JOI News
Spring 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

The School of Rock Expedition: Educators Learning on the High Seas

Matt Niemitz, JOI

"Whales starboard, sunning seals floating on their backs, Captain Alex and the bridge, Dynamic Positioning, hard rock samples, petrographic microscopes…and that was only today." So begins Calvin Bucholtz's entry in the Day 9 blog for the 12-day School of Rock Expedition. Bucholtz, a high school science teacher from San Antonio, Texas, and 12 other educators took part in the pilot program to increase teacher knowledge of the Integrated Ocean Drilling Program (IODP), scientific ocean drilling, and marine geology.

Visit the School of Rock website at www.joilearning.org/school-ofrock/ to learn about the expedition and to access new classroom and lab activites based on scientific ocean drilling.

School of Rock participants sailed on board the *JOIDES Resolution* from October 31 to November 11, 2005, during the Vancouver to Acapulco transit at the beginning of IODP Expedition 312. The educators conducted a series of research activities similar to those that take place during scientific drilling expeditions and learned from scientists whose research focuses on IODP samples and data. In turn, the participating educators have translated scientific results into age-appropriate and audience-friendly earth system science activities for classrooms and museums. Each participating educator will further disseminate drilling-related science education by conducting two teacher workshops during the coming year.

Educators taking part in the first School of Rock Expedition experience a sampling party on board the JOIDES Resolution. (Photo: IODP-USIO/TAMU)

The School of Rock Expedition attracted 59 applicants from 28 states. Ten school educators were selected, including six high school teachers, three middle school teachers, and one regional science specialist. In addition, three invitations were extended to one textbook science consultant and educators from two museums. The participant selection process took into consideration applicants' teaching experience; grade level taught; background in geology, ocean sciences, and education; experience developing curriculum; potential for local, state, and national outreach; and geographic origin.

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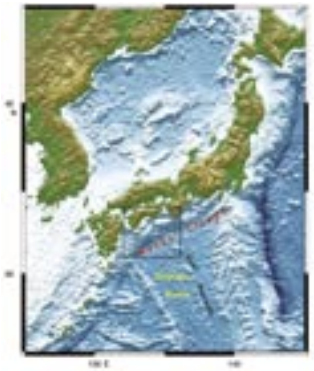

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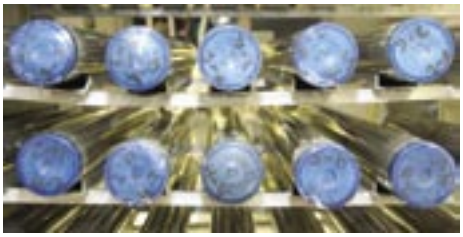

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IODP Expedition 312: The catwalk is all smiles with the arrival of a long gabbro core. From left to right: D. Teagle, Ex. 206 and 309 Co-Chief; N. Banerjee, Ex. 309 and 312 Staff Scientist; D. Wilson, Ex. 206 Co-Chief; S. Miyashita, Ex. 312 Co-Chief; J. Alt, Ex. 312 Co-Chief; R. Grout, 312 Operations Superintendent; W. Malone, Transocean Offshore Installation Manager; J. Attryde, Transocean Core Technician/Tool Pusher.

Photo: IODP-USIO (TAMU)

IODP Expedition 312: Jeff Alt (Ex. 312 Co-Chief), Damon Teagle (Ex. 206 and 309 Co-Chief) and Sumio Miyashita (Ex. 312 Co-Chief) inspect a newly recovered gabbro core on the catwalk.

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The Nankai Trough, site of the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE), is located southeast of Japan.

IODP Expedition 312: Blue capped core tubes. Photo: IODP-USIO (TAMU)

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 20 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.

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IODP
INTEGRATED OCEAN DRILLING PROGRAM

Drill Bits

Subseafloor Life Workshop

Date: October 3-5, 2006

Where: Vancouver, British Columbia

JOI and IODP Management International are jointly sponsoring a community workshop "Exploring Subseafloor Life with the Integrated Ocean Drilling Program." The workshop has two main objectives: to introduce a community of microbiologists and related global biogeochemists to the Integrated Ocean Drilling Program (IODP), its capabilities, and the opportunities of drilling in the ocean; and to develop scientific objectives for deep biosphere studies that can be addressed by scientific drilling—particularly in the ocean. The workshop agenda, which is still being developed, will include keynote speakers, thematic discussion groups, and informal evening sessions. For more information, see www.iodp.org/workshops.

Bruce Malfait Retires

Dr. Bruce Malfait, Head of the Marine Geosciences Section and Principal Official for the Integrated Ocean Drilling Program (IODP), recently announced that he is retiring from the National Science Foundation (NSF) in May after 32 years of service to the scientific community. Malfait is one of the principal architects of the IODP, and for most of his career worked in the Ocean Drilling Program or the Marine Geology and Geophysics Program at NSF. He also spent a number of years with NSF's Seabed Assessment Program in the 1970s and 1980s. Malfait received his Ph.D. in geological oceanography from Oregon State University in 1974. Bruce will be missed by his many friends and colleagues at NSF and within the broader ocean sciences community.

Investigating Continental Breakup and Sedimentary Basin Formation

Date: September 16-19, 2006

Where: Pontresina, Switzerland

This international IODP-sponsored workshop will define key scientific objectives for studying continental rifting, breakup, and initiation of seafloor spreading, global long-term drilling strategies and the technological requirements to address these objectives. What are the processes that break apart continental lithosphere, create new oceanic lithosphere, and control the formation and evolution of sedimentary basins? The full spectrum of rifted continental environments, including magma-dominated and tectonic-dominated rifting, and older and younger rifting will be considered. Participants will include scientists with expertise in magmatic, tectonic, and sedimentary processes, and whose methods range from field observation to geodynamic simulation. Drilling engineers will participate and provide information about enhanced drilling, logging, and long-term borehole monitoring capabilities of IODP. Support for travel expenses is available for approximately 40 participants. Places will be reserved for advanced students and early career scientists. Apply online by May 31, 2006 at www.iodp.org/workshops.

JOI Reaches out to Microbial Ecologists at ISME

JOI will sponsor a roundtable, "Exploration of the Marine Subsurface Biosphere with Scientific Ocean Drilling," at the 11th International Symposium on Microbial Ecology (ISME-11) in Vienna, Austria, August 20-25, 2006. The session will be co-chaired by David Smith of the Graduate School of Oceanography, University of Rhode Island, and Ken Takai of the Deep-Sea Microorganisms Research Group at the Japan Agency for Marine – Earth Science and Technology (JAMSTEC). Also speaking are Bo Barker Joergensen of the Max Plank Institute for Marine Microbiology, Katrina Edwards of Woods Hole Oceanographic Institution, and Jennifer Biddle from Pennsylvania State University. This session is designed to inform the ISME community about current understanding of the diversity and activities of microorganisms in the marine subsurface, based partly on results from the Ocean Drilling Program, and about how IODP's three simultaneously operating, configurable drilling platforms can be used to open new research areas—both scientifically and geographically. More information about the International Society for Microbial Ecology can be found at www.microbes.org.

A completely destroyed C-7 drill bit rests next to a new one, demonstrating the hardness of the recystallized dikes Expedition 312 drilling penetrated before reaching gabbros. (Photo: IODP-USIO/TAMU)

Website Provides Updates on the Scientific Ocean Drilling Vessel

JOI has launched a redesigned Scientific Ocean Drilling Vessel (SODV) website (www.joiscience.org/sodv)! The website has been updated to better engage and inform the community of activities regarding the conversion process and the technical improvements to the SODV. The SODV website explains how the program is organized and funded, and features conceptual layouts, organizational charts, monthly program reports, and advisory committee and team meeting minutes, among many other things.

Workshop on Fault Zone Drilling

Date: May 23-26, 2006

Where: Miyazaki, Japan

The Integrated Ocean Drilling Program (IODP) and the International Continental Scientific Drilling Program (ICDP) are holding an international joint workshop on fault-zone drilling, addressing the science and technology of drilling, sampling, testing, and long-term borehole monitoring of active faults. Many major fault-zone drilling projects are underway or planned in a range of tectonic environments on land and beneath the sea. Drilling can provide unique observations inside active faults at depth and can contribute to a better understanding of the processes governing earthquakes and fault behavior—a fundamental scientific challenge of great importance to society. This workshop brings together scientists and engineers from diverse fault-zone drilling projects for an open and detailed exchange of results, ideas, and experiences. Despite their differing tectonic environments and scientific objectives, these projects all share the technical challenges of drilling into active faults and an emphasis on in situ measurements. Developing the technological capability to successfully drill, test, sample and instrument the active fault environment is critical to the success of all the projects.

The School of Rock Expedition

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While at sea, the educators took part in discovery-based learning activities such as describing and sampling cores and working in the shipboard laboratories. They attended science lectures—both on ship and via videoconference—and observed core processing and lab demonstrations in chemistry, paleomagnetism, and paleontology. Scientific topics covered during the expedition included plate tectonics, lithostratigraphy, biostratigraphy, paleomagnetism and magnetostratigraphy, hydrogeology and Circulation Obviation Retrofit Kits (CORKs), geophysics and seismic stratigraphy, and carbonate geochemistry. Broader themes—such as abrupt events in earth history and climate cyclicity and the relevance of scientific ocean drilling to these topics—were also discussed. Educators also learned how to access scientific drilling data using the online JANUS database and publications from the IODP predecessors, the Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP). Data from 26 expeditions and 56 sites were specifically used.

To share their experiences while on board the *JOIDES Resolution* with students and other educators as well as to provide exposure to scientific ocean drilling, School of Rock participants developed more than 15 inquiry-based exercises for students at various educational levels and wrote 25 career profiles of IODP-USIO and shipboard staff. The website library created for the expedition (see www.joilearning.org/schoolofrock/Library.html) is a clearinghouse for these resources and other materials developed for the School of Rock participants prior to the expedition. The website library catalogs additional information on topics covered during the expedition—and includes classroom activities for middle school, high school, and undergraduate-level audiences. The library also includes classroom-friendly data sets, relevant website links, downloadable resources, and recommended publications pertaining to each topic covered during the School of Rock.

The School of Rock Expedition, a pilot program for educators, was conducted on board the JOIDES Resolution *during the 12-day transit prior to Expedition 312. (Photo: IODP-USIO/TAMU)*

During the expedition, the educators continued to have contact with their students back on shore, fielding over 300 questions submitted via web e-mail during daily video question and answer sessions. A few teachers even produced video demonstrations or lessons for their classes to watch during the expedition; daily interaction was bolstered through a daily blog and interactive online latitude and longitude exercises.

Reflections from a School of Rock Participant: Sharon Cooper

"The School of Rock Expedition was a unique experience in a number of ways. The first and most obvious was the venue. Being on a research vessel was fascinating. The other participants and I were able to learn how such a large ship operates, what it is like to be a part of an isolated shipboard community, and how all the necessary scientific equipment is maintained and modified to function on board."

"We also participated in many of the very same activities as expedition scientists. While getting crash courses in geology, paleontology, sedimentology, and chemistry, etc., we were able to immediately put that knowledge into action. There certainly is nothing like authentic experiences to make one understand the excitement of science—and also its challenges. We translated some of this information into curriculum and materials for students. While many of us had created curriculum in the past, it is much more exciting to create lesson plans based on real experiences. And being amid the experience itself allowed us to develop what we hope will be special and engaging lesson plans."

"There is also something appealing about participating in a pilot project. This was the first School of Rock Expedition and we were all guinea pigs. But this was also an opportunity, and we could offer suggestions and help shape the program for the future and for other educators and students."

"In addition to the academic benefits of this program, I met a truly dedicated, warm and friendly group of people: fellow educators, shipboard staff and crew. These benefits cannot adequately be measured, but they are always valuable. I hope to keep in touch with many of these people for years to come."

Sharon Cooper in the paleontology lab. (Photo: IODP-USIO/TAMU)

Sharon Katz Cooper is the Education Specialist for the National Museum of Natural History's Ocean Hall. In this role, she advises the exhibit team on educational goals, objectives and components. Prior to coming to the museum, she worked in environmental education for more than 10 years, working for such organizations as the National Wildlife Federation and the Bronx Zoo. She holds a bachelor's degree in Ecology and Evolutionary Biology from Princeton University and a master's degree in Environmental Studies from the Yale School of Forestry and Environmental Studies.

For information about the School of Rock staff and participants, visit www.joilearning.org/schoolofrock/Bios.html.

The educators participating in the School of Rock became aware of the myriad of important scientific contributions and discoveries that ocean drilling programs have made during the last four decades. By learning to explore and sift through various data sets from previous scientific expeditions, they uncovered evidence for some of these discoveries themselves and gained a newfound appreciation for some of the science that they already teach their students on a daily basis.

"Evidence is a very powerful tool to use to explain things," remarked School of Rock educator Heather Kortlandt, a high school earth science teacher. "When kids in my class ask 'How do you know?' now I can say, 'Here's how we know!' I don't have to tell them, 'We know this because experts have researched this.' Instead I can say 'Here are the research results that they've gotten.' And maybe an even more effective tool is to show students that they can analyze the supporting data themselves—and that the evidence wasn't necessarily so difficult to unearth. It's difficult to drill and actually get the cores, but it's not as difficult to look at the cores and ask 'What do you see here?' It can be challenging—but anybody can do it."

The enthusiastic response of the School of Rock educators to science that is sometimes viewed as too complex to communicate to those outside of the research community has shown that the legacy of scientific ocean drilling is a major educational resource. In turn, this legacy can be hugely enriched by education and outreach—spurring the JOI Learning team to expand the School of Rock program beyond this initial group of educators. This pilot project clearly demonstrates the vast educational potential that is embodied by the IODP, DSDP, and ODP programs—and we've only just begun to tap their rich resources.

The School of Rock Expedition team is actively working to expand the scope of the original program model for the future. We aim to create a multifaceted program that continues to provide opportunities for educators to use scientific ocean drilling data in educational settings for the entire public. The goal is to make scientific findings more accessible for educators by developing curricula which include bona fide data sets. In the future, associated professional development workshops of varying length may also be conducted on board the U.S. scientific ocean drilling vessel, at ports of call, or at the core repositories.

The School of Rock Expedition intimately connected educators with scientists and the vast research results and data sets of an international science program. This was not just a "cool" cruise for 13 educators that has come and gone. It's only the beginning of a broader-scale effort—and we are hopeful that this type of connection is not the exception but rather becomes the norm as the research community strives to achieve broader public impact and to help develop and strengthen an earth-system-science literate society. To receive notices of future educational opportunities, just send an e-mail request to joilearning@joiscience.org.

The Author

Matt Niemitz is an Education Program Associate at JOI (mniemitz@joiscience.org).

School of Rock Participants

Dan Bregar, Crescent Valley High School (Corvallis, Oregon) • Calvin Buchholtz, John Jay High School (San Antonio, Texas) • Jerry Cook, Phoenix Country Day School (Paradise Valley, Arizona) • Sharon Cooper, Smithsonian National Museum of Natural History (Washington, DC) • Debbie Faulkner, Halifax County High School (South Boston, Virginia) • Laura Jo Fojtasek, Science Consultant (Temple, Texas) • Virginia Jones, Bonneville High School (Idaho Falls, Idaho) • Bryan Kennedy, Science Museum of Minnesota (St. Paul, Minnesota) • Heather Kortlandt, Otsego High School (Otsego, Michigan) • Julie Marsteller, Hoover Middle School (Potomac, Maryland) • Ramona Smith, South Hadley High School (South Hadley, Massachusetts) • Mary Whaley, Science Specialist, Lowcountry Math and Science Regional Center (Summerville, South Carolina) • Roberta Young, Gunn Junior High School (Arlington, Texas)

The Expedition Team

Leslie Peart, JOI (Expedition Director) • Dr. Mark Leckie, University of Massachusetts (Expedition Science Professor) • Dr. Kristen St. John, James Madison University (Expedition Science Professor) • Dr. Scott Slough, Texas A&M University (Evaluation and Assessment) • Ann Klaus, IODP-U.S. Implementing Organization (Logistics and School of Rock Liaison with shipboard personnel) • Matt Niemitz, JOI (Website and Ship-to-Shore Communications) • Lisa Crowder, Chieh Peng, and Paula Weiss, all IODP-USIO (Shipboard Laboratory Support)

School of Rock Expedition Blog
Day 12, Friday November 11, 2005

Today was a bittersweet day. We awoke with a view of the mountains of Mexico and the prospect of docking in Acapulco. We were all ready to reach land, see Acapulco, and prepare to head home. But, no one wanted the School of Rock journey to end!

We left Victoria with dozens of people that we didn't know, on a ship that we weren't familiar with, and embarked on an expedition of 12 days. But when we arrived in Acapulco this morning, we all felt like we were leaving dozens of good friends behind and abandoning our home away from home. The consolation to this thought is that we are all excited about heading home and sharing this journey with many others. Our efforts on this expedition have produced many new ideas on teaching earth science in classrooms of all types and size.

We've learned about how we know many of the things that we know about our earth. We can provide evidence for the movement of geologic plates, the timing of geologic events, global climate change, and the Earth's magnetic reversals. And we know the *JOIDES Resolution* inside and out and can tell of its amazing capabilities and crew who never quit in searching for the Earth's secrets held in cores from the seafloor.

As we spread to our respective parts of the United States, we will also spread this new knowledge that we have. We will tell of this journey for years to come and we will never forget the unique experience we each had. We will always have our memories of 18-foot swells, lifeboat drills, making smear slides, watching the skies from the helideck, Bubba and the drill bits, BBQs on the deck... the list goes on and on.

Will the School of Rock journey ever really end? We don't think so.

www.joilearning.org/schoolofrock/Blog.html

Networking and Mentors Make a Difference

Minorites Striving and Pursuing Higher Degrees of Success in Earth System Science

The Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science (MS PHD'S) initiative was developed by and for underrepresented minorities to increase their participation in earth system science and engineering. Established in 2003, the program exposes participating undergraduate and graduate students to the earth system science and engineering communities via scientific conferences, mentoring relationships, and virtual community activities. Students expand their professional skills (e.g., grantsmanship, research, communication, and teaching) through development activities and receive information regarding future funding, education, and career opportunities. Students also learn to network with established earth system science researchers and educators, and become members of a virtual community that encourages both networking and collaboration among peers, junior- and senior-level researchers and educators.

For information about the MS PHD'S Program, visit: www.msphds.usf.edu

The MS PHD'S program is funded by NSF and NASA, and is housed at the University of South Florida. JOI contributes to the program by introducing students to the international and inherently diverse nature of global science and program management.

In 2005 JOI provided "experiences" for eight MS PHD'S students by sponsoring their attendance at workshops and IODP-related meetings. To learn about the program, visit: www.msphds.usf.edu. For information about JOI's diversity activities, contact Amy Castner (acastner@joiscience.org).

Meet MS PHD's Participant and Micropaleontology Graduate Student: Dana Brown, Georgia State University

Once upon a time, Dana Brown firmly believed that she would never pursue a doctoral degree. A master's degree candidate in geology at Georgia State University, a Ph.D. is now just one of her many options. Dana's change of heart is a direct result of the MS PHD'S program, which has impacted dozens of other minority students like her.

Dana is a paleoceanographer who, under the guidance of Dr. Beth Christiansen, is studying foraminiferal biofacies changes and global sea-level events in the Pliocene using Ocean Drilling Program cores. She received her A.S. degree in natural science at Reinhardt College in Waleska, Georgia in 1997 and then transferred to Georgia State University where she graduated with a B.S. in biology the summer of 2001. As an undergraduate, she never had a mentor or attended any conferences. In Dana's words, "I received two degrees on my own, without 'real' support from many professors. I didn't need a mentor. I felt like networking was 'selling myself' and I wanted my work to speak for me; I didn't know what networking was."

Dana learned about the MS PHD'S program in 2003 when she crossed paths wth its director, Dr. Ashanti Pyrtle, University of South Florida, who was visiting Georgia State to give a talk. Upon meeting Dana, Dr. Pyrtle gave her a brief program overview and told her that she expected to see her application. The same night that they met, Dana completed the MS PHD'S program application and the next morning asked her professors for letters of recommendation.

After Dana became part of the 2003 pilot group for the MS PHD'S program, she shared her fears and past experiences. Dr. Pyrtle assured Dana that the program would help her develop professionally and that she needed mentoring. Dana recalls, "At the end of the pilot program I had a new extended family, a couple of mentors, and an abundance of information about opportunities I never even dreamed about. My mentors called me to inquire about why I hadn't contacted them a month after we parted ways."

Dana Brown

Dana applied to the 2004 program with some apprehension. She remembered the journaling, paperwork, and how overwhelming the whole experience had been. At least this time she knew what to expect. Dana says, "Once again my family extended, the numbers of mentors increased, and the number of opportunities multiplied." During the program, Dana maintained contact with her mentors via telephone or e-mail, and she reports that with their help, "I have learned how to network and have realized the necessity for networking. I have learned how to walk up to a scientist, introduce myself, and ask questions about what I didn't understand in a presentation. Before this program, I never would have initiated a conversation with a stranger."

Dana's first conference was the Joint Global Ocean Flux Survey (JGOFS) Ocean Science meeting in 2003. She also attended the JOI-supported Bering Strait Workshop in Fairbanks, Alaska in June 2005 and the 2004 fall meeting of the American Geophysical Union (AGU). She now regularly employs the MS PHD'S program skills that she learned during AGU but was previously was too intimidated to carry out. She states, "Because of these experiences, I now have so much confidence. Because of the MS PHD'S program I presented my first poster, gave a talk at AGU, and have actively worked on accepted science-education initiatives through the joint National Congress on Science Education/National Science Teachers Association (NCSE/NSTA) meeting." With JOI sponsoring her attendence, Dana's experience at NCSE/NSTA in 2005 solidified her career choice to help bridge the gaps among teachers, researchers, and students through outreach. She knows now that she has lots of options for how to pursue such a career.

JOI Climate Change Forum at AAAS Explores Risk Management and the Next 100 Years

Holly Given, JOI

Concerned about climate change? Expert speakers at the JOI-sponsored symposium "Climate Change, Risk Management, and the Next 100 Years" advise to think locally and be prepared for climate surprises, run for public office, and take incremental steps toward radical change. The symposium was held in St. Louis, Missouri, during February 2006 as part of the American Association for the Advancement of Science (AAAS) annual meeting, which had the theme "Grand Challenges, Great Opportunities."

Geochemist and Chair of the U.S. Advisory Committee to JOI for Scientific Ocean Drilling, Professor Gabriel Filippelli (Indiana University–Purdue University at Indianapolis) opened the symposium emphasizing that climate change is a geologic truism, so that learning how the Earth has responded in the past is crucial in helping humans plan for future change. Using examples from the geologic record of the scale of changes that might occur, he discussed differences between global and local forecasts. For instance, while global temperatures are expected to rise about 3°C on average by 2090, climate models show that the rise may exceed 5°C in parts of the United States. Models also predict that by 2100, global sea levels will rise by at least 40 cm, dramatically affecting small island nations and low-lying countries. Future summer rainfall in places like Indiana may decrease, affecting staple crops like corn and soybeans. These examples illustrate how globally averaged magnitude changes do not reveal the impact to a specific region, culture, or economy. Filippelli showed that the geologic record also contains climate "surprises," such as a rapid cooling event 8,200 years ago—documented by oxygen isotopes in Greenland ice cores—likely stimulated by subtle changes in North Atlantic Ocean circulation.

Congressman Vernon Ehlers (R-Michigan), the first research physicist elected to the House of Representatives and a member of the House Committee on Science, summarized the political climate on Capitol Hill. Ehlers' talk touched on four areas: what the Administration is doing about climate change, what the Congress is doing, related political problems, and what the scientist can do. Ehlers stated that the Administration generally recognizes global climate change as a sobering problem but is proceeding cautiously, funding a Climate Change Technology Program ($3B/yr) and a Climate Change Science Program ($2B/yr). In Congress, opinions range from "no problem" to "imminent disaster," with the bulk of members in the undecided middle. Most members support climate change research, but are uncertain of what to do when weighing it against other pressing issues such as avian flu or increasing diabetes rates. In each of the last two Congresses, both political parties introduced over 50 pieces of legislation related to climate change.

Forum speaker Congressman Vernon Ehlers (R-MI).

Using the example of El Niño, which had both positive and negative economic effects (e.g., mudslides in California, but record crops in the Midwest), Ehlers pointed out that developing a consensus approach regarding climate change would be a political challenge. Any eventual policy must address developing nations, but how to best proceed is unclear. In conclusion, Ehlers encouraged the audience of scientists to engage their legislators; examples include inviting their representative to address their classrooms or tour their labs—invitations that members may well accept. Ehlers also advised scientists to use layman's terms when talking with legislators, to emphasize the relevance to home districts or states, and to offer Congresspersons field experiences. Finally, Ehlers challenged scientists to consider running for municipal office or state or national legislatures, and to be willing to "reach the unreached," rather than only interacting with the like-minded.

Dr. Robert Lempert, a senior scientist with the RAND corporation who studies the generic process of decision making in the face of deep uncertainty, spoke on "Incremental Steps Towards Radical Change: Robust Decision Making for Long-Term Climate Policy." During the 21st century, our near-term policy choices will significantly affect the impact of climate change, yet the near-term interests of many diverse groups complicate the long-term view. To address the needs of future generations, we must contend with the uncertainties of long-term costs and effects of specific actions. Today's actions—such as the building of new coal-burning power plants—can lock in in high emissions for many decades. However, because the topic of climate change confronts decision makers with uncertainties, good intentions can go awry if competing analyses lead to gridlock, if uncertainties are underestimated, or if decision makers do not factor in unlikely outcomes.

Seeking robust, adaptive strategies to address multiple scenarios is the best approach. Predictions have limitations, so strategies must be able to evolve over time in response to changing conditions. The role of science is to generate options and to assess what is working and what isn't. By shaping the choices available to future decision makers, scientists can take incremental steps toward radical change. What does the future need from us? Viable technology options for large emission reductions, institutions that can effectively monitor worldwide greenhouse gas emissions, and immediate efforts to achieve near-term, inexpensive emission reductions and to slow emissions "lock-in," all of which are helped by maintaining a strong national economy. Lempert believes that we would be well on the way to success if, within the next decade, we saw emissions trading within and among most sectors of the U.S. and other developed economies, growing constituencies for emissions controls in developing countries, significant reduction in new infrastructures that lock in high emissions, and a range of tested, marketable technology options deployed in developed and developing countries. Meeting near-term reduction targets is far less important than meeting these milestones, which build in flexibility for the future.

–Holly Given, Director of Science Facilitation and Development, JOI (hgiven@joiscience.org)

IODP Expedition News

Photo: Albert Gerdes, IODP-ESO

Expedition 310 mission-specific platform, D.P. Hunter.

Expedition 310
Tahiti Sea Level

Twenty-six scientists convened in mid-February at the University of Bremen to analyze coral fossil samples retrieved by Expedition 310 from Tahitian waters during October and November 2005. During the next year, these expedition participants will study 632 meters of fossil material recovered from 37 boreholes in the seafloor. The initial conclusion is that the IODP Tahiti Sea Level Expedition has assembled the most accurate physical evidence available today of changes in sea level during the last deglaciation, including a full record of temperature and salinity changes in the southern Pacific.

Co-Chief Scientist Gilbert Camoin (Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, France) summarized the expedition's success: "Tahiti has given us a treasure of records that archive sea-level change over approximately the last 20,000 years. Because corals are ultra-sensitive to environmental change, we have been able—by splitting lengths of coral reef cores we acquired—to get better, more accurate descriptions of reef growth during the sea-level rise that occurred after the last glacial maximum, 23,000 years ago." Camoin explains that Tahiti was chosen for this expedition because of its unique geology and location. As a relatively stable, volcanic island, Tahiti is subsiding at a rate of just 0.025 mm per year and its location in the southern Pacific, far from previously glaciated regions, means that changes in sea level there must be solely related to global effects.

Co-Chief Scientist Yasufumi Iryu, Tohoku University, Japan, praises the quality of the cores. "The longest continuous coral core we collected is 3.5 meters long; it represents 350 years of coral growth." Providing a reliable climate record without gaps, massive coral samples—just five percent of the samples obtained—are highly valued by investigators as they reconstruct climate variability and piece together the frequency and amplitude of climate cycles such as El Niño.

Camoin says, "Examining the massive coral cores retrieved between 40 and 120 meters below sea level, we identified grooved pairs of light and dark bands, each pair measuring a centimeter in width and representing one year of growth. Using radiometric methods, we are able to determine a coral fossil's age to within 30 years." Iryu agrees that the age and water-depth information found archived in the coral reef cores is simple, but crucial. He also says, "We measured live microbes (bacteria) living in the spaces within the deep fossil reefs. These samples have been collected and frozen for DNA sequencing."

IODP Expedition 310 was conducted by the European Consortium for Ocean Research Drilling (ECORD) Science Operator, IODP's specialist in mission-specific platform operations. A participant list and other expedition information is available at www.ecord.org/exp/tahiti/310.html.

Expedition 311
Cascadia Margin Gas Hydrates

IODP Expedition 311 was designed to further constrain models for the formation of marine gas hydrate in subduction zone accretionary prisms by determining the mechanisms that control the nature, magnitude, and distribution of gas hydrate occurrence. The expedition's scientific objectives included characterizing the deep origin of the methane, its upward transport, its incorporation in gas hydrate, and its subsequent loss to the seafloor. Expedition results also are being used to further characterize gas hydrate's effect on the physical properties of host sediments and to investigate the microbiology and geochemistry associated with gas hydrate occurrence.

From September 19 through October 28, 2005, Expedition 311 drilled and cored a transect across the Northern Cascadia Margin to study gas hydrate occurrences and formation models for accretionary complexes. The transect's four sites represent different stages in the evolution of gas hydrate across the margin from the earliest occurrence on the westernmost first-accreted ridge (Site U1326) to its final stage at the eastward limit of gas hydrate occurrence in shallower water (Site U1329). In addition, a fifth site (U1328) was visited representing a cold vent with active fluid and gas flow.

Logging-While-Drilling and Measurement-While-Drilling (LWD/MWD) provided data to guide subsequent coring and special tool deployments at all five drilling sites. Additional wireline logging at each site and two vertical seismic profiles at Sites U1327 and U1328 were completed. A total of 1218 meters of sediment core was recovered using conventional wireline coring systems, which were interspersed with 43 pressure core deployments.

Indirect evidence for the presence of gas hydrate was found from the downhole logging program by increased electrical resistivities and P-wave velocities, and in the recovered cores from low-salinity interstitial water anomalies, numerous infrared cold spots, decrease in void gas C1/C2 ratios, as well as from gas-hydrate-related moussy and soupy sediment textures. Gas hydrate was also observed directly in the recovered

cores. The combined observations show that gas hydrate occurs mainly within coarser grained turbidite sands and silts. Several key factors appear to control its occurrence, including local methane solubility linked with pore water salinity, fluid and/or gas advection rates, and availability of suitable host material.

In previous published models for gas hydrate formation in an accretionary margin, the highest concentrations of gas hydrate were expected to occur near the base of the gas hydrate stability zone above the bottom-simulating reflector (BSR). In spite of evidence for widespread gas hydrate–related BSRs, by far the largest concentrations of gas hydrate were observed well above the base of the gas hydrate stability zone at a point where the amount of methane in the pore fluid exceeded the local methane solubility threshold. This condition was most evident at Sites U1326 and U1327, where gas hydrate was observed in sections several tens of meters thick at a shallow depths of ~100 mbsf, with concentrations locally exceeding 80% of the pore volume. Another site of very high gas hydrate concentrations was the cold vent Site U1328, where beds containing massive forms of gas hydrate occurred within the top ~40 mbsf with concentrations locally exceeding 80% of the pore space as a result of focused fluid/gas migration along imaged fault systems from deeper sources.

—The IODP Expedition 311 Scientific Party

An infrared (IR) image of the Expedition 311 Scientific Party on the bow of the JOIDES Resolution *highlights the unique nature of gas hydrate expeditions and the important use of IR technology in gas hydrate core studies. In alphabetical order: F. Akiba, M. Blanc-Valleron, T. Collett, M. Ellis, G. Guèrin, Y. Hashimoto, V. Heuer, Y. Higashi, M. Holland, P. Jackson, M. Kaneko, M. Kastner, J. Kim, H. Kitajima, P. Long, A. Malinverno, M. Malone, G. Myers, L. Palekar, J. Pohlman, M. Riedel, M. Rothfuss, P. Schultheiss, B. Teichert, M. Torres, A. Tréhu, F. Tuynder, J. Wang, U. Wortmann, and H. Yoshioka. Photo: IODP-USIO (TAMU)*

Expedition 312
Superfast Spreading Rate Crust 3

Expedition 312 Science Party (in alphabetical order): J. Alt, R. Anma, N. Banerjee, J. Carlut, D. Christie, R. Coggon, L. Galli, N. Hayman, N. Hirano, S. Ingle, J. Koepke, C. Laverne, J. Maclennan, S. Miyashita, S. Morgan, N. Neo, S. Park, B. Scheibner, S. Swift, D. Teagle, A. Tikku, M. Tominaga, A. Veloso, D. Wilson, T. Yamasaki, S. Yamazaki. Photo: IODP-USIO (TAMU)

IODP Expedition 312 was the third ocean drilling cruise in a multiphase mission that successfully recovered a complete section of the upper oceanic crust—from extrusive lavas down through dikes and into gabbros. In November and December 2005, Expedition 312 successfully deepened Hole 1256D—initiated during ODP Leg 206 and revisited by IODP Expedition 309—by 250 meters to a total depth of 1507 meters below seafloor (mbsf). Hole 1256D is located in crust that formed 15 million years ago at the East Pacific Rise during a period of superfast spreading (>200 mm/year). This site was chosen to exploit the inverse relationship observed from seismic experiments between spreading rate and the depth to axial low-velocity zones, thought to be magma chambers now frozen as gabbros. Hole 1256D is the fourth-deepest hole drilled into oceanic basement since the inception of scientific ocean drilling in 1968 and the second-deepest penetration into intact ocean crust after Hole 504B.

The upper 754 meters of basement rock in Hole 1256D consists mostly of sheeted and massive lava flows with minor pillow lavas, capped by a ponded lava flow over 74 meters thick. Below the lavas is a thin (~60 m) lithologic transition zone in which dike-chilled margins become more common downhole. The 345-meter-thick sheeted dike section comprises massive basalts with common doleritic texture and subvertical intrusive dike contacts. Gabbros were encountered at 1407 mbsf, within the depth range predicted from modern multichannel seismic experiments, confirming the inverse relationship between spreading rate and depth to the axial melt lens. Coring continued 100.5 meters into the plutonic section, which consists of two intrusive gabbroic bodies 52 and 24 meters thick, separated by a 24-meter-thick dike screen. Compositions of the gabbroic bodies are similar to the lavas and dikes, but are evolved compared to primary melts from the mantle. This means that cumulates must form deeper in the crust and that the lower crust cannot form by subsidence of high-level evolved melt lenses like those penetrated by Hole 1256D.

The transition from low-temperature alteration to high-temperature hydrothermal alteration coincides with the transition from lavas to dikes. Below ~1028 mbsf, the presence of chlorite, actinolite, prehnite, titanite, and epidote indicate hydrothermal alteration under subgreenschist to greenschist facies conditions. The lower 50 meters of the dikes display granoblastic textures and contain secondary pyroxenes as the result of contact metamorphism by underlying gabbros. The gabbros are variably altered to amphibolite and greenschist assemblages, with the intensity of alteration increasing with grain size and proximity to igneous contacts.

Based on interpretation of seismic experiment data, the layer 2 to layer 3 transition occurs below the bottom of Hole 1256D which does not correlate with the cored transition from dikes to gabbro. Hole 1256D remains open, in good condition, and ready for deeper drilling—to test models for lower oceanic crust formation and for magma chamber and hydrothermal processes.

—The IODP Expedition 312 Scientific Party

Seven Schlanger Fellowships Awarded in 2006

The Schlanger Ocean Drilling Fellowship Program offers merit-based awards for outstanding graduate students to conduct research related to the Integrated Ocean Drilling Program. The $28,000-per-year award is to be used for stipend, tuition, benefits, research costs, and travel. Research may be directed toward the objectives of specific expeditions or may address broader themes.

Alexandra Abrajevitch

University of Michigan

"Rock magnetic record of the Asian monsoon preserved in Bengal Fan sediment: A new look at an old problem"
Relevant Expedition: ODP Leg 116

Research Abstract: Various geologic proxies indicate that the Asian monsoon system changed significantly about 7 to 8 million years ago, yet the nature and cause of this change remains unclear. Potential scenarios range from increased aridity to intensification of the monsoon (i.e., increased precipitation) that developed either in response to a pronounced uplift of the Tibetan Plateau or as a local response to global climate change. The main goal of my Schlanger Fellowship research is to explore the nature of this change—aridity versus intensified monsoons—by measuring variations in the relative abundances of climate-sensitive minerals, such as goethite and hematite, in sediments of the Bengal Fan.

Biography: After growing up in Kazakhstan, I received my B.S. degree in geology and geophysics from the St. Petersburg State University (Russia) and a MPhil degree in earth sciences from the University of Hong Kong (Peoples Republic of China). My professional interests are in applying paleomagnetism and rock magnetism methods to a variety of geologic problems, including the tectonic assembly of Eurasia and the collision of India and Asia. While taking part in research projects that focused on mountain-building episodes, such as evolution of the Ural-Mongol belt and Himalayan-Tibet orogen, I became interested in the relationship between tectonics and climate. How do orogenic belts modify climate on local to global scales? How does climate influence erosion of the mountains? The Schlanger Ocean Drilling Fellowship will allow me to indulge my interest in using rock magnetic tools to recognize environmental change as I pursue my Ph.D. at the University of Michigan.

The Schlanger Ocean Drilling Fellowship program is supported by the U.S. Science Support Program associated with the IODP through a cooperative agreement with the U.S. National Science Foundation. The fellowship is open to all graduate students enrolled at U.S. institutions in full-time Ph.D. programs.

Erin Banning

Woods Hole Oceanographic Institution

"An in situ incubator for sampling subseafloor microbial communities"
Relevant Expedition: IODP Proposal 677-Full

Research Abstract:The potential exists for a vast subseafloor microbial biosphere. The ocean crust provides much more habitat for mineral-attached microorganisms than that available for pelagic microorganisms. Many traditional microbiological methods are focused on pelagic forms, and the techniques for culturing subsurface microorganisms are not well developed. For my research, I will design and test a mineral-packed, flow-through column to act as an in situ borehole microbial colonization reactor. It will be deployed during an upcoming drilling expedition to the flank of the Mid-Atlantic Ridge and will act as a laboratory incubator for culturing subsurface microorganisms.

Schlanger Fellowship applicants are encouraged to propose innovative and imaginative research projects. JOI convenes a panel of scientists familiar with ocean drilling to evaluate fellowship applications. Fellow selection is based strongly on research potential and quality.

Biography: Throughout my childhood—spent mostly in Kansas City but also in New Jersey, New York State and Colorado—I was interested in science and space. Despite this, I've taken a circuitous ten-odd-year path to reach my current position as an oceanography graduate student. My journey has included a high school plan to go to art school, a bachelor's degree in newspaper journalism from Syracuse University, a few years designing news pages for a Florida newspaper, and extended road trips around the United States. Somewhere along the way, I realized that I'd rather be answering my questions about the limits of life and its interaction with the physical universe as a scientist, than asking them as a journalist. This revelation led to a second bachelor's degree—in biology at the University of South Florida—before I arrived at Woods Hole Oceanographic Institution. Whenever I'm not in the laboratory, I try to kayak, SCUBA dive, hike, and read as much as possible.

Hiroko Kitajima

Texas A&M University

"Sediment consolidation state and fluid flow properties of Nankai Trough and Cascadia Margin accretionary subduction zones"
Relevant Expeditions: ODP Legs 190 and 196, and IODP Expedition 311

Research Abstract: To better understand fluid flow and earthquake mechanisms in subduction zones, my research focuses on sediment consolidation state and fluid-flow properties. My experiments on IODP/ODP samples at high pressure and temperature will simulate subseafloor conditions where sediments are subducted and accreted. The mechanical and hydraulic data will allow sub-

seafloor systems of coupled deformation and fluid flow to be numerically modeled. My goals are to 1) determine permeability/porosity structures of accretionary prisms, 2) empirically evaluate long-term sediment compaction and cementation processes, and 3) characterize interaction between deformation and fluid flow.

Biography: Before I arrived at Texas A&M University in 2004, I received my B.S. degree in geology at Kyoto University (Japan). As a sophomore, I was impressed by a book entitled, "The Origin of Continents and Oceans." The author, Alfred Wegener, is the person who first proposed continental drift although he was an expert in meteorology rather than geology. This example helps me keep in mind that it is necessary to obtain a broad perspective and to combine evidence from all disciplines in studying earth science. In this regard, I found participating in IODP Expedition 311 to be a great opportunity to share all kinds of information with many scientists, and I hope to take part in another IODP expedition in the future. To study in the U.S. is also a wonderful opportunity because I meet many women scientists—still rarely seen in Japan, especially in the field of geology. I truly appreciate the Schlanger Fellowship which is open to all graduate students studying in the U.S., regardless of their nationality.

Mark Lever

University of North Carolina

"Community composition, metabolism and activity of methanogens at two Ocean Drilling Program sites"
Relevant Expeditions: ODP Leg 201 and IODP Expedition 301

Research Abstract: I will study patterns in methanogen community composition along environmental gradients of substrate concentrations, temperature, and lithology via PCR-assays of DNA and ribosomal RNA (rRNA) at IODP Site U1301 and ODP Site 1230. Using a multidisciplinary approach combining in situ energy yields, ^{13}C-signatures of methane, phylogenetic affiliations of environmental clones, and enrichment experiments, I will infer biochemical pathways of methanogenesis. I will then relate data on community composition and biochemical pathways to net metabolic activity and activity profiles to better understand the controls on marine subseafloor community structure and activity.

Biography: I was born in Boston and my family lived near the ocean—allowing me to explore the nearby beach, rocks and tidal pools. From age 5 to 18, I lived in Germany where my focus shifted to puddles, ponds, and creeks. I also had several aquaria—the most fascinating had stinky mud from a nearby pond. In high school, playing tuba sidetracked me from water and mud, and a tuba professor led me to Boston University. However, I missed studying nature and switched to biology—then marine biology. For my masters degree research I studied benthic microphytes in estuaries at Woods Hole Oceanographic Institution. There I met Andreas Teske who later became my Ph.D. adviser at the University of North Carolina, Chapel Hill. When I took part in IODP Expedition 301, I became completely dedicated to the study of subsurface microbial ecology and biogeochemistry. Tuba playing is on hold, but music continues to be my main hobby and I spend a lot of time deejaying electronic music.

Next Application Deadline
November 15, 2006
For more information, please visit
www.usssp-iodp.org/Education/Fellowship/default.html
or e-mail schlanger@joiscience.org

Micah Nicolo

Rice University

"Eolian grain-size records across the Paleocene-Eocene transition: Constraints on atmospheric circulation during global climate change"
Relevant Expeditions: ODP Legs 198 and 208

Research Abstract: Eolian material in open-ocean sediments at several drill sites becomes significantly finer across the Paleocene-Eocene (P-E) transition. This may represent a profound global decline in the intensity of atmospheric circulation coinciding with rising earth surface temperatures. However, the P-E transition is complicated by both short- and long-term climate changes, and available eolian records are low in temporal resolution. To add to the discussion of global applicability of paleo-eolian grain-size interpretations, I will produce the first high-temporal-resolution records of eolian grain-size across the P-E transition from two distant sites (Site 1263, South Atlantic, and Site 1209, North Pacific).

Biography: I grew up in the Finger Lakes region of central New York State and remained there for my undergraduate degrees in political science and geology, which I received from Hobart College in 2001. Prior to graduation I participated in a semester with the Sea Education Association, where I found that I immensely enjoyed oceanographic research and that I clearly did not want to be a lawyer. The following year I worked as an intern and program assistant for Joint Oceanographic Institutions. There, I gained a unique perspective on the role of politics in science and identified the type of project and advisor I wanted for a graduate research program. My Ph.D. work with Jerry Dickens at Rice University has me pursuing topics centered on the effects of early Paleogene global climate change. To this end, I have sailed on ODP Leg 208 (Early Cenozoic Extreme Climates: The Walvis Ridge Transect) and conducted fieldwork on outcrops in New Zealand. I plan to eventually pursue a career in academia.

As part of their fellowship experience, Schlanger Fellows will visit the office of Joint Oceanographic Institutions (JOI) in Washington, DC, to present initial results of their research and to take part in U.S. Science Support Program-related activities.

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2006 Schlanger Fellowship Awards

continued from page 11

Patrick Rafter

Scripps Institution of Oceanography

"Tropical Pacific nutrient dynamics over the past 1 million years: Mechanistic insight to the origin of the 100 Kyr climate cycle"

Relevant Expeditions: ODP Legs 130, 138, and 202

Research Abstract: The dominant rhythm in the timing of the late Pleistocene ice ages, 100 kyr, has never been fully explained. The question I propose to address is: How has the relationship between global climate and the tropical Pacific Ocean evolved since the onset of the 100-kyr climate cycling about 1 million years ago? My preliminary evidence from nitrogen isotope records from piston core sediments indicates that this cycle is evident in the eastern Pacific, but completely absent in the western tropical Pacific during the late Pleistocene. I believe that extending these records beyond 1 million years ago using Oceand Drilling Program cores should provide strong constraints on the origin and amplification of ice age cycles.

Biography: My explorations began along the shifting sand dunes of a New Jersey barrier island with the Atlantic Ocean on one side and wetlands on the other. My desire to fundamentally understand my local environment led me to double major in environmental science and marine environmental studies at Florida Institute of Technology. This multi-disciplinary education was a great background for the next stage in my academic career—studying the puzzles associated with glacial to interglacial climate change. Now, in pursuit of a piece of this puzzle I am investigating tropical Pacific nutrient dynamics from 1 million years ago to the present at the Scripps Institution of Oceanography. The tools I will be employing are the nitrogen isotopes of bulk sediment, diatom-bound nitrogen, and modern day nitrate.

Sam VanLaningham

Oregon State University

"Documenting the source of the Meiji Tongue over the last 200,000 years: Implications for deepwater dynamics in the North Pacific"

Relevant Expeditions: DSDP Leg 19 and ODP Leg 145

Research Abstract: Since the early Cenozoic, deepwater currents in the North Pacific Ocean have deposited nearly two kilometers of sediment to form a 1500-km-long, ~300-km-wide feature known as the Meiji Tongue. Sediment sources for this drift deposit are unknown, but dense deepwater overflows from the Bering Sea may be involved. I will use traditional Sr, Nd and Pb isotopic tracers coupled with ^{40}Ar-^{39}Ar age determinations on bulk terrigenous sediment to constrain the sources of continental material to the drift. Identifying these sources and tracking changes in provenance through time will provide better constraints on North Pacific deepwater movements and may increase understanding of the evolution of Northern Hemisphere climate on glacial-interglacial timescales.

Biography: I was raised on the east flanks of the Cascades in Ellensburg, Washington by a bookkeeper and a boatbuilder. This is probably where my interests in mountains, math and water began. I earned a B.S. in geology from Central Washington University. Pursuit of a M.S. in geology from Oregon State University introduced me to sediment transport processes related to tectonics. Since then I have been learning what sediments can reveal—from their sources on land to their final destination on the seafloor—about oceanographic and climatic processes. I'm working toward a Ph.D. degree under the direction of Bob Duncan and Nick Pisias in the College of Oceanic and Atmospheric Sciences at Oregon State University. In the future, I hope to integrate what I have learned to study interactions between climate and tectonics through the sediment record. Away from my research, I love spending time with my wife, Christie, and have a variety of interests, many related to music, woodworking and the outdoors.

Graduate Student Opportunity to Visit Japan in Summer 2007

Joint Oceanographic Institutions (JOI) is soliciting pre-proposal letters of interest from U.S. graduate students pursuing research related to the Integrated Ocean Drilling Program who wish to visit Japan in summer 2007 as part NSF's East Asia and Pacific Summer Institutes for U.S. Graduate Students (EAPSI) Program (www.nsf.gov/funding/pgm_summ.jsp?pims_id=5284&org=OISE&from=home). Japan's Center for Deep Earth Exploration (CDEX), a part of JAMSTEC, has agreed to host U.S. EAPSI participants, particularly those interested in its new research vessel *Chikyu*, riser drilling technology, or developing contacts and research ideas with JAMSTEC scientists. The visits will be for approximately 10 weeks between June and August 2007.

The pre-proposals should be two pages or less and should describe the applicant's motivation to visit Japan, ideas about potential summer projects, and the relevance to scientific ocean drilling. JOI will work with the most promising candidates to finalize a full proposal to the EAPSI Program by December 12, 2006. Students may also contact JAMSTEC scientists directly to discuss potential projects. 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. graduate students with colleagues in Japan and coordinate logistics and timing of potential joint projects that are relevant to the IODP. Please send your pre-proposal to Holly Given, JOI (202-787-1611, hgiven@joiscience.org) by July 15, 2006. Interested applicants may contact NSF Program Managers for assistance; questions about the program can also be directed to Rodey Batiza, NSF/OCE (703-292-7710, rbatiza@nsf.gov).

Nankai Trough Seismogenic Zone Drilling in 2007

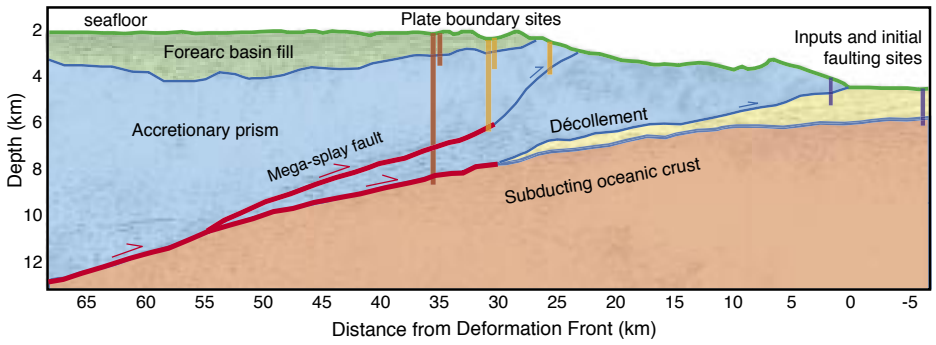
Opportunities for NanTroSEIZE Participation Abound

The first deep riser-drilling program for the Integrated Ocean Drilling Program (IODP) targets the Nankai Trough, an active seismogenic zone where the Philippine Sea plate is being subducted beneath Japan—resulting in a potential for earthquakes of a magnitude up to 8+ and tsunamis. The processes governing the occurrence of powerful subduction earthquakes like the December 2004 Sumatra event are not well understood. Access to the interior of active faults where processes can be monitored and fresh materials can be sampled is essential to understanding earthquake mechanics. The scheduled drilling follows the IODP Science Advisory Structure ranking of Complex Drilling Proposal 603 Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) as a priority among both riser and riserless drilling proposals.

NanTroSEIZE drilling is currently scheduled to kick off with what will be among the first expeditions of both the *Chikyu* and the U.S. Scientific Ocean Drilling Vessel (SODV) in late 2007. The first stage of NanTroSEIZE will target (a) the sediment section, fluids, and basement entering the plate boundary system at the trench; (b) the shallower portions of the thrust faults up-dip of the seismogenic zone; (c) the forearc basin, gas hydrate reflector, and prism interior above the seismogenic zone; and will include (d) the first borehole observatory CORK system. This Stage 1 drilling will address exciting portions of the overall science plan as well as prepare the way for deeper, riser-based drilling to come in 2008 and beyond. Planned highlights include the inaugural IODP expedition with *Chikyu*—a cruise focused on Logging-While-Drilling (LWD) to obtain state-of-the-art data logs from the riserless sites and an SODV expedition to emplace an advanced, multi-sensor CORK system above the up-dip edge of the megathrust. Three separate *Chikyu* expeditions and two with the U.S. SODV, all in FY2008, will require a shipboard and shore-based scientific team of unprecedented size (50 to 100 scientists) and scope.

An overview for the five planned Stage 1 expeditions will be published electronically by IODP this summer, accompanied by a call for shipboard and/or shore-based scientific participants for all five of those expeditions. Watch for that announcement in *Eos* and online at www.iodp.org!

-Harold Tobin, U.S. Chief Project Scientist for NanTroSEIZE, New Mexico Institute of Mining and Technology (tobin@nmt.edu)



This cross-section schematically shows the planned drilling sites in the Nankai Trough subduction zone. Pilot holes at these sites will be drilled in Stage 1 of the program, beginning in late 2007.

Preparing for Nankai Trough Drilling with 3-D Seismic Data

To prepare for the multi-year NanTroSEIZE program, the Japanese Implementing Organization (CDEX) and the U.S. NSF agreed to fund a commercially acquired 3-D seismic data volume to refine the proposed IODP drill sites in the Kumano Basin of the Nankai Trough seismogenic zone. To facilitate planning, JOI provided travel funds for two U.S. scientists associated with the NanTroSEIZE project—Greg Moore, University of Hawaii, and Nathan Bangs, University of Texas at Austin—to meet with their Japanese colleagues and the "Asia groups" of several potential contractors to discuss numerous survey design and contracting details that have tremendous cost implications for such a large seismic acquisition project.

To learn more about NanTroSEIZE planning efforts, visit www.ees.nmt.edu/NanTroSEIZE/

Various acquisition parameters affect quality and cost. Face-to-face meetings were essential to understand the potential trade-offs determining each contractor's bid price. In May 2005, Moore and Bangs met in Singapore with representatives of the contractors to discuss general issues. Additional meetings with operations, sales and processing personnel for each of the companies followed before a negotiation strategy was developed. Next, acquisition specifications were finalized and an invitation to tender was issued. Before and after these meetings, Bangs visited Shell Exploration and Production in Houston to discuss the contracting process. As frequent users of the potential Asian contractors, Shell staff offered independent perspectives on the contracting process, the contractors' facilities, and other insights.

The CDEX and U.S. groups jointly decided to choose Petroleum Geo-Services (PGS) to conduct the survey. In late October 2005, Bangs joined Moore to meet with PGS operations and processing personnel at CDEX to discuss details of the program's acquisition and processing phases. During November, the JAMSTEC accounting group continued negotiations with PGS; the final contract was signed in January 2006. The survey began on April 10 and continues as this issue goes to press.

Greg Moore relocated to Japan in early 2006 to take on the important role of Advisor to the Director-General of CDEX, where he will continue to provide international NanTroSEIZE coordination.

New Horizons for Familiar Faces

News from the National Science Foundation

Rodey Batiza and Jamie Allan
Program Directors, NSF/ODP

In December 2005, NSF approved a contract, between Overseas Drilling Limited (ODL) and the Texas A&M Research Foundation, for ODL to provide the riserless U.S. Scientific Ocean Drilling Vessel (or SODV) for the Integrated Ocean Drilling Program (IODP). This "new" riserless vessel will be the *JOIDES Resolution*, rebuilt and renamed. Substantial improvements to this 20-year veteran of scientific ocean drilling will include a 50% increase in lab space along with more privacy, recreational space, and berths for expedition participants. Sixty bunks, an increase of 23, in double- or single-person rooms (No more cozy four-person rooms!) will provide great flexibility for sailing engineers, educators, and others. Significant upgrades are also planned for the riserless rig facilities, and studies are being conducted to lengthen the ship by 30 feet.

The vessel conversion project will cost an estimated $115 million. The first $73 million in funding has been approved in FY2005 and FY2006, and the remaining $42 million is planned for the FY2007 budget. The drill ship should be ready for operations in late summer 2007. Community input regarding the vessel's design is still welcome. A briefing book describing all aspects of the renovated drilling vessel's capability and habitability is available at www.joialliance.org/MREFC/briefing_book/default.html. Comments may be directed to JOI or members of the SODV Program Advisory Committee (Peggy Delaney, Chair), Science Lab Conversion Design Team (Mitch Malone, Chair), and the SODV Independent Oversight Committee (Rannie Boyd, Chair). At NSF, John Walter has primary responsibility for rebuilding the SODV.

JOI and subcontractor, Metcalf and Eddy, will produce a new Environmental Impact Statement for IODP SODV operations for NSF. The National Oceanic and Atmospheric Administration/National Marine Fisheries Service will serve as a cooperating agency. In support of this project, a series of scoping group meetings held nationwide in February allowed the public to learn about and comment on the proposed activities.

On other fronts, Julie Morris has been selected as the new Director of the Ocean Sciences Division at NSF. Veteran ODP and IODP participants know her from scientific expeditions, her excellent work as Chair of the JOIDES Dynamics of the Earth's Interior Science Steering and Evaluation Panel, and as the current 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 Marine Geosciences Section plans to hire two scientists as new rotators in 2006, one in the NSF/ODP Program and one in the Marine Geology and Geophysics Program. The selection process should be concluded this spring.

The new U.S. seismic vessel, the 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 of Columbia University, is being modified to support other tasks required of a general research vessel.

And last—but not least—FY2006 funding for the NSF Ocean Sciences Division is slightly higher than in FY2005, with support for ship operations remaining tight. In FY2006, the NSF/ODP Grants program will have greater ability to fund site survey and equipment research in support of IODP drilling proposals, including Expedition Objective Research proposals. As a consequence, there are a number of newly funded programs which are listed in the announcement on this page.

New and Upcoming Activities Funded by NSF-ODP

Expedition Objective Research (EOR)

Ex. 302 ACEX: Arctic paleoceanography and chronology (Moore [U. Michigan])
Ex. 302 ACEX: Iron fingerprinting of sediments (Darby [U. Alaska])
Ex. 304/305 Core complex: Structure/geochronology (John [U. Wyoming])

Borehole

Engineering phase of CORK development for second Juan de Fuca Ridge flank hydrogeology program (Fisher [UCSC] et al.)
Additional funds have also been provided to the SeisCORK development effort (Stephen [WHOI])

"High Risk" proof of concept

Linking climate change and geodynamo/orbital variations (Acton [UC Davis])
Massively parallel DNA sequencing capability (House [PennState])

"Visualization"

Corewall development (Ito [U. Minnesota])

Recently completed NSF-supported IODP-related activities

IODP Expedition 301 Juan de Fuca CORKs/Osmosamplers (Becker [U. Miami] et al.)

Upcoming NSF-funded site surveys supporting IODP proposals

2006: Cenozoic paleo-equator (Lyle [Boise State], IODP Proposal 626)
2006: Louisville hotspot chain (Lonsdale [SIO] and Mahoney [U. Hawaii], piggyback IODP Proposal 636)
2006: Nankai CDP site survey in partnership with CDEX (Moore [U. Hawaii], IODP Proposal 603)
2006-07: South Pacific Gyre (D'Hondt [URI], IODP Proposal 662)
2006-08: Analysis of NW Australia industry 3-D seismic data (Fulthorpe et al. [UTIG])
2007: Costa Rica MARGINS (Holbrook [Wyoming], IODP Proposal 537)
2007: Ninety East Ridge (Sager [TAMU] and Frey [MIT])
2008: Juan de Fuca hydrogeology expedition drilling preparation (Fisher [UCSC])

Proposal Target Dates: August 15 and February 15
www.nsf.gov/funding/pgm_summ.jsp?pims_id=13524

Synergy and Scientific Drilling

A Letter from the Chair

Syn·er·gy (noun): The working together of two or more things, people, or organizations, especially when the result is greater than the sum of their individual effects or capabilities.

Scientific ocean drilling is an excellent example of synergy. Provocative scientific ideas are teamed with long-range planning, drilling operations, science support, scientists, students, and society to produce exciting discoveries and results. A myriad of people and systems—each with a unique role—must coordinate their efforts to implement a successful drilling expedition—no small feat given the breathtaking scope of the scientific problems being investigated. For example, no one scientist alone in his or her laboratory could imagine being able to characterize the subseafloor biosphere in the Pacific, yet with the efforts of many—and synergy—the Integrated Ocean Drilling Program (IODP) has done just that.

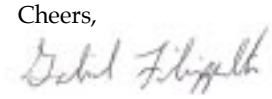
On a smaller scale, we collectively minimize another critical synergy—that between research practice and research translation. Another way of stating this is that we scientists often have to be reminded that our research would not be funded were it not for the continued interest and commitment of the citizens and government of our country. We sometimes take for granted that our efforts in scientific ocean drilling are universally important and of the highest priority, when in fact these efforts compete against many other worthwhile investments. Obviously, the National Science Foundation does not take this for granted, by explicitly including research objectives and "broader impacts" in their proposal review criteria. "Broader impacts" can be overarching scientific contributions, but can also constitute efforts by scientists to develop Education and Outreach (E&O) components into funded scientific efforts.

A dynamic tension seems to exist between research and E&O, such that a perception exists that if you have one, you shouldn't or can't have the other. Although we often "self-classify" our interests as research or E&O, a synergy has always existed between these activities that makes research more humanly tangible and E&O more gripping and timely. Any teaching academic has seen this synergy in the classroom. Students listen to and occasionally learn about various scientific topics that their teachers have lifted from textbooks. However, when given a lecture about research that the teacher or student has actually participated in, both excitement and learning are maximized. It is these examples that—for better or worse—are the ones that students often remember years after they graduate.

USAC has made several discrete efforts to integrate E&O into scientific ocean drilling. First, USAC membership itself reflects a balance of expertise to match the synergy between research and E&O. Second, USAC has a standing Education and Outreach Subcommittee, currently chaired by Lisa Robbins, which works closely with JOI staff to link research and E&O objectives of the U.S. Science Support Progrm (USSSP) in creative ways. Third, USAC has added an E&O objective statement to the review criteria for USSSP-funded workshops. Although not all types of workshops may be enhanced by an E&O component, most are. Thus all proposals will have to at least consider the appropriateness of E&O, and proponents will be encouraged to use the E&O expertise that resides at JOI and on USAC.

As part of USAC's commitment to education and outreach, we also look forward to nominating truly diverse slates of individuals to the Science Advisory Structure for IODP and to USAC. As a reminder, USAC will make recommendations for these panels (see page 16 of this newsletter) at our July meeting. We urge you to self-nominate or nominate others who embrace the concept of synergy at many levels.

Cheers,



Gabe Filippelli
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JOI News

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IODP Needs YOU!

Call for U.S. Volunteers and Nominations to Scientific Ocean Drilling Panels and Committees
Deadline: June 30, 2006

Both experienced and new members are needed. Young scientists are strongly encouraged to become involved.

U.S. Advisory Committee (USAC) for Scientific Ocean Drilling

USAC will nominate five new members in July 2006. Members are appointed by the Joint Oceanographic Institutions (JOI) Board of Governors, and will serve three-year terms beginning October 1, 2006. USAC is the U.S. national committee for scientific ocean drilling, representing the interests of the U.S. scientific community to the Integrated Ocean Drilling Program (IODP). USAC provides guidance to JOI in managing the U.S. Science Support Program (JOI/USSSP), which supports U.S. participation in the IODP.

Science Advisory Structure (SAS) for the Integrated Ocean Drilling Program (IODP)

USAC invites expressions of interest and nominations to join more than 50 U.S. scientists and engineers serving in the Science Advisory Structure (SAS) of the IODP. At its July 2006 meeting, USAC will appoint new U.S. SAS members for the following panels:

- Science Steering and Evaluation Panel (SSEP)
- Site Survey Panel (SSP)
- Scientific Technology Panel (STP)

USAC will also make recommendations to the JOI Board of Governors for three of the seven U.S. Science Planning Committee (SPC) members.

Please see **www.usssp-iodp.org/advisory_committees/panel_nominations** for more detailed information regarding these panels, their roles in the SAS, and terms and commitments of panel members.

U.S.-based scientists willing to represent the U.S. ocean drilling interests should send a two-page CV and a cover letter to: Carl Ebeling, JOI/U.S. Science Support Program, at cebeling@joiscience.org. Letters should briefly document any previous committee experience, a description of interests in IODP and related activities, and an indication of preferred panel assignment. The nomination deadline is June 30, 2006.

For more information about this opportunity, please contact Gabe Filippelli, USAC Chair, at gfilippe@iupui.edu, Christina Ravelo, USAC Nominations Subcommittee Chair, at acr@ucsc.edu, or Holly Given, USSSP Director, at hgiven@joiscience.org.