions and/or applications to: Margo Cortes (mcortes@joiscience.org), Joint Oceanographic Institutions, 1755 Massachusetts Avenue, NW, Suite 700, Washington, DC 20036.

Going Digital: Site Surveys and Drilling on Leg 199

contributed by Mitchell Lyle

Before scheduling, the most significant task for a scientific drilling program is to gather a comprehensive set of site survey data adequate to locate drill sites and to determine any pollution/safety hazards. Survey data are important both to guide and to interpret drilling, but these data are rarely available at sea in a digital format during ODP drilling legs. Because of this, it is a challenge to compare the survey data with information acquired during the ODP leg. An important goal for the next phase of scientific drilling is to integrate drilling with previous geophysical surveys by developing effective means to send digital data to sea.

Transmitting digital information to the drillship is primarily a challenge of data transfer and software integration so that geological and geophysical data sets can be easily and efficiently stored, retrieved, and displayed. One possible solution is to use seismic interpretation software developed for oil exploration. Through a JOI/USSSP site survey augmentation award I was given the chance to explore this technology, as well as to bring seismic interpretations I had made on shore to the ship for Leg 199 (Lyle et al., in press).

For this purpose, we investigated the use of the Schlumberger-GeoQuest GeoFrame software which was kindly donated to Boise State University as part of the Schlumberger University Software Program. We used this software because it was being supported by the Borehole Research Group at both LDEO and on the *JOIDES Resolution*. It also has the capability of displaying logging data with the seismic reflection profiles once a velocity-depth profile has been established.

Background

ODP Leg 199 was designed to drill the first systematic survey of the early Eocene equatorial region in the Pacific. The 56 Ma equator is now probably located at about 12°N in the region of Leg 199 drilling (Figure 1). The primary objectives of the leg were to study the evolution of the equatorial Pacific current and wind system as the Earth went from maximum Cenozoic warmth to initial Antarctic glaciations. The drilling program was mostly a transect along 56-57 Ma crust, old enough to capture the Paleocene/Eocene boundary (P/E) in the basal, more carbonate-rich sediments. The Leg 199 transect extends from early Eocene paleolatitudes of ~11°N to ~5°S to encompass a relatively thick early Eocene sediment section perhaps 8°N of the paleoequator. One drill site (Site 1218) was drilled on 40 Ma crust to collect a near-equatorial sediment sequence from the middle Eocene through late Eocene in order to investigate the transition in global climate from the Eocene "greenhouse" to the Oligocene "icehouse."

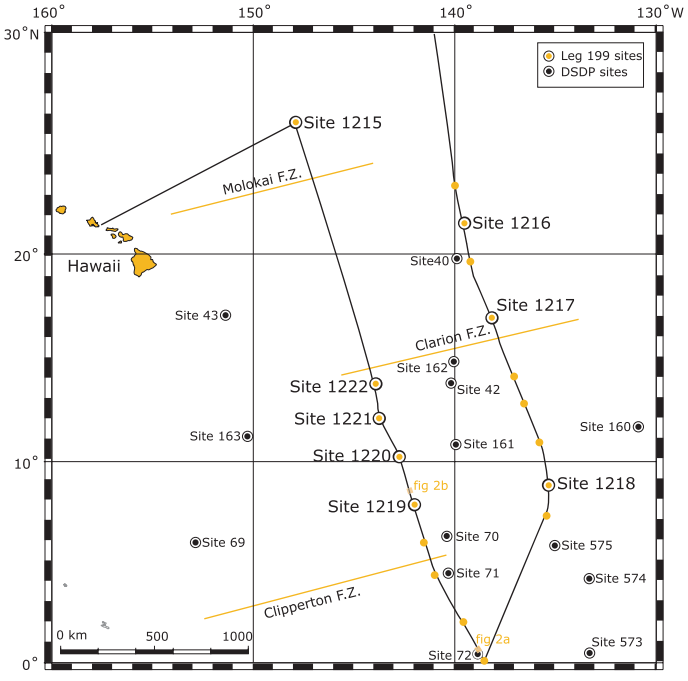

Figure 1: Track of the Leg 199 site survey cruise (EW9709).

The Pacific Plate has drifted northwards through Cenozoic time, transporting Paleogene biogenic sediments deposited under the high productivity equatorial belt into a zone of extremely slow sediment (red clay) accumulation. The thin Neogene cover of red clay in the area meant that much of the Paleogene sediment section could be recovered by advanced piston coring (APC) and extended core barrel (XCB) methods.

Site Survey

The site survey for Leg 199 drilling, cruise EW9709 (R/V *Maurice Ewing*, 12/97 to 1/98), collected digital seismic reflection data primarily using a single 80 cubic inch water gun and a 4-channel streamer. At each proposed drill site (Figure 1), we surveyed grids of seismic lines at a ship speed of about 7 knots. These grid surveys were used to locate individual drillsites for Leg 199. We recorded data during the grid surveys at 0.5 ms sample rate using a Geometrics engineering seismograph. We also digitally recorded the 3.5 kHz subbottom profiler on another Geometrics seismograph. During transits between sites, we recorded seismic reflection data in order to reconstruct the history of the equatorial sediment bulge, to be constrained by Leg 199 drilling. We recorded transit data underway at 10 knots using the Digicon data acquisition system on the *Ewing*. All the data were processed in a standard manner by normal moveout corrections, stacking, bandpass filtering, spectral whitening, and migration.

Developing a Digital Package

Because we were interested in developing a transect of equatorial sedimentation and paleoceanography, we wanted to tie together drilling and seismic reflection data to develop a regional picture of sedimentation with groundtruth from Leg 199 drilling. To achieve this goal, we needed to compare drilling to

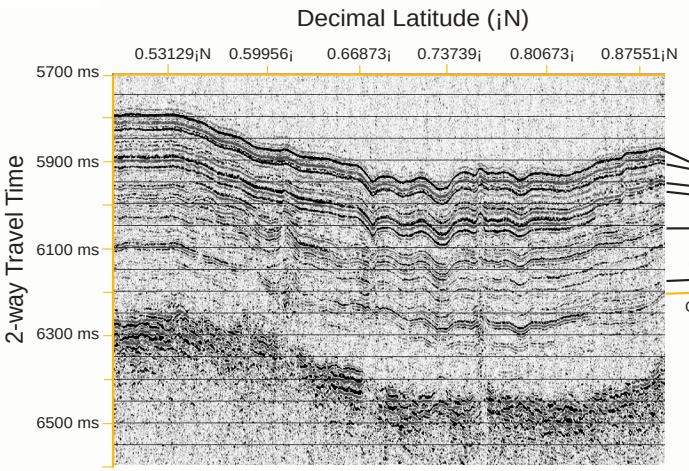

Figure 2a: Neogene equatorial sediments.

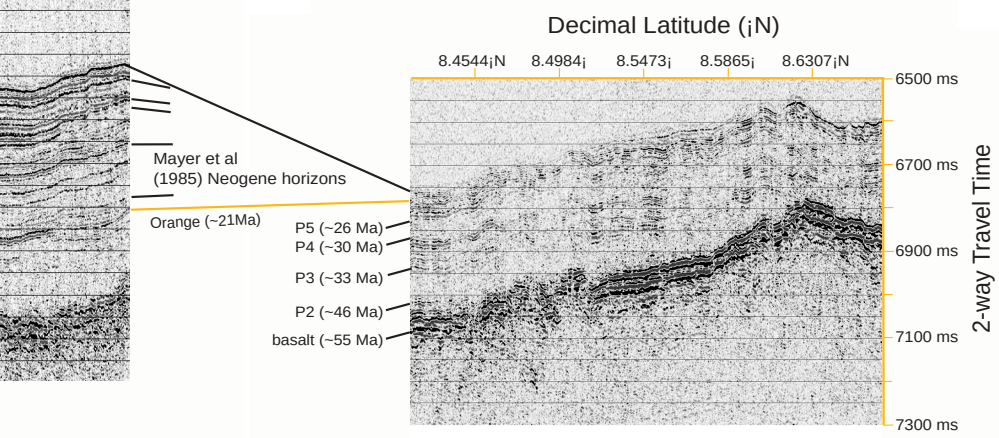

Figure 2b: Paleogene equatorial sediments (North of Site 1219).

the seismic data for the Paleogene sediments we would recover (Figure 2). Mayer et al. (1985) already constructed a seismic stratigraphy for the Neogene equatorial Pacific. The stratigraphic horizons they identified are time stratigraphic, and at least some have been shown to be continuous over more than a thousand kilometers (Bloomer et al., 1995). After the survey cruise, we could identify Paleogene seismic horizons that appeared chronostratigraphic (Moore et al., 2002). We wanted to transmit these interpretations to the drillship for comparison to drilling results.

The first tasks were to install the GeoFrame package, which proved formidable, and to make certain the data were properly navigated, consistently processed, and archived in an accessible manner. GeoFrame installation is not straightforward because it links to an Oracle database which must also be running correctly. It took several months of consultation with GeoQuest to get the software working properly. Checking and archiving the seismic data were tedious but not particularly difficult. Once GeoFrame was working correctly, building interpretations was not difficult. The biggest difficulty in the interpretation was the relatively large fault offsets found on ca. 56 Ma crust when compared to the site surveys on ca. 40 Ma crust (Lyle et al., in press). The thin sediment column, caused by a shallow Eocene carbonate compensation depth (low deposition when compared to the Neogene), was also more difficult to image than Neogene sediments. Nevertheless, the sites were interpreted and each of the site data packages backed up. Once saved, the data packages were easily mobile. We sent data to the Borehole Research Group electronically to ensure that we could communicate these data packages to another institution and to test the compatibility of GeoFrame software versions available on the ship with the versions that we had installed. The data were opened with no difficulty.

At Sea

The availability of the digital data and the seismic interpretation software was important during Leg 199 because it allowed the shipboard scientists to better compare drilling with our seismic interpretation. Later in the leg we were able to predict lithology with some confidence because of the large spatial scale of typical pelagic sedimentation. In other words, it was a good bet that we would encounter similar sequences at adjacent drillsites. We failed at near-real-time comparison of downhole logs with the seismic reflection record, however, because of the poor quality of the velocity logs on the holes that we logged. Nevertheless, the availability of the data in a portable digital package has allowed me to send the data to the institutions that have taken the lead in developing the synthetic seismograms and velocity-depth profiles, so that they can continue to develop the sediment-seismic comparison.

My experience with handling these "digital site surveys" suggests that we, as a community, are on the threshold of being able to conduct this analysis routinely. If we do, we will better integrate all of the data we have available about a drillsite. In the case of 3D data sets that may be needed for riser drilling in IODP, such a capability will probably prove essential. Scientific drilling will gain by better integration of the site survey data with the actual drilling, and by having data in a routine format that can be transported and exchanged much more efficiently than paper records. If the digital site survey concept is carried forward from the beginning of the proposal process for the IODP phase of ocean drilling, we can minimize many of the problems I experienced. There are downsides—the software used is proprietary and expensive, and there is a large learning curve for using it effectively. Formats are proprietary and there is a risk that must be assessed of investing in an "orphan" format that may disappear in a decade. We, however, have faced similar risks in a conversion to other digital products and should be able to evaluate the challenges effectively.

The Author

Mitchell Lyle is at Boise State University. Please contact Mitch (mlyle@cgiss.boisestate.edu) to obtain a better version of the seismic line in Figure 2.

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QUATERNARY CARIBBEAN SEA CARBONATE RECORDS

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Numerous studies have examined variations in carbonate preservation and dissolution in pelagic sediments at water depths (WD) greater than 2500, but few have done so at intermediate depths (500-2500 m). I have developed high-resolution paleoceanographic records from Quaternary sediments recovered during ODP Leg 165 in the Caribbean Sea to determine long-term variations in carbonate sediment preservation and to investigate the relationships between preservation and intermediate water depth circulation. The Caribbean basin affords a unique opportunity to investigate these relationships because it plays an important role in global ocean circulation and because western Atlantic waters filling the basin are intermediate in origin, restricted by a maximum sill depth of 1800 m.

Do these carbonate preservation records contain any long-term cyclical patterns? Bassinot, et al. (1994) and Yasuda, et al. (1993) proposed an oscillation in deep Quaternary carbonate preservation in the Indian and Pacific oceans with a periodicity of 425-550 kyr. The mechanism(s) for such an oscillation remain conjectural. My records from ODP Sites 999 and 1000 will reveal if a similar pattern occurs in the Caribbean.

Site 999 (2800 m WD) is located on the Kogi Rise, an isolated bathymetric high 1000 m above the floor of the Colombian Basin, an enclosed basin below the maximum Caribbean sill depth. While Site 999 is located below intermediate water depths, the waters bathing the site originate from Western Atlantic intermediate waters at the 1800 m Caribbean sill depth. The Quaternary at Hole 999A corresponds to a 55 m-thick hemipelagic sequence of nannofossil and foraminiferal clay-rich sediment with an average sedimentation rate of 3.3 cm/kyr. Site 1000 (930 m WD) is located in Pedro Channel on the Northern Nicaragua Rise. The Quaternary at Hole 1000A corresponds to a 60 m-thick periplatform sequence of micritic ooze with foraminifers, pteropods, and nannofossils with an average sedimentation rate of 3.6 cm/kyr. Many cores recovered from the Caribbean prior to Leg 165 do not contain the entire Quaternary sequence, or are disturbed by turbidites, or have sedimentation rates too low for high-resolution analysis. The Quaternary sequences at Holes 999A and 1000A are undisturbed and continuous. My 10 cm-sample spacing results in a ~3000-year time interval between consecutive samples at both sites.

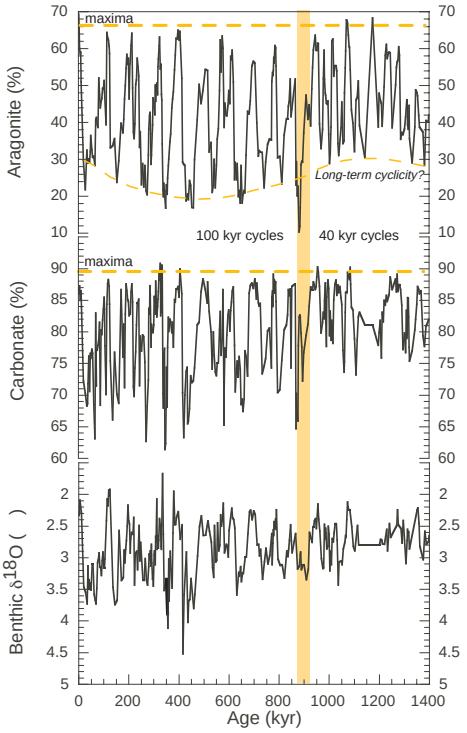

Figure 1: Carbonate content, percent aragonite, and benthic $\delta^{18}O$ at ODP Hole 1000A.

A continuous, high-resolution chronostratigraphy has been established by $\delta^{18}O$ stable isotope analysis of the benthic foraminifer *Cibicidoides wuellerstorfi*. Benthic $\delta^{13}C$ stable isotopes provide a history of intermediate water flux. I have used a multi-proxy approach to minimize local effects in carbonate preservation. Using a combination of sedimentological and geochemical methods, I have constructed high-resolution records of percent coarse fraction and percent bulk carbonate (Sites 999 and 1000) and carbonate mineralogy (Site 1000). Foraminifer (Site 999) and pteropod fragmentation (Site 1000) records are nearly complete. These dissolution indices are being statistically combined into a Composite Dissolution Index (CDI) and I will assess the periodicity of carbonate preservation change by power-spectral and cross-spectral analysis.

The bulk sediment carbonate content and percent aragonite at Hole 1000A (shown with the $\delta^{18}O$ in Figure 1) clearly show the transition from 40-kyr cycles to the modern 100-kyr cycles. Glacial/interglacial cycles are evident in both records. During interglacial stages, the carbonate maxima are consistently 87-90%. However, the lower values during glacial stages are more variable due to fluctuations in dilution by non-carbonate sedimentation. The glacial values in the aragonite record, in particular, suggest a longer-term cyclicity.

These paleoceanographic records vastly expand the available data for carbonate preservation at intermediate water depths. Their high resolution greatly facilitates our ongoing investigation of the relationships among carbonate preservation, changes in North Atlantic Deep Water production, Antarctic Intermediate Water flux, transfers of carbonate from neritic to pelagic reservoirs, and global climate change.

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"May You Live in Interesting Times"

Although often meant as a curse, this phrase encapsulates the crux of the transition from ODP to IODP. The U.S. ocean-drilling community will certainly experience "interesting times" over the next few years. U.S. participation in the IODP will mean a number of changes in how our community plans and manages new science initiatives, participates in multi-platform expeditions, and publishes IODP science. USSAC has considered a variety of transition issues and will continue to address U.S. interests and participation in IODP for the foreseeable future. As the new USSAC Chair, I wish to thank outgoing Chair Peggy Delaney for her leadership, dedication and organization in leading USSAC into a more active role in advising JOI and in helping to plan the ODP-IODP transition.

The evolving IODP structure has many implications for the planning and participation of U.S. scientists. IODP will be a new playing field! We must take these changes into account as we structure the U.S. support program for IODP. Although summarized in the report from the Conference on U.S. Participation (CUSP) in IODP, a few important changes include:

- IODP will deploy multiple drilling platforms (riser, non-riser, mission specific).
- Multi-year, multi-leg, and multi-platform proposals (i.e., complex drilling programs) will become more common.
- U.S. partnership in IODP and therefore representation in the Science Advisory Structure will likely decrease from over half in ODP to about one third in IODP.
- Educational and outreach activities will be more prominent in IODP.

These and other changes demand that we re-examine how the U.S. support program is structured and evaluate if the activities it supports will prepare U.S. scientists to exploit the new opportunities in the IODP. USSAC initiated CUSP to address the current and future needs of the U.S. ocean-drilling community. The CUSP report (see page 1) and recommendations are intended to give community-based advice to JOI and NSF on how the U.S. science support should be structured for the IODP. The CUSP workshop and USSAC recommendations address the full range of activities associated with planning and managing new drilling programs, participating in drilling expeditions, supporting post-expedition science, and educational/outreach activities. I urge you to read the CUSP report and send comments to JOI (info@joiscience.org). We thank the 150 participants in our online survey for providing community feedback. The responses were incorporated into the final CUSP report to the NSF.

The CUSP report also has implications for USSAC as a community-based advisory body. In general, the more complex organization and management of IODP (i.e., multiple platform operators, a central management organization, expanded advisory structure) means that the USSAC-successor will have to provide more continuous coordination and oversight of IODP activities and must become more proactive in reflecting and representing the interests of the U.S. ocean drilling community to JOI and to the Science Advisory Structure (SAS) of the IODP. In short, USSAC will have to act more as a U.S. national committee than it has in the past. For example, USSAC currently nominates U.S. members to the JOIDES and interim Science Advisory Structure (iSAS) panels and committees. In JOIDES, the U.S. scientists constituted over half of the panels so that the absence of one or even two members did not change the balance of the panel. However, in the iSAS and SAS, the absence of U.S. members will strongly affect panel balance. USSAC anticipates the need to communicate more effectively with U.S. panel members and to provide alternate members where absences or conflict-of-interests would impact the U.S. panel participation. Another example is that in IODP, like ODP, the platform operators will have the final choice on scientific crew selection. Thus the U.S. may need a body to coordinate applications and "horse trade" on behalf of the U.S. community. These are but a few of the possible changes that the USSAC-successor may face in the IODP.

IODP planning is already upon us. During this past year, a wide variety of workshops have been completed, scheduled, or proposed.

- CUSP (6/02)
- Cretaceous Climate & Ocean Dynamics (7/02)
- NantroSEIZE: Drilling & Instrumenting the Nankai Trough Seismogenic Zone (7/02)
- Deep Biosphere Mini-Workshop (9/02)
- Continent-Ocean Interactions within the East Asian Marginal Seas, Chapman Conference (11/02)
- Southeast Asian Epeiric Seas Drilling Project Mini-Workshop (11/02)
- Costa Rica Drilling Workshop (12/02)
- Support for U.S. participation in the European (JEODI) workshop "Scientific Ocean Drilling in the Arctic: The Site Survey Challenge, January 13-14, 2003"
- IODP GeoSCAN. Geophysical Site Characterization and Needs (Spring/03)
- USSAC Education Workshop (2003)
- Workshop for planning drilling of the Indian Ocean Fan Systems (2003)
- Interplay of Collisional Tectonics & Late Cenozoic Glacial Climate in Alaska & the Northeastern Pacific Ocean (Spring/03)

In closing, the transition from ODP to IODP will be an exciting time in the marine geosciences. All of us, especially JOI and USSAC, will need to adapt to the changing playing field and adjust our activities and structure to enable the U.S. ocean-drilling community to take full advantage of the opportunities in the IODP.

Sincerely,

Warren Prell
Chair, USSAC

News and Views from NSF

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

"The art of progress is to preserve order amid change and to preserve change amid order."

- Alfred North Whitehead

As of this writing, NSF is operating under a continuing resolution awaiting passage of the federal budget. Both the Senate and House appropriation sub-committees have recommended significant increases for fiscal 2003 and suggested the possibility of doubling the NSF budget over the next five years. However, we may not know the final NSF 2003 budget for several months.

Elsewhere in this issue the new Chair of USSAC, Warren Prell, discusses the significant changes that will affect the U.S. scientific ocean drilling community's participation in planning and managing IODP. As we transition to a more ambitious, multi-platform drilling program, I agree with Warren that there will be many changes, new challenges, and greater opportunity for participation in IODP. It is also important to emphasize the need for greater involvement by an expanded scientific drilling community. There is a strong need to collaborate with major initiatives in the earth sciences such as MARGINS, ICDP, RIDGE, etc. Warren's article points out several ways to take advantage of these opportunities through the various planning activities, future workshops, and by serving on IODP advisory panels.

All of this planning is predicated on good science being proposed that advances the goals defined in the IODP Initial Science Plan *Earth Oceans, and Life*. In order to start a vigorous drilling program as the various drilling platforms come on line, IODP will need a suite of highly ranked, mature drilling proposals that are ready for drilling. Although 'riser' drilling may seem to be a long ways off, the increased planning and preparation needed for "riser" drilling requires that we start now.

NSF recognizes this and strongly encourages proposals towards that end. NSF provides funding for drilling-related research performed by U.S. scientists. Activities include investigations of potential drilling regions, especially by means of regional geophysical field studies; the feasibility and initial development of downhole instruments and techniques; and downhole geophysical and geochemical experiments. In addition, NSF will consider proposals for studies that lead to a long-range definition of future drilling objectives on all platforms to be supported by IODP. To be considered for support, proposed projects should be clearly relevant to the drilling plans of the international drilling community and focus on pre-drilling or drilling-concurrent activities. Post-cruise studies should generally be submitted through other appropriate NSF programs in the areas of ocean and earth sciences and polar programs.

The Grant Proposal Guide (GPG) provides guidance for the preparation and submission of proposals to NSF. The latest edition is available at www.nsf.gov/cgi-bin/getpub?gpg. Effective October 1, 2002, NSF will return without review, proposals that do not separately address both of the following merit review criteria within the Project Summary: "What is the intellectual merit of the proposed activity?" and "What are the broader impacts of the proposed activity?" It is believed that these changes to NSF's proposal preparation and processing guidelines, will more clearly articulate the importance of broader impacts to NSF-funded projects. Examples illustrating activities likely to demonstrate broader impacts are available electronically at www.nsf.gov/pubs/2002/nsf022/bicexamples.pdf

On a separate note, we welcome both Dr. Jamie Allan and Ms. Ann Noonan who have recently joined the ODP staff at NSF: Jamie as a new program director and Ann as a program assistant. Ann comes to the program with numerous years of service with the federal government and experience as a management specialist. Jamie, who comes to the program from Appalachian State University is not new to NSF or to ODP, having served at one time as an ODP staff scientist at Texas A&M University and also as an NSF rotator several years ago. The program is very fortunate to have people with the experience and background of these two individuals.

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JOI/USSAC NEWSLETTER

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The *JOI/USSAC Newsletter* is issued three times a year by Joint Oceanographic Institutions (JOI) and is available free of charge. JOI manages the international Ocean Drilling Program (ODP) and the U.S. Science Support Program (USSSP) which supports US participation in ODP. Funding for JOI/USSSP is provided through a cooperative agreement with the National Science Foundation (NSF).

JOI/USSAC
NEWSLETTER

Joint Oceanographic Institutions
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JOI's New Game: Fishing for Words

Instructions:

First, fill in the blanks in Section A. Then, read the story in Section B, replacing the numbered blanks with the corresponding words. Be creative.

Section A

1. Place _____
2. Mode of transportation _____
3. Past-tense verb _____
4. Geologic feature _____
5. Chemical element _____
6. Rock type _____
7. Number _____
8. Adjective _____
9. Adjective _____
10. Plural noun _____
11. Adverb _____
12. Adjective _____
13. Greeting _____
14. Famous person _____
15. Emotion _____
16. Adjective _____
17. Verb _____
18. Plural beverage _____
19. Place _____

We hope you enjoy this new word game. If you wish to contribute any future stories or ideas for other word games, please email them to:
Jennifer Anziano
janziano@joiscience.org

Section B

"A Trip to AGU"

At the ____(1)____ airport I was getting on the ____(2)____ when I almost ____(3)____ my luggage. I am heading to AGU in San Francisco, the city by the ____(4)____, to give a talk on ____(5)____ Concentrations within the Oligocene ____(6)____ from ODP Leg ____(7)____. Of course, my first stop is the ____(8)____ ODP booth. I want to get a hand on one of those ____(9)____ new JOI ____(10)____. I also want to ____(11)____ read the *JOI/USSAC Newsletter*, check out the ____(12)____ODP-related abstracts and say ____(13)____to the JOI employees, especially ____(14)____. I hope my talk goes well, since I feel ____(15)____ talking in front of large groups. My advisor says to picture them ____(16)____. After that I will ____(17)____ to the ODP Town Meeting to enjoy a few ____(18)____ before I walk back to ____(19)____.