JOI News
Summer 2006
from the Joint Oceanographic Institutions U.S. Science Support Program associated with the Integrated Ocean Drilling Program
Advancing global understanding of the Earth
IODP INTEGRATED OCEAN DRILLING PROGRAM

Thirty Years of JOI: Accomplishments and Challenges

Steve Bohlen, JOI

JOI turns 30! I have long since personally marked this rite of passage from youth to maturity. So it is with some experience that I reflect on what it means for Joint Oceanographic Institutions (JOI) to reach this milestone and what the future might bring.

JOI was founded in April 1976, the U.S. Bicentennial. World population was 4.1 billion. Steve Jobs founded Apple Computer. Viking 1 and 2 landed on Mars. The first Cray computer was installed at Los Alamos National Laboratory. Jimmy Carter was elected president. The active phase of the Ocean Drilling Program (ODP) was still almost a decade away, but its potential was evident as the Deep Sea Drilling Project (DSDP) broadened its horizons by welcoming international partners.

The common view is that JOI was designed to help the scientific community develop site surveys of future drill sites and to manage the international phase of DSDP. Its Certificate of Incorporation, however, states a much broader objective:

- To promote, encourage, develop, and support efforts to advance knowledge and learning in the science of oceanography;
- To formulate goals, policies, and objectives and to provide counsel, advice, and management direction for, and to conduct, scientific, educational and research programs in the field of oceanography, marine research, and other related sciences;
- To promote the exchange of information and knowledge and to create, foster and encourage cooperative efforts between the members of the Corporation and any other organizations, research workers, teachers, students, and other institutions involved in the area of oceanography.

In the context of this mandate, JOI's role is to facilitate discovery, not only through systems engineering and program management, but also through catalytic workshops and discussions, developing new avenues of research, educational programs and public communication.

In the late 1980s and 1990s, JOI held workshops where early visions for what is now the Ocean Observatories Initiative were crafted. JOI's work also encouraged integrated projects using satellite oceanography and ship-based research. These were important initiatives, but it is the leadership of ODP and its successor, the Integrated Ocean Drilling Program (IODP), that has defined JOI for much of the past 30 years.

Over 2,500 scientists representing more than 220 institutions sailed on ODP legs. These expeditions retrieved some 35,000 cores—230 km of sediment and ocean crust—leading to more than 22,000 publications in refereed scientific journals.

Scientific ocean drilling has made fundamental contributions to our understanding of the Earth. Over 2,500 scientists representing more than 220 institutions sailed on ODP legs. These expeditions retrieved some 35,000 cores—230 km of sediment and ocean crust—leading to more than 22,000 publications in refereed scientific journals. Paleoceanography, an entirely

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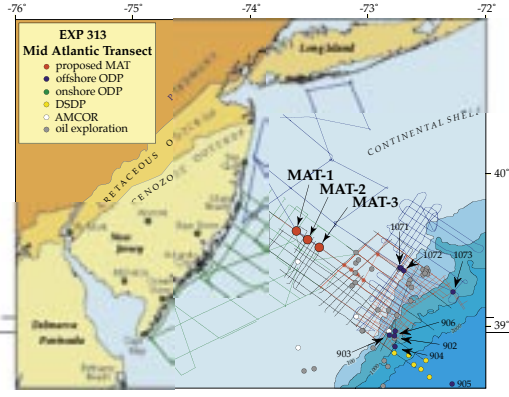

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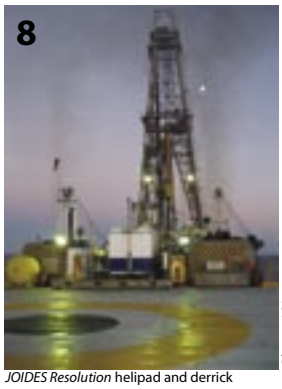

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JOI News

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JOI News, formerly named the *JOI/USSAC Newsletter*, is issued by Joint Oceanographic Institutions (JOI) and is available free of charge.

JOI is a consortium of 29 premier oceanographic research institutions that serves the U.S. scientific community through management of large-scale, global research programs in the fields of marine geology and geophysics and oceanography. Known for leadership of U.S. scientific ocean drilling initiatives and growing involvement in ocean observing, JOI has helped facilitate discovery and advance global understanding of the Earth and its oceans through excellence in program management.

JOI manages the U.S. Science Support Program (USSSP) associated with the Integrated Ocean Drilling Program (IODP). Funding for USSSP is provided through a cooperative agreement between JOI and the National Science Foundation (NSF). The U.S. Advisory Committee (USAC) for Scientific Ocean Drilling offers guidance to JOI regarding the needs of the U.S. scientific community.

Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of NSF or JOI.

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IODP
INTEGRATED OCEAN DRILLING PROGRAM

Drill Bits

IODP-MI Board Creates New Executive Committee

The IODP-MI Board of Governors (BoG) established the Science Advisory Structure Executive Committee (SASEC) in April 2006. With a revised role and purpose, this committee replaces the Science Policy and Planning Oversight Committee as the executive committee of IODP's Science Advisory Structure. SASEC members, designated by the IODP-MI BoG, began their terms with a July 11-12 meeting in Washington, DC.

SASEC is chaired by Susan Humphris, Woods Hole Oceanographic Institution. Other U.S. members are John Hayes, Woods Hole Oceanographic Institution; Ken Miller, Rutgers, The State University of New Jersey; and Eli Silver, University of California, Santa Cruz. Keir Becker, University of Miami and SAS Science Planning Committee Chair, is a non-voting member.

Frank Rack: Out of the Water and onto the Ice

Frank Rack, Director of Ocean Drilling Programs at JOI, departed JOI in August to become the Executive Director of the ANDRILL Science Management Office at the University of Nebraska, Lincoln. ANDRILL (ANtarctic DRILLing, www.andrill.org) is a multinational scientific drilling program that recovers stratigraphic records to investigate Antarctica's role in global environmental change over the past 65 million years. Managing ANDRILL will be another phase in Frank's long association with scientific drilling. Frank came to JOI in 1998 and previously served as the Assistant Director of both the Ocean Drilling Programs and the U.S. Science Support Program. He also managed agreements with the U.S. Department of Energy and ChevronTexaco for initiatives related to gas hydrates. Frank is a veteran of eight Ocean Drilling Program expeditions—three as the staff scientist.

David Divins Takes the Helm

David Divins has become the Director of Ocean Drilling Programs at JOI, replacing Frank Rack. David has been the Associate Director of Ocean Drilling Programs at JOI since January 2006. Before coming to JOI, he was a senior scientist in the Marine Geology and Geophysics Division of the NOAA National Geophysical Data Center, and before that he was a research scientist at the University of Colorado's Cooperative Institute for Research in the Environmental Sciences (CIRES).

South Korea Joins IODP

IODP has expanded its base of international support by welcoming the Republic of Korea as its newest member. An Interim Asian Consortium was created with South Korea's Korean Institute of Geoscience and Mineral Resources (KIGAM) as its first affiliated institution. By fiscal year 2008, the Interim Asian Consortium will contribute $1 million in funding to IODP. The consortium will provide a scientist to IODP expeditions and will send an observer to the SAS Executive Committee.

Summer 2007 Graduate Student Opportunity in Japan

JOI is soliciting pre-proposal letters of interest from U.S. graduate students pursuing IODP-related research who wish to visit Japan in summer 2007 as part of NSF's East Asia and Pacific Summer Institutes for U.S. Graduate Students (EAPSI) program. JOI will work with the most promising candidates to finalize a full EAPSI program proposal by December 12, 2006. The pre-proposal process through JOI is not an EAPSI program requirement and will have no impact on NSF's EAPSI review process. Rather, it is intended to help connect interested U.S. students to Japanese mentors and coordinate logistics for potential projects. Please send your pre-proposal to Holly Given, JOI (hgiven@joiscience.org), by September 15, 2006. The full JOI program announcement is at: www.joiscience.org/japan_07.html.

Fond Farewells

Robert Burger, the Associate Director for the U.S. Science Support Program, departed JOI at the end of August to become the Assistant Provost for Science and Technology at Yale University. Bob joined JOI in 2002 as USSSP's Assistant Director. Matt Niemitz, a Program Associate for the *JOI Learning* program, also left JOI at the end of August to pursue a Masters degree in Education Technology at Harvard University.

The Oceanography Society Magazine Features Ocean Drilling

In December 2006 a special issue of *Oceanography*, the official magazine of The Oceanography Society (TOS), will focus on the scientific impact of the Ocean Drilling Program. Robert Burger, Yale University, and Kantaro Fujioka, JAMSTEC, are the guest editors. Visit www.tos.org for information about TOS.

JOI Employment Opportunities

Interested in science program management? To learn about current employment opportunities at Joint Oceanographic Institutions in Washington, DC, visit: www.joiscience.org/About/Employment/.

Workshop Support Available

Funding from JOI's U.S. Science Support Program is available for workshops to generate ideas for advancing the study of earth processes and history through scientific ocean drilling. Conveners receiving awards must produce a report summarizing the goals and results of the workshop.

USSSP encourages

- broad community involvement
- multidisciplinary approaches
- relevance to IODP's *Initial Science Plan*
- graduate student participation

To discuss ideas, contact

Holly Given
USSSP Director
hgiven@joiscience.org
(202) 232-3900 x1611

For information:
www.usssp-iodp.org/workshops

Proposal Deadlines: October 1 and April 1

Thirty Years of JOI

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new field of research, was born. Last, but not least, the scientific communities of over 22 international partners were drawn together in productive collaborations, many of which continue to this day. ODP ranks as one of the most significant international scientific endeavors ever (see table, page 5), rivaling the international collaborations among physicists in the early 20th century. Through it all, JOI and our JOI Alliance partners, Lamont-Doherty Earth Observatory of Columbia University and Texas A&M University, have provided systems integration, engineering, and science support and facilitation to the community in keeping with JOI's 1976 charter and mission.

Next year, IODP will usher in a new era when the program gains the full benefit of its enhanced drilling assets. Even though IODP officially launched in October 2003 and several expeditions using specialized platforms and the ODP workhorse *JOIDES Resolution* have yielded first-order discoveries, the true scientific potential of IODP still lies ahead. The *JOIDES Resolution* will be rebuilt to become the new U.S. Scientific Ocean Drilling Vessel (SODV), and the sea trials of the Japanese drilling ship *Chikyu* will be complete. With mission-specific platforms and these two state-of-the-art drilling vessels at their disposal, researchers will be able to reach new frontiers, far beyond the science of ODP.

The Hubble Challenge

In March of this year, I spoke to members of IODP Management International's Board of Governors and other leaders of IODP about the future of the program. I proposed that it is time to create a bold new science vision for IODP. With ODP's impressive record, a respectable vision would be to build upon those accomplishments by further improving resolution and process understanding, and following discoveries where they may lead. But is that a sufficiently exciting vision for a program funded at the level of other global-scale science programs? The committee that developed IODP's *Initial Science Plan*, published over five years ago, considered this same question.

The Hubble Space Telescope Program's funding is similar to that of IODP, so I encouraged the IODP Board to accept the "Hubble Challenge." That is, attempt to reach for science outcomes far beyond incremental improvements in our understanding of Earth processes developed from ODP discoveries. Hubble changed the way we think about and explore the universe. Using the Hubble Telescope's capabilities, scientists discovered the accelerating universe and dark energy, extra-solar planets, explained gamma ray bursts, and refined the distance scale and age of the universe.

IODP must also aim to make discoveries that expand and revolutionize our understanding of the Earth. To encourage a bold science vision, JOI must help engage the community in extensive dialogue to:

- Define objectives and address first-order science problems of global significance;
- Marshall resources and reach out to other programs and communities to address these first-order problems;
- Strategically define roles of program management and the science advisory structure in achieving first-order outcomes;
- Identify cutting-edge technologies to advance the science; and
- Define our outreach objectives (scientific and communications) clearly and fund them appropriately.

JOI is striving to bring these issues to the science community's attention. For example, working with the U.S. Advisory Committee for Scientific Ocean Drilling (USAC), JOI has created thematic working groups to explore new scientific directions by involving other communities.

As a start, a working group of prominent microbiology and drilling leaders has developed a white paper, "Scientific Opportunities in the Deep Sub-Seafloor Biosphere" (www.usssp-iodp.org/Publications). This summer, JOI is sponsoring a session to present IODP and the opportunities to explore sub-seafloor microbial ecology at the International Symposium on Microbial Ecology. This fall, JOI and IODP Management International will host a community workshop on the deep biosphere. Beyond these efforts, JOI program directors are developing relationships with other programs working on microbial ecology and DNA sequencing of microbes. A primary purpose is to explore the potential for collaboration and joint funding of specific projects—similar to JOI's collaboration with the Department of Energy's Methane Hydrate Program, which significantly contributed to ocean drilling expeditions focusing on gas hydrates.

In another direction, USAC members Christina Ravelo and Peter Molnar are exploring and expanding interactions among the drilling community, climate modelers, physical oceanographers and paleoceanographers. Climate dynamicists with training in oceanography and atmospheric sciences are turning to paleoceanography for data to address basic questions regarding climate. Promoting and increasing this interaction should accelerate our understanding of climate and climate change, and input from climate dynamicists may make future ocean drilling more effective.

Other initiatives designed to meet the Hubble Challenge are also underway in education and outreach, technology (connections with industry on technology for the converted U.S. drilling vessel), and new visualization tools such as the CoreWall Suite (a real-time stratigraphic correlation, core description and data visualization system; see www.evl.uic.edu/cavern/corewall).

Ocean Observatories and the Future of Oceanography

Congress willing, funds will flow this fall or early next year to the National Science Foundation's Ocean Observatories Initiative (OOI) (www.nsf.gov/funding/pgm_summ.jsp?pims_id=6197&org=OCE). The challenges of designing and implementing this new facility, and the stresses this ambitious undertaking will place on community resources, will be great. Some scientists have expressed concern about the balance of funds between facilities and research during a period of restrained funding.

Even though the President's Competitiveness Initiative gives hope for above average growth in NSF's budget, the pressing need for facilities—new ships, autonomous vehicles, submersibles, next-generation sensors—will impact what can be developed

while maintaining robust basic-research initiatives. Undoubtedly, the creativity of the community will generate ideas and hypotheses that exceed the funds available to investigate them. On the other hand, the opportunities are breathtaking. OOI affords a long-term, global presence, permitting the study of ocean systems on a variety of scales. Integrating its observatories with borehole observatories will allow exploration of the interactions between the oceans and their basins, enhancing quantitative description of the entire earth system.

As the lead for the Ocean Research Interactive Observatories Networks (ORION) office, the Ocean Observatories Initiative, U.S. activities in IODP (as part of the JOI Alliance) and the SODV conversion, JOI brings new technology together with cutting-edge research—uniting oceans research, from beneath the seafloor to the ocean-atmosphere interface. JOI is well tuned to help the community surmount the challenges ahead, while leveraging improved technology and catalyzing new scientific research endeavors. JOI staff eagerly face the future and look forward to continuing our role in advancing global understanding of the Earth.

The Author

Steve Bohlen has been the president of JOI since November 2000.

Scientific Ocean Drilling: Thirty Years of Discovery

Scientific ocean drilling has:

Confirmed the basic tenets of plate tectonics and continental drift, by:
- Confirming that the age of ocean crust becomes progressively older away from spreading ridges.
- Matching magnetic reversal stratigraphy with age of ocean sediments and crust away from spreading ridges.
- Elucidating various plate motions and evolution of continental drift over the past 120 million years.
- Demonstrating that hot spots—once thought to be stationary—can slowly migrate.
- Confirming that the oldest ocean crust is younger than Jurassic in age.
- Quantifying the amount of ocean sediment recycled into the Earth's mantle at subduction zones.

Established and quantified global environmental changes over the past 100 million years, by:
- Documenting and quantifying global climatic change over the past 120 million years.
- Discovering rapid (decadal) climate change as a global phenomenon.
- Documenting and quantifying climate extremes (including Ocean-wide Anoxic Events) over the last 120 million years.
- Confirming details of the "hothouse" world 55 million years ago when tropical climates prevailed at the polar regions.
- Proposing the hypothesis that rapid (decadal) climate change was initiated by global decomposition of methane hydrates in ocean sediments.
- Confirming the timing of the gateway opening between Australia and Antarctica, leading to the establishment of the Antarctic Circumpolar Current, which ended the "hothouse" era and began a 40-million-year cooling of the Earth.
- Establishing the hypothesis that uplift of the Himalaya enhanced global cooling.
- Confirming the closing of the seaway between Central and South America circa 5 million years ago and linking this change with the onset of the Pleistocene.
- Determining the history of sea-level rise and fall over the past 60 million years.
- Discovering the global environmental impacts caused by the extrusion of large volumes of igneous rocks (known as "large igneous provinces").
- Demonstrating that the Mediterranean Sea evaporated at least once leaving a nearly empty ocean basin.
- Discovering global anoxic events in the oceans.
- Documenting extreme drought in Central East Africa, thought to have been the impetus for human migration from Africa 1 to 2 million years ago.
- Providing key samples that allow sea surface temperatures of ancient oceans to be determined from the chemistry of the shells of organisms once living within surface waters but deposited in ocean sediments.

Revolutionized understanding of the formation of mineral resources of copper and zinc, by:
- Discovering massive Cu and Zn deposits at spreading ridges, leading international resource companies to revise their exploration strategies (annual impact of roughly $0.5 B).

Changed understanding of the nature and genesis of geologic hazards, by:
- Evaluating fluid flow in the accretionary sediments in subduction zones and elucidating the role of water in subduction zone earthquakes.
- Determining the significance of mud volcanoes in subduction zone dehydration and the connection of dehydration to earthquakes and explosive volcanoes.
- Discovering existence and cause of major undersea landslides of sufficient size to generate large tsunamis.

Discovered methane hydrates in ocean sediments and confirmed their existence worldwide, by:
- Determining the nature of chemosynthetic communities associated with methane hydrates in ocean sediments.
- Documenting the vertical and horizontal distribution of methane hydrates in ocean sediments.
- Providing information necessary to quantify the volume of gas (and carbon) in the global methane hydrate reservoir in ocean sediments.

Confirmed the catastrophic impact of a meteorite with Earth 65 million years ago.

Discovered evidence of a vast, active deep biosphere in the ocean's sediments and crust.

Established ocean-floor observatories to monitor earthquakes, tsunamis, and fluid flow in ocean sediments and crust.

NanTroSEIZE Stage 1: Call for Participants

Application Deadline for Interested Scientists is October 15!

The Japanese *drillship* Chikyu *will begin IODP operations in support of NanTroSEIZE. (Photo: IODP)*

JOI's U.S. Science Support Program seeks participants for a series of expeditions conducted by the Integrated Ocean Drilling Program in Stage 1 of its first Complex Drilling Project, the Nankai Trough Seismogenic Zone Experiment, known as NanTroSEIZE. Applications for U.S. scientists are at: www.usssp-iodp.org/Science_Support/Sailing_Information/NanTroSEIZE_S1.html. The application deadline is October 15, 2006. Stage 1 consists of five riserless drilling expeditions; two operated by the U.S. Implementing Organization (USIO) aboard a newly refurbished U.S. Scientific Ocean Drilling Vessel (SODV) and three operated by Japan's Center for Deep Earth Exploration (CDEX) aboard the *Chikyu*. A prospectus describing the NanTroSEIZE program and specific Stage 1 science objectives and implementation strategies is available at www.iodp.org/NanTroSEIZE.

Applications for U.S. Scientists: www.usssp-iodp.org/Science_Support/Sailing_Information/NanTroSEIZE_S1.html

The two USIO expeditions are tentatively scheduled for January to February 2008 and March to April 2008. The first will consist of riserless drilling at reference sites NT01-01 and NT01-07. Operations for the second will consist of drilling a riserless pilot hole and a subsequent CORK installation at the proposed riser site NT03-01. The schedule and operational sequence depend on when the rebuilt SODV is completed.

The three CDEX operations are currently planned to begin September 2007 with a Logging While Drilling (LWD) expedition of all NanTroSEIZE Stage 1 sites. The second expedition will drill a 1000-meter-deep riserless hole in preparation for the proposed riser hole NT2-03 into the splay fault. The third expedition will focus on riserless drilling of sites through the seaward part of the splay fault (NT02-01) and through the frontal thrust at the prism toe (NT01-03).

Prospective science party members should identify specific expeditions in their applications as their first-, second-, and third-priority options for participating on NanTroSEIZE Stage 1 expeditions. Every effort will be made to comply with successful applicants' highest priority options; however, achieving disciplinary and member country or consortia staffing balances may require assignments to second- or third-priority choices. The currently planned operational dates are tentative and likely to change; thus, selected participants must remain flexible as the science parties are being formed and the expeditions' operational schedules develop .

Distinguished Lecturer Series: Giving and Receiving

The JOI/USSSP Distinguished Lecturer Series (DLS) brings discoveries made possible by scientific ocean drilling to students, researchers, and educators. Since the program began in 1991, it has expanded to reach wider and more diverse audiences. JOI is currently exploring how to incorporate the ocean-drilling focused program into a larger-scale lecture series that reflects the corporation's scientific breadth. For example, speakers could present topics such as ocean observatories and ocean engineering.

Host a Lecture

Each spring JOI seeks host institutions for the following academic year, and April 13, 2007 is the application deadline for the 2007-08 lecture season. Lecturers agree to give at least six talks throughout the U.S. Many lecturers generously agree to visit additional institutions and speak to more than one audience. JOI covers the lecturer's air-travel expenses with local travel and accommodation provided by the host institution. Once applications are received, JOI selects the venue institutions, giving preference to applicants that have not hosted a DLS speaker previously or to those that serve minorities or underrepresented groups. This year, nine institutions are first-time awardees and one is a minority-serving school. The DLS also tries to reach small institutions with less active research programs, two-year colleges, professional organizations, and other public forums. That said, JOI also awards lectures to departments that are active in IODP; in the 2005-06 series, speakers visited JOI member institutions Stanford University, Rutgers University, and the University of South Florida. As ambassadors of IODP, the lecturers are encouraged to schedule informal gatherings with students and to provide information on opportunities associated with scientific ocean drilling.

"I have just finished the last of my DSL talks, and would like to thank you for the opportunity to travel around making friends, talking to students and learning from faculty. It was a wonderful experience."

–Ted Moore, Univ. of Michigan

2005-06 DLS Speaker

Give a Lecture

DLS speakers are talented and special individuals who have been involved with scientific ocean drilling; JOI and USAC are truly grateful for their generosity and dedication. Jerry McManus, Woods Hole Oceanographic Institution, was a speaker in the 2004-05 DLS series because he wanted to give something back to the program, which had given him many research opportunities. With great enthusiasm, he now recalls how

Lecture Series
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he went to each of his lecture assignments expecting to give of himself, but found himself constantly receiving as well. Harold Tobin, now at the University of Wisconsin, Madison, was a speaker in the 2005-06 series and found that visiting institutions he never would have seen otherwise was an interesting and refreshing experience. He says, "I was impressed to learn about the range and quality of research being conducted at some relatively small schools." Harold and a number of other past DLS speakers also found it a fascinating opportunity to compare both departments and institutions.

Julie Morris, NSF's new OCE Division Director (see article on page 12), is another past DLS speaker (1998-99) who remembers her DLS tour as being intense, hectic, and exciting. In addition to almost missing a lecture by getting stuck in the desert during a field trip with the host institution, she recalls meeting many faculty members at small schools who were conducting excellent research with minimal funds. She came away from the experience impressed with the vitality of the geosciences across the U.S. Al Hine of University of South Florida shared this view. After finishing a marathon of 13 lectures at nine schools in 2005-06, he wrote "There is a lot of interest out there and all programs expressed great gratitude for having someone come talk to them. It was a terrific experience for me as well. I highly recommend it to good speakers who can promote scientific ocean drilling but who might be fence-sitters and might not want to do this. For sure, it was a lot of work and time away—but well worth it." USAC chooses Distinguished Lecturers at its summer meeting, so selected individuals have about 14 months advance notice. To nominate a future speaker, please contact dls_coordinator@joiscience.org.

Lectures Online

As a test project to increase the reach of the lecture series, JOI began recording lecturer presentations during the 2004-05 series. These are archived as online web-casts at www.usssp-iodp.org/Education/DLS/webcasts.html. The community should consider these as resources for upper-level undergraduate and graduate courses in oceanography and marine geology and geophysics.

2006-2007 JOI/USSSP Distinguished Lecturer Series

For lecture abstracts and more information, visit www.usssp-iodp.org/dls

Katharina Billups
University of Delaware

Exploring the Application of Foraminiferal Mg/Ca Ratios to Questions of Early Cenozoic Climate Change

Colorado College
Florida International University
Indiana State University
Syracuse University
University of Miami, RSMAS
University of Wisconsin, Madison

Donna Blackman
Scripps Institution of Oceanography

Discoveries, Hypotheses, and Drilling Surprises: Adventures in Studying the Formation and Evolution of Oceanic Lithosphere

Brigham Young University
Colorado State University
James Madison University
The Pennsylvania State University
Southwestern Oregon Community College
University of Missouri, Columbia

Larry Krissek
Ohio State University

Iceberg-Rafted Sediment in the Deep Ocean—An Ice Volume Story or Not?

Geological Society of New Hampshire
Iowa State University
Southern Illinois University
University of Akron
University of Nebraska, Lincoln
Woods Hole Oceanographic Institution

Terrence Quinn
The University of Texas at Austin

Estimating the Level and Taking the Temperature of the Tropical Seas over the Past 25,000 Years

Bowling Green State University
Hardin-Simmons University
Jacksonville University
Purdue University
University of Minnesota, Duluth
University of Missouri, Kansas City
University of Rhode Island
University of Wyoming

Christopher House
The Pennsylvania State University

Probing the Microbiology of Deeply Buried Marine Sediments

Central State University
Eastern Kentucky University
La Salle University
University of California, Riverside
University of Arkansas
University of Idaho
University of Texas, Arlington

Ken Miller
Rutgers, The State University of New Jersey

The Phanerozoic Record of Global Sea-Level Change: ODP Constrains the Last 100 Million Years

Appalachian State University
Colby College
Lawrence University
Savannah State University
University of Connecticut
University of North Carolina, Wilmington
Western Michigan University

James Zachos
University of California, Santa Cruz

A Rapid Rise in Greenhouse Gas Concentrations 55 Million Years Ago: A Deep-Sea Perspective on the Causes and Consequences

Denver Museum of Nature and Science
Duke University
Florida A&M University
St. Cloud State University
University of Colorado
University of Minnesota, Minneapolis
University of South Florida, St. Petersburg

IODP Expedition News

IODP Plans for New Jersey Shallow Shelf Expedition to Sail in 2007

An IODP expedition to investigate sea-level change on the continental margin off New Jersey is planned for up to three months during the summer or fall of 2007. The European Consortium for Ocean Drilling Research (ECORD) Science Operator (ESO) initially planned to launch this mission-specific platform expedition in 2006, but additional time was necessary to resolve contractual, technical, financial and permitting issues. The contracting process for a drilling platform is currently underway and further information will be available from ECORD when a contract is finalized (www.ecord.org/exp/new-jersey/313.html).

The co-chief scientists for the expedition are Stephen Hesselbo, University of Oxford, and Gregory Mountain, Rutgers, The State University of New Jersey. The staff scientist will be Christian Wilson of the British Geological Survey. After considering applications, ESO has issued invitations for the scientific party and hopes to post the list of expedition participants soon.

The primary objective of the New Jersey Shallow Shelf Expedition (Expedition 313) is to obtain continuous cores and downhole logging measurements of siliciclastic sequences on a modern continental margin. Important paleo-inner-shelf facies at three sites (MAT-1, MAT-2 and MAT-3) represent the most sensitive and accessible locations for deciphering the amplitude of sea-level changes and for testing facies models. The coring goals are to:

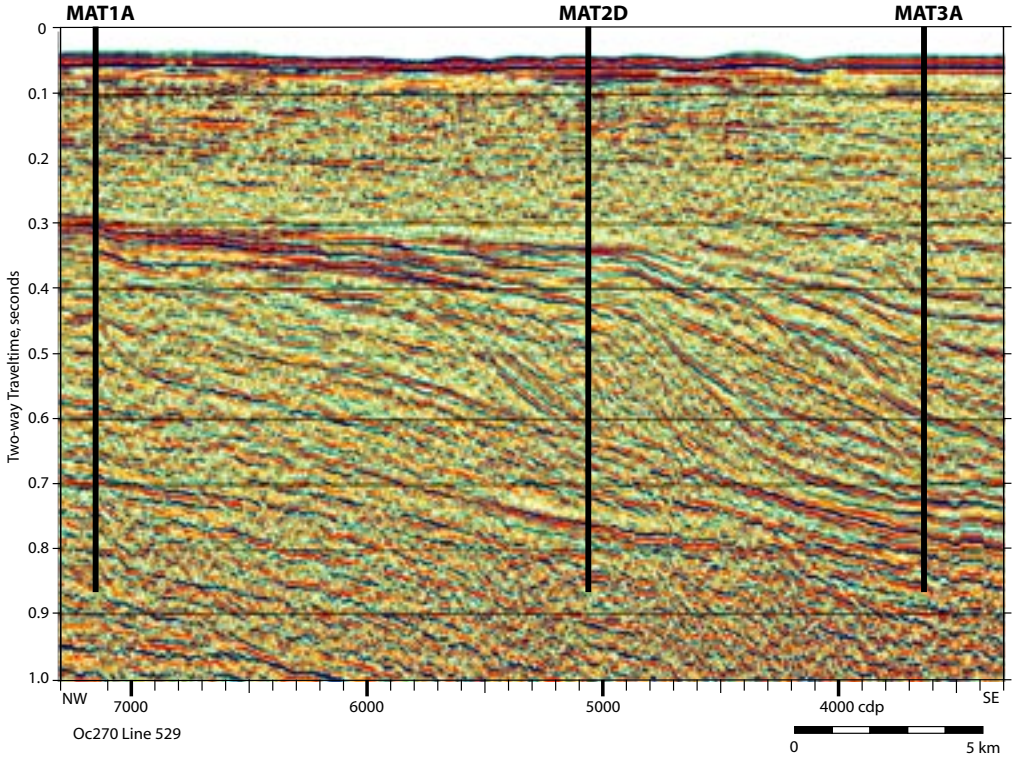
- Date major "Icehouse" (Oligocene to Recent) sequences, a period of known glacioeustatic change, and compare ages of the unconformable surfaces bracketing these sequences with ages of sea-level lowstands predicted from the $\delta^{18}O$ glacioeustatic proxy;
- Estimate the amplitudes, rates, and mechanisms of sea-level change;
- Evaluate sequence stratigraphic facies models (e.g., systems tracts) that predict depositional environments, sediment compositions, and stratal geometries in response to sea-level changes; and
- Provide a baseline for IODP drilling that addresses the effects and timing of sea-level changes on other passive margins.

The New Jersey continental margin is ideal for studying the history of sea-level change from the Oligocene to the Recent, as well as its relationship to sequence stratigraphy. The region is characterized by:

- Rapid depositional rates;
- Tectonic stability;
- Well-preserved, cosmopolitan fossils suitable for age control that characterize the sediments of this margin throughout the interval of interest; and
- A large set of seismic, well-log, and borehole data with which to frame the objectives and choose appropriate drill sites.

The existing data include 11 onshore coreholes sampled and logged cooperatively by the Ocean Drilling Program (ODP), NSF's Division of Earth Sciences, and both the U.S. Geological Survey and the New Jersey Geological Survey. Recognizing the benefit of drilling regardless of the location of the present shoreline, the International Continental Drilling Program is contributing funds and resources to Expedition 313. Combined with results from Deep Sea Drilling Project and ODP holes drilled on the adjacent outer continental shelf, slope and rise, the expedition will complete a long-awaited margin-wide transect. Its findings will also guide the scientific and logistical planning already begun for mission-specific drilling on other passive margins.

—Gregory Mountain, Rutgers University, IODP Expedition 313 Co-Chief Scientist



This site survey profile (Oc270 Line 529) runs through proposed sites (MAT1A, 2D and 3A) for IODP Expedition 313 from 45 to 65 km offshore New Jersey at a water depth of 30 to 34 meters. Each site will be sampled and logged to 800 meters below seafloor to determine the age and depositional environment of these post-Eocene sediments. The expedition's goal is to evaluate models that predict the composition, depositional environment, and stratal geometry of sediments that accumulate along a continental margin during global changes in sea level. (Figure provided by Greg Mountain, Rutgers University)

IODP Expeditions on the Horizon

In 2007, IODP plans to visit the New Jersey continental margin with a mission-specific platform (see page 8) as well as to initiate riserless drilling in support of the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE). Stage 1 of NanTroSEIZE includes three expeditions using the *Chikyu*, beginning in the fall of 2007, and two using the U.S. Scientific Ocean Drilling Vessel (SODV) in early 2008. A call for NanTroSEIZE scientific staff is on page 6.

What other IODP expeditions are on deck for 2008? The current working model—to be approved by IODP's Science Planning Committee (SPC) at its August 2006 meeting—includes six expeditions, in addition to the NanTroSEIZE expeditions, which would begin late in 2007 and run through 2009. These expeditions in their recommended sequence (proposal numbers in parentheses) follow:

- Equatorial Pacific Paleogene Transect (626-Full2)
- NanTroSEIZE Stage I (603A, B, C)
- NanTroSEIZE Stage I (continued)
- Bering Sea Plio/Pleistocene (477-Full5)
- Juan de Fuca Flank Hydrogeology III (545-Full3)
- Equatorial Pacific Paleogene Transect II (626-Full2)
- Canterbury Basin Sea Level (600-Full)
- Wilkes Land Margin (482-Full3, 638-APL2)

This model reflects the most recent recommendations of IODP-MI's Operations Task Force (OTF). The OTF formulates the most logistically and fiscally effective operational plans possible using a matrix combining the SPC science plan with operational and environmental constraints as well as risk, operational days at sea, and transits. However, the schedule and operational sequence are subject to significant change depending on the SODV's drydock location and starting date for IODP operations.

What potential expeditions are on the horizon beyond 2008? The SPC considered 20 existing proposals and reviews from the Science Steering and Evaluation Panel (SSEP) in March 2006. SPC assigned the proposals to groups based on priority, as summarized in SPC Motion 0603-21 (see meeting minutes at www.iodp.org/spc/). The top six proposals were assigned to Group 1 and sent to the OTF, where they will remain until scheduled. These proposals are:

- 677-Full Mid-Atlantic Ridge Microbiology
- 603D-Full2 Nankai Trough Seismogenic Zone Observatories
- 637-Full2 New England Shelf Hydrogeol.
- 605-Full2 Asian Monsoon
- 549-Full6 Northern Arabian Sea Monsoon
- 537A-Full5 Costa Rica Seismogenesis Project Phase A

The sun sets on the Pacific Ocean horizon during the Expedition 301 transit. (Photo: Bob Burger, JOI)

Currently, there are 126 active proposals in the IODP Science Advisory Structure system at different stages of review and maturity. Of the active proposals, 40 are related to the solid earth, 29 are related to the deep biosphere and sub-seafloor, and 57 are related to the environment. By nationality of the lead proponents, 59 proposals are from the U.S., 44 are from ECORD, 17 are from Japan, one is from China, and five fall in the "other" category. By platform, 91 of the proposals require a riserless drillship, six require a riser vessel, 13 require a mission-specific platform, and the remainder require a combination of platforms. The active proposals include a record 19 new drilling proposals submitted to IODP-MI for the April 1, 2006 deadline. To learn more about submitting a drilling proposal to IODP, or to view the active proposals, visit www.iodp.org/drilling-proposals.

Chikyu's Riser Drill System Tested

As *JOI News* goes to press, the Japanese research vessel *Chikyu* is beginning another phase of its "shakedown" operations procedure. This time, the focus is on its riser drilling capabilities. During a three-month operation which began in early August, the ship operator, Japan Agency for Marine-Earth Science and Technology's Center for Deep Earth Exploration (JAMSTEC/CDEX), will continue to test the vessel's riser handling, Blow Out Preventer (BOP) landing, mud circulation, emergency disconnection, and coring operation. The test drilling target is located more than 2,000 meters below the seafloor.

The readiness of *Chikyu's* laboratory facilities, including laboratory set-up, manuals and "cookbooks," core processing procedure, and Information Technology environment will also be reviewed in real time with IODP scientific and engineering representatives on board. Among them will be researchers from the U.S. science community who were invited to participate by CDEX due to their anticipated roles as co-chief scientists of the NanTroSEIZE Stage 1 expeditions or their specific domain expertise in expedition science procedures. JOI is sponsoring six of these *Chikyu* pioneers: Liz Screaton of the University of Florida; Harold Tobin of the University of Wisconsin, Madison; Demian Saffer of Pennsylvania State University; Mike Underwood of the University of Missouri; Geoff Wheat of the University of Alaska, Fairbanks; and Gary Acton of the University of California, Davis. Follow the shakedown online by visiting the following link: www.jamstec.go.jp/chikyu/eng/.

U.S. Scientists Involved in IODP Expeditions Add Up

Since the Integrated Ocean Drilling Program (IODP) was launched in October 2003, a total of 96 U.S. scientists have participated on its 12 expeditions. These scientists represent 46 different academic institutions and four other affiliations. Of the participants, 24 (25%) have been graduate students and 29 (30%) have been female. The U.S. Science Support Program at JOI has issued a total of $2,598,830 in salary awards and $2,367,367 in post-expedition activity awards to support the participation of these scientists in IODP.

Education Opportunities and Resources

Education Activity at GSA

A short course for scientists and educators "Using Authentic Scientific Ocean Drilling Data for Earth Systems Science Inquiry" will be held Sunday, October 22, during the annual meeting of the Geological Society of America (GSA) in Philadelphia. The course will demonstrate the accessibility and applicability of scientific ocean drilling results to undergraduate and secondary earth systems science curricula. Published data from 40 years of scientific ocean drilling expeditions support teaching plate tectonics, deep time and age determination, and the history of global climate change. The course is an onshore extension of the School of Rock Expedition (www.joilearning.org/school- of rock). Kristen St. John, James Madison University; Mark Leckie, University of Massachusetts, Amherst; and Leslie Peart, JOI, are the instructors. For more information, visit www.geosociety.org/meetings/2006/cw_GSA.htm.

Also at the annual GSA meeting, EarthScope and JOI will convene a topical oral session titled "Using Large Experiments and Programs for Education and Outreach: Examples From EarthScope, the Joint Oceanographic Institutions, and Others" (Session number T41). Sponsored by the GSA Geoscience Education Division and the National Association of Geoscience Teachers, this session will focus on special issues inherent to education and outreach in large experiments and programs with particular emphasis on developing and maintaining a high level of public interest and interaction. Large-scale experiments may act as a catalyst to increase public interest in and knowledge of geoscience. The excitement of being on the cutting edge of science can be coupled very effectively with pedagogical needs and may include "teachable moments" from events such as earthquakes, volcanic eruptions, and El Niño activity.

JOI Learning Website Launched

JOI Learning's new website, www.joilearning.org, is an online destination for educators devoted to teaching about the Earth. Resources available at the site teach lifelong skills to students of all ages. The site includes curriculum activities based on scientific research expeditions that will strengthen students' math, science, and analytical skills; posters; career profiles; and multimedia resources including videos, interactive activities, and online lectures.

Reaching out to Educators

The *JOI Learning* Program has become a familiar presence at the annual education conferences of the National Science Teachers Association (NSTA) and the National Marine Educators Association. The *JOI Learning* presence at NSTA in 2006 featured an all-new exhibit and a teacher workshop conducted in partnership with textbook publisher Macmillan-McGraw Hill. In addition, Kristen St. John, James Madison University, gave a talk at the National Earth Science Teachers Association (NESTA) Earth and Space Science Resource Day about bringing the science of ocean drilling into the classroom using *School of Rock* expedition activities as a model. Another recent *JOI Learning* initiative includes providing an activity on the topic of "Citizen Science" for the American Geological Institute's Earth Science Week calendar.

JOI Undergraduate Research Awards

Student	Institution	Expedition/Parent Award	Faculty Sponsor
Dan Preston	Oregon State University	Expedition 304/305. Diversity of endolithic microorganisms 400-1400 mbs	Martin Fisk
Jennifer Cheng	University of California, Santa Cruz	Expedition 304/305. Rock magnetic evaluation of lower crustal gabbros from Site U1309, Atlantis Massif	XiXi Zhao
Teh Soo-Huey	University of Hawaii	Expedition 304/305. Atlantis Massif oceanic core complex geochemical source characteristics and lower crustal intrusive processes from olivine gabbros and melt inclusions	Kevin Johnson
Jason Esselburn Jennifer Sorrell	Muskingum College	Expedition 306. Analysis of ice-rafting debris from the central North Atlantic (IODP Sites U1313 and U1314)	Shelley Judge
Matt O'Connell	University of Virginia	Expedition 308. Geochemical characterization of fluid flow in overpressure systems	William Gilhooly and Stephen Macko
Nicole Evans	Florida State University	Expedition 308. Calcareous nannofossils from the Gulf of Mexico (Brazos-Trinity and Ursa minibasins) during the latest Quaternary	Anatoliy Shumnyk
TBD	Texas A&M University	Expedition 309. Geochemical and biogeochemical study of oceanic crust formed at a superfast spreading rate	Neil Banerjee
Andrea Burke	Williams College–Mystic Seaport	Expedition 309. Physical properties of the ocean crust at Hole 1256D	Lisa Gilbert
Richard Berg	Scripps Institution of Oceanography	Expedition 311. Fluid sources, transport processes, and relations to mode of occurrence of gas hydrates at the northern Cascadia Margin	Miriam Kastner
Nichole Cespedes	Oregon State University	Expedition 311. Subsurface temperature and physical properties of the Cascadia accretionary complex	Anne Trehu

JOI Undergraduate Research Awards are supplements to USSSP sub-awards. They are made when Principal Investigators show that an undergraduate student can participate in their project in a meaningful way. One of JOI's goals is to expose undergraduates to scientific ocean drilling techniques and expedition-specific goals.

Microbial Populations at Deeply Buried Methane/Sulfate Transition Zones

Jennifer Biddle*
Penn State University
PhD Advisors:
Jean Brenchley
Christopher House

*Now a post doc at Penn State

The deep subsurface biosphere may comprise 10 to 33% of the Earth's biomass. Evidence from cell counts, geochemical profiles and isotopic measurements indicates that subsurface microbial communities contribute significantly to nutrient cycling through the environment. Otherwise, we know little about the diversity and function of this important community. Early studies of deep-sea sediment, focusing on molecular characterization of the microbial community and using DNA sequence analysis or lipid biomarkers, demonstrated that active microbial life exists from the seafloor to at least 800 meters below seafloor (mbsf). Despite this initial research, we still seek answers to integral questions such as: which microbes are present and responsible for the major geochemical changes in this environment and how active are the different cells that exist within the sediment column?

Addressing such questions was the goal of Ocean Drilling Program (ODP) Leg 201, which probed the deeply-buried microbial communities of the Peru Margin. ODP-Leg 201 was one of the first expeditions to dedicate its mission to exploring the microbial life of deep-sea sediment, and it retrieved an ideal collection of sediment cores for microbiological study. My co-advisor, Christopher House, was a shipboard participant on ODP Leg 201, and my advisor Jean Brenchley and I were shore-based participants. House returned to central Pennsylvania bringing stacks of coolers filled with preserved, chilled and frozen sediment—in addition to live samples he had subjected to shipboard experimentation. Thanks to these coolers and House's efforts, I had plenty of material with which to build a dissertation.

The major goals of my Schlanger Fellowship were to analyze the microbial communities in these Peru Margin sediments through the dual approach of Fluorescent In Situ Hybridization – Secondary Ion Mass Spectrometry (FISH-SIMS) and the physiological characterization of microbial isolates. Through these analyses, I aimed to: 1) determine carbon source use by individual microbial cells; 2) cultivate and characterize novel psychrophilic (cold-loving) microorganisms; and 3) determine the in situ ecological significance of these isolates.

First, I examined sediments from ODP Site 1230 to determine if current isolation methods were appropriate for cultivating deep-sea psychrophilic bacteria. In this initial work I found that we were indeed cultivating deep-sea species, but that our isolates had wide temperature ranges of growth (2 to 37°C), even though they were enriched and grown at 2°C (Biddle et al. 2005a). Next, I examined the cultivability of bacteria throughout the ODP Site 1229 sediment core to determine if depth, lithology or interstitial water chemistry influenced how recoverable the isolates were. I discovered that bacterial isolates were obtained independent of depth or lithology, but that few bacterial colonies formed in sediments from the sulfate/methane transition zones (SMTZs) suggesting that interstitial water chemistry affected these "weeds" (Biddle et al. 2005b). Because most bacteria don't grow in laboratory culture I knew I was cultivating just a small percentage of the subsurface population, but I was surprised to find that such "weeds," or easily grown bacteria, were less abundant in the SMTZs.

ODP Site 1229 FISH Counts

Depth (meters below seafloor)	Percent of archaea [archaeal FISH count/ (archaeal + bacterial FISH counts) x 100]
0.7	45
4.3	68
12.9	69
29.8	80
30.4	86
49.8	81
54.3	67
86.8	94
89.1	98
121.4	63

Sulfate/methane transition zones (SMTZs) are highlighted in red

In the SMTZs at ODP Sites 1227, 1229 and 1230, we expect sulfate-dependent anaerobic methane oxidation (AOM) to take place, and direct cell counts are higher than other regions of the sediment—presumably because cells have extra energy available from AOM. Using FISH, I analyzed the two domains of prokaryotes in the sediment: the bacteria and the archaea. After my cultivation study, I expected that bacteria would be less abundant in the SMTZs, and by FISH, I determined that the archaeal population is indeed highest within the SMTZs, constituting up to 98% of the total hybridized cell count at ODP Site 1229 (see inset table). I then analyzed the carbon isotopic composition of these individual archaeal cells by SIMS and determined that they were relatively isotopically heavy (average $\delta^{13}C$ ~ -20‰), which means it is unlikely these cells are directly consuming the most available carbon source in the SMTZs, the isotopically light methane.

From additional investigations of RNA and intact polar lipids by fellow Leg 201 investigators, along with overall inspection of the sediment carbon budget, it appears that these archaea are heterotrophic (Biddle et al. 2006) and their role in the SMTZ is unknown. Using this multifaceted approach to study these deep sediments, we have unearthed an interesting relationship among bacteria, archaea and porewater geochemistry. Based on our research, we propose that archaea, rather than bacteria, are the dominant active microbial population in the SMTZs that we examined. Little is known about these archaea; however, they may be able to metabolize using unique pathways that were previously unexpected in the subsurface.

References

Biddle, J.F., et al. 2005a. In Jørgensen, B.B., et al. eds. *Proc. ODP. Sci. Results*, 201. www-odp.tamu.edu/publications/201_SR/107/107.htm.

Biddle, J.F., et al. 2005b. *Geobiology* 3:287-295.

Biddle, J.F., et al. 2006. Heterotrophic Archaea dominate sedimentary subsurface ecosystems off Peru. *Proc. National Academy of Sciences* 103(10):3846-3851.

Serving the Ocean Sciences Community

Meet Julie Morris, Director of the Ocean Sciences Division at NSF

Andrea Johnson, JOI

In April 2006, Julie Morris became the Director of the Ocean Sciences Division (OCE) at the National Science Foundation (NSF) as well as NSF's Principal Official to the Integrated Ocean Drilling Program. She hit the ground running and hasn't stopped yet. She was ready for new challenges and a fast pace—but at NSF things happen even more quickly than she imagined.

Although new at NSF, Julie is no stranger to science management. She is the past Chair of the MARGINS office and brings this experience combined with her perspective as an active scientist to NSF. Her personal research is largely on hold during her three-year NSF commitment, but her lab and graduate students at Washington University in St. Louis continue with her guidance from afar. As a Research Associate Professor in the Department of Earth and Planetary Sciences, she understands maintaining a lab, keeping students funded, and other hurdles that her colleagues in the community face. Now, from her NSF vantage point, she finds it rewarding to open avenues and provide tools to make science possible.

A geochemist with an interest in magmatism and tectonics, Julie's roots are literally in subduction zones. She grew up in Truckee, California surrounded by rocks of the Sierra Nevada that originated in a subduction zone. She spent much of her childhood outdoors, but the story told in her hometown rocks didn't become clear until years later. After planning to study psychology in college, an oceanography class at the University of California, Santa Cruz, set her on the road towards a major in geology. She then studied geology and geochemistry at the Massachusetts Institute of Technology for her PhD. Following her doctoral studies, Julie spent 1984 to 1993 at the Carnegie Institution in Washington, DC as first a post doc and then a staff member focusing on studies using cosmogenic ^{10}Be isotopes.

After Carnegie, she went to Washington University in St. Louis, where her interest in subduction zones blossomed and led to her involvement with the Ocean Drilling Program (ODP). In 2002, Julie was a Co-Chief Scientist for ODP Leg 205 (Costa Rica Convergent Margin) which she considers a career highlight. Before the expedition, she was aware of the quality of scientists involved with scientific ocean drilling and their science results. However, as a Co-Chief she loved learning the "nuts and bolts" of a drilling leg with a strong engineering emphasis, and she truly appreciated the ship, technical, and drilling crews' skill and pride in their work. This unique experience was both physically and mentally exhausting at times. She recalls the unpredictable nature of a drilling expedition: going to sleep jubilant only to learn that things had gone sour by morning, or turning in with despair and awakening to learn all was well.

In her new role as Director of NSF/OCE, Julie wants to demonstrate her care, concern, and commitment to the oceanography and marine geology and geophysics communities. She was attracted to the position because it was a tremendous opportunity to both increase her knowledge of oceanography and boost her own creativity. The exposure to new scientific problems and approaches offers a broader perspective from which to view her research interests. She experienced a similar phenomenon as the Chair of the JOIDES Science Steering and Evaluation Panel for studies of the Earth's Interior (ISSEP) and while serving on steering committees for two USSSP-supported workshops. These activities introduced her to hydrology and biology perspectives that contributed to the science strategy and success of ODP Leg 205.

Julie's goal is to serve the entire OCE community, but her intimate knowledge and high regard of scientific ocean drilling can't be ignored. When asked about the role of ocean drilling in OCE, she responds that she would like to see a larger community involved in the program because it offers so many opportunities, e.g., to study carbon cycling and biology, and to link paleoclimate and paleoceanographic studies to climate and oceanographic studies.

What does she hope to accomplish in the next three years? She hesitates to mention any grand new visions just yet, recognizing the need to pay for the vision that has characterized the Ocean Sciences Division over the last years. She thinks it essential to truly understand the balance of funding between core research and facilities and to establish where OCE is versus where it should be for the long-term health of the research community. For instance, she considers setting up the Ocean Observatories Initiative (OOI) a huge success for OCE, but recognizes it as a challenge to manage and budget. She wants to make sure that it serves the interests of both the oceanography and geology communities; for example, incorporating gliders and autonomous underwater vehicles would be valuable because of the increased spatial scale and oceanographic context they would add to fixed moorings. OCE is also part of a nationwide discussion on an *Ocean Research Priorities Plan* that could emphasize high priorities for ocean research, and Julie is working with her program officers to nurture the vision emerging from the community.

If she finds any spare time in DC, Julie looks forward to catching up with old friends and colleagues. Her husband, Robert Tucker of Washington University in St. Louis, was able to join her by taking on a World Bank project through the U.S. Geological Survey.

Julie Morris (left) and Miriam Kastner, Scripps Institution of Oceanography, pose with the CORK screen during ODP Leg 205. A major objective of the 2002 expedition, which followed four years of planning, was to install long-term observatories in the boreholes to sample fluids and monitor temperature and pressure. The screen prevents sediments from clogging the instruments. (Photo: Adam Klaus, IODP-USIO/TAMU)

Learning about the Other Side of Science

The Schlanger Ocean Drilling Fellowship Class of 2005-06 Visits Washington, DC

JOI invited the Schlanger Ocean Drilling Fellowship Class of 2005-06 to Washington, DC to attend the summer meeting of the U.S. Advisory Committee (USAC) for scientific ocean drilling. In addition to observing the meeting and giving research presentations, the fellows visited NSF and their congressional representatives. One fellow, Graham Baines, visited the embassy of his native Britain. The purpose of bringing the fellows to Washington, DC was to broaden their fellowship experience and foster their connection to the scientific ocean drilling community. Because this was the first Schlanger Class to officially visit Washington, JOI was eager to hear and share their perspectives.

Schlanger Fellowship Class of 2005-06 schmoozes at the City Club of Washington. From left to right, down stairwell: Samuel Hulme, Heather McCarren, and Graham Baines.

Behind the Scenes in DC

The National Science Foundation (NSF) was the first stop for the Schlanger Ocean Drilling Fellows during their July 2006 visit to DC. Meeting with several program directors revealed NSF's internal machinations, demystifying the funding process. In the words of Samuel Hulme, "Entering the headquarters of the NSF, which funds so much of the work that I have been doing, was like seeing a pen pal that I had never met before. Meeting the people who are at the forefront of scientific research and having the opportunity to ask them questions about the future direction of science placed my own career in perspective. Now I will no longer think of them as a faceless entity that decides my fate, but as real people who are doing their best to help maintain the highest level of scientific advancement while at the same time enabling the next generation of scientists to pursue their goals."

Next the fellows met political decision-makers. Graham Baines visited the British Embassy where he learned how important the issue of climate change is to the British government. He used the opportunity to highlight the role of scientific ocean drilling in understanding past climate. Meanwhile, on Capitol Hill, Heather McCarren was surprised to learn, "Legislators with similar positions on science issues had vastly different staff members. Some offices included recent PhD graduates whose presence greatly impacted the direction and breadth of our meetings in a beneficial way." Hulme found that visiting his local senator and congressional representative was eye-opening experience. "I felt fortunate to have my voice heard by people who are in a position to directly affect our current administration's policy on science. As I sat there with three senate staff members grilling me on what I knew about subjects from microbiology to the latest chemical methods, I felt as though every word I said had the greatest importance."

On their second day in DC the fellows attended the USAC meeting and found it a valuable experience. The detailed insight into the exciting future of scientific ocean drilling made them feel a part of the IODP community. Presenting their research to the USAC panel was also exhilarating. According to Hulme, "I felt challenged to illustrate the significance of my findings after hearing USAC discuss some of the most important upcoming expeditions. Whether I succeeded or not, I now feel that I can present my future findings before any group. At the City Club of Washington, after the meeting, I was able to discuss in great detail some fascinating issues in science today."

And Back in the Lab...

Graham Baines, University of Wyoming
Thermal and tectonic evolution of lower oceanic crust at an ultra-slow spreading ridge
At Atlantis Bank, on the ultra-slow spreading Southwest Indian Ridge, ODP Hole 735B penetrates 1508 meters of gabbroic lower oceanic crust. Geochronometric dating of single zircon crystals recovered from evolved gabbro and felsic veins found here constrains processes of crustal accretion. Lower oceanic crust at ultra-slow spreading ridges is thought to form gradually by intrusion of discrete plutons (1 to 500 m scale), but the timescale and pattern of accretion is unknown. So to address how lower oceanic crust forms, I have dated igneous zircons, using the U-Pb method, to determine crystallization ages (to accuracies of ± 100 to 200 kyr) for these intrusive bodies.

Samuel Hulme, University of Hawaii
Biogeochemical fluxes across the Juan de Fuca Ridge-flank: minor & trace element systematics
Oceanic ridge-flank convection of seawater circulates extraordinary volumes of fluids through the crust, profoundly affecting global geochemical cycles, plate tectonics and the deep biosphere. My research showed which trace elements can be accurately determined from ocean drilling and open borehole sampling by comparison with the time-integrated samples obtained from three sealed boreholes. Once the accurate composition of the basement fluids was established, it was possible to examine the regional trends of the hydrothermal aquifer system both along strike of the axis and across the Juan de Fuca ridge-flank. Calculating biogeochemical fluxes within ridge-flank hydrothermal settings will greatly advance understanding of the co-evolving oceanic lithosphere and deep biosphere.

Heather McCarren, University of California, Santa Cruz
Depth dependent variations in deep water chemistry and temperature across the P-E boundary
Cores from ODP Leg 208, Walvis Ridge, provide sediment records with unprecedented temporal resolution and stratigraphic control for the upper Paleocene to lower Eocene transition within the confines of a well characterized paleo-depth transect. High-resolution stable-isotope data derived from benthic foraminifera along with faunal assemblage data are establishing geochemical and biological variability on orbital time scales during this period of extreme climate change. These data also provide a means to empirically test prevailing theories regarding the mass extinction event involving benthic foraminifera at the Paleocene-Eocene (P-E) boundary.

Ships, Scientists, and Science

News from the National Science Foundation

Rodey Batiza and Jamie Allan
Program Directors, NSF/ODP

Activities related to converting the *JOIDES Resolution* to the riserless Scientific Ocean Drilling Vessel (SODV) for the Integrated Ocean Drilling Program (IODP) are well underway. Overseas Drilling Limited (ODL), as part of their IODP drilling contract with Texas A&M Research Foundation, is managing the engineering design effort to fully define the vessel modifications, as necessary to solicit realistic bids for implementing the conversion. Glosten Associates of Seattle—a well known naval architecture, marine and ocean engineering firm with significant experience designing and modifying research vessels—is ODL's subcontractor. Glosten is integrating the scientific requirements and laboratory arrangements that were developed by the JOI Alliance and vetted with the scientific community. The new design will reflect a converted vessel with significant improvements in scientific capability and habitability. Plans to increase the vessel's length by 32 feet will make this transformation possible. With additional upgrade and life-cycle extension projects, the vessel will be able to effectively serve as the riserless platform through the current term of the IODP and beyond.

Engineering design is being performed concurrently with efforts to identify interested commercial shipbuilding/ship conversion entities with the required technical capacity and availability to support the target completion schedule. This approach should mitigate adverse schedule impacts caused by project resource issues resulting from rapidly changing, worldwide circumstances in a post-Hurricane Katrina maritime industrial environment with crude oil prices at $70+ per barrel. With the ship conversion contract planned for award in the fall of 2006, the vessel should be operational by late fall 2007.

The investment required for this rebuilding project is estimated at $115 million. The first $73 million in funding has been approved in FY05 and FY06, with the remaining $42 million planned to be in the FY07 budget. Further information about the SODV conversion and capabilities, laboratory arrangements, status, organizational structure, and supporting documentation is available on the recently updated SODV website at www.joiscience.org/SODV. John Walter is the principal point of contact for the SODV conversion project within NSF.

The process of producing a new Environmental Impact Statement (EIS) for IODP SODV operations is also underway. JOI, working together with contractor Metcalf and Eddy, will produce the document for NSF, with the National Oceanic and Atmospheric Administration/National Marine Fisheries Service serving as a cooperating agency. The draft EIS is expected to be available for public comment in early 2007.

Julie Morris became our new Director of the Ocean Sciences Division (OCE) at NSF in April (see page 12); she is also serving as the NSF IODP Principal Official. Veteran ODP and IODP participants know her excellent past work as Chair of the JOIDES Dynamics of the Earth's Interior Science Steering and Evaluation Panel and as Chair of the U.S. MARGINS Program Office. We are fortunate to have a new Division Director who is so intimately familiar with scientific drilling!

The NSF Ocean Drilling Program bid adieu to Carolyn Ruppel, who departed for the U.S. Geological Survey in Woods Hole after serving brilliantly as the rotator overseeing the ODP Grants program. Kevin Johnson of the University of Hawaii arrived in August 2006 to become her replacement. A new rotator in the Marine Geology and Geophysics Program, Adam Schultz from Oregon State University, arrived in July.

The new U.S. seismic vessel *R/V Marcus G. Langseth* is expected to begin science operations in late 2006. This former industry seismic vessel, owned by NSF and operated by Lamont-Doherty Earth Observatory, is being modified to support other tasks required of a general research vessel.

FY06 funding for the NSF/OCE is slightly better than in FY05, with ship operations support remaining tight. We expect that FY07 funding may offer another modest increase. At the May Marine Geosciences Section panel, several NSF/ODP proposals were recommended for awards. These include projects to study the seismic structure and petrology of the Kane Megamullion on the Mid-Atlantic Ridge, thermal environment of the South Pacific Gyre, microbial observatories at North Pond on the Mid-Atlantic Ridge, CORKs for Nankai Trough, and an EOR project related to Arctic drilling during IODP Expedition 302.

The U.S. Science Support Program (USSSP) which funds the participation of U.S. scientists in all aspects of IODP planning and at sea expeditions is being recompeted. A solicitation (NSF 06-575) with a proposal deadline of September 20, 2006 describes the new program in detail.

Rodey Batiza is the Acting Head of the Marine Geosciences Section at NSF, following Bruce Malfait's retirement in May 2006.

Expedition Objective Research Funding Available

NSF/ODP encourages Expedition Objective Research (EOR) proposals from participants in Integrated Ocean Drilling Program (IODP) expeditions to address the scientific objectives of specific drilling expeditions. Resulting EOR grants may begin during the period between the Co-Chief Scientists' approval of the expedition sampling plan and the end of the sample moratorium period.

Annual EOR Proposal Deadlines:
February 15 and August 15

For questions please contact
Rodey Batiza
(rbatiza@nsf.gov)
Kevin Johnson
(kjohnson@nsf.gov)
www.geo.nsf.gov/oce/programs/drilling.htm

Out to Sea, Again

A Letter from the Chair

A wave of anxiety swept over me recently, followed quickly by one of excitement. The anxiety was precipitated by the realization that what we have long worked for as a community—i.e., several high-tech floating research laboratories simultaneously exploring the mysteries of the ocean—is finally coming to pass. Shakedown cruises for the Japanese drillship *Chikyu* begin late this summer, and the rebuilt U.S. vessel is expected to begin operation in November of 2007. The Science Advisory Structure, IODP-MI, and the program offices like JOI have already launched the complicated scoping, scheduling, and staffing activities required to conduct these multi-platform operations.

Why did this cause anxiety? At my moment of realization, we at USAC and JOI were trying to determine how to provide scientific staffing advice, a science leadership system, and expedition-related support for researchers on several platforms. The complication here is that the *Chikyu* and the refurbished U.S. scientific ocean drilling vessel (not to mention mission-specific platforms) will be operating at the same time, sometimes with overlapping expedition or mission objectives. The science parties may be staffed on one or more vessels, and leadership systems may include Co-Chiefs and science and mission leaders. In addition, publication and outreach objectives will transcend our former concepts of "moratoriums."

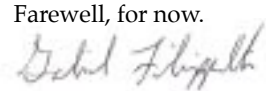
Why the excitement? Our science capabilities are expanding greatly, providing unprecedented opportunities to rethink science and management structures, to broaden our connection to new disciplines, and to explore places previously beyond our reach. A less obvious but equally important reason to be excited is that USAC has been actively preparing to assume this more complicated role. We have been in close communication with the Project Management Team for the large-scale, multiplatform and multi-expedition NanTroSEIZE, working through the staffing and scientific support structures required to maximize success of this venture. Based on this experience, we now are prepared to support other large-scale scientific missions that are currently being developed within the advisory structure of IODP.

So, I am happy to see us "out to sea" again, and in a more integrated and comprehensive way than ever before—an approach needed to meet some of the objectives articulated in IODP's *Initial Science Plan*. I am less happy to report that I will soon be "out to pasture," at least as far as USAC is concerned.

This column is my last as Chair of USAC, with my two-year term ending September 30. The capable and eloquent Christina Ravelo will replace me—we are lucky to have her take on the job. Christina has been the Chair of USAC's Nominations Subcommittee and has already worked with USAC and JOI to conceive and implement creative new initiatives. She will also continue the reign of paleoceanographers as Chairs of USAC, becoming the fifth one straight!

To conclude, I want to thank the wonderful people that I have worked with at JOI—most directly Holly, Bob, Steve, Carl, Susan, Leslie, Jon and Andrea. These folks champion our causes and work hard to keep everything running. I also want to thank Rodey Batiza, among others, for graceful leadership at NSF and all of the outstanding individuals with whom I have been able to interact in the various advisory committees and national program offices throughout the world. Juggling chairing both USAC and my university department has been personally challenging, but I admit that I enjoy my USAC job at least 10.4 times more than my other job. (There is a reasonable chance that my Dean doesn't actually read this, meaning that for better or worse I will remain a chair of something.) Thanks for reading these past few years.

Farewell, for now.



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NanTroSEIZE Stage 1: Call for Scientific Participants

The U.S. Science Support Program, managed by Joint Oceanographic Institutions, seeks participants for a series of expeditions conducted by the Integrated Ocean Drilling Program in Stage 1 of its first Complex Drilling Project, the Nankai Trough Seismogenic Zone Experiment, known as NanTroSEIZE. Applications for U.S. scientists are at: www.usssp-iodp.org/Science_Support/Sailing_Information/NanTroSEIZE_S1.html. The application deadline is October 15, 2006. A prospectus describing the NanTroSEIZE program and Stage 1 science objectives and implementation strategies is available at www.iodp.org/NanTroSEIZE. See page 6 for additional information!

Photo: IODP-USIO