

FALL
2013

CORE DISCOVERIES

The Newsletter for
US Scientific Ocean Drilling

Advisory Panels Merge in the new IODP *pg. 4*

How Core Logging Works *pg. 6*

Antarctic Cores Tell of
a Planet in Flux *pg. 9*



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On the cover: Heather Barnes (IODP-USIO) stands on the helideck of the JOIDES Resolution, watching for marine mammals during vertical seismic profiling (VSP) operations.

The International Ocean Discovery Program (IODP) is an international research program dedicated to advancing scientific understanding of the Earth through drilling, coring, and monitoring the seafloor. The US Science Support Program (USSSP) supports the involvement of the US scientific community in IODP and is funded by the US National Science Foundation (NSF). The *JOIDES Resolution* is a scientific research vessel managed by the US Implementing Organization of IODP (USIO). Together, Texas A&M University, Lamont-Doherty Earth Observatory of Columbia University, and the Consortium for Ocean Leadership compose the USIO. IODP is supported by: the US National Science Foundation (NSF); Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT); the European Consortium for Ocean Research Drilling (ECORD); the Australia-New Zealand IODP Consortium (ANZIC); India's Ministry of Earth Sciences; the People's Republic of China (Ministry of Science and Technology); the Korea Institute of Geoscience and Mineral Resources (KIGAM); and Brazil's Ministry of Education (CAPES). For more information, visit www.iodp.org.

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For more information about IODP, visit: www.iodp.org

For more information about USIO and USSSP, visit:
www.oceanleadership.org/programs-and-partnerships/



UPCOMING EVENTS/ MEETINGS/WORKSHOPS

IODP Town Hall

December 10, 2013, 5:30 PM
Marriott Union Square, Main Ballroom
San Francisco, California

Mini-Workshop: Aleutian Basin

December 11, 2013
San Francisco, California

usssp-iodp.org/workshop/aleutian-basin/

IODP Science Evaluation Panel

January 6-9, 2014
La Jolla, California

www.iodp.org/facility-boards

US Advisory Committee for Scientific Ocean Drilling Meeting

January 21-23, 2014
Monterey, California

usssp-iodp.org/committees/usac/

Workshop: Paleooceanography of the Brazilian Equatorial Margin

February 4-6, 2014
Maresias, Brazil

usssp-iodp.org/workshop/bem/

Workshop: Deep Drilling of the Amazon Continental Margin

March 24-26, 2014
Buzios, Brazil

usssp-iodp.org/workshop/amazon/

Chikyu IODP Board Meeting

February 18-21, 2014
Yokohama, Japan

Ocean Sciences Meeting

February 23-28, 2014
Honolulu, Hawaii

www.sgmeet.com/osm2014/default.asp

ECORD Facility Board

March 4-6, 2014
Bremen, Germany

www.ecord.org/ecord-fb.html

JOIDES Resolution Facility Board Meeting

April 23-24, 2014
Washington, DC

www.iodp.org/facility-boards

EXPEDITION UPDATES

JOIDES Resolution to Study Subduction and Volcanism at Izu-Bonin-Mariana System

Starting in March 2014, the *JOIDES Resolution* will begin a series of three expeditions focused on the Izu-Bonin-Mariana (IBM) arc. Each phase will explore a different aspect of this oceanic arc, formed by the subduction of the Pacific Plate underneath the Philippine Sea Plate. Previous drilling expeditions have looked at the IBM forearc and the volcanic front – both immediately to the west of the plate boundary on the overlying Philippine Sea Plate.

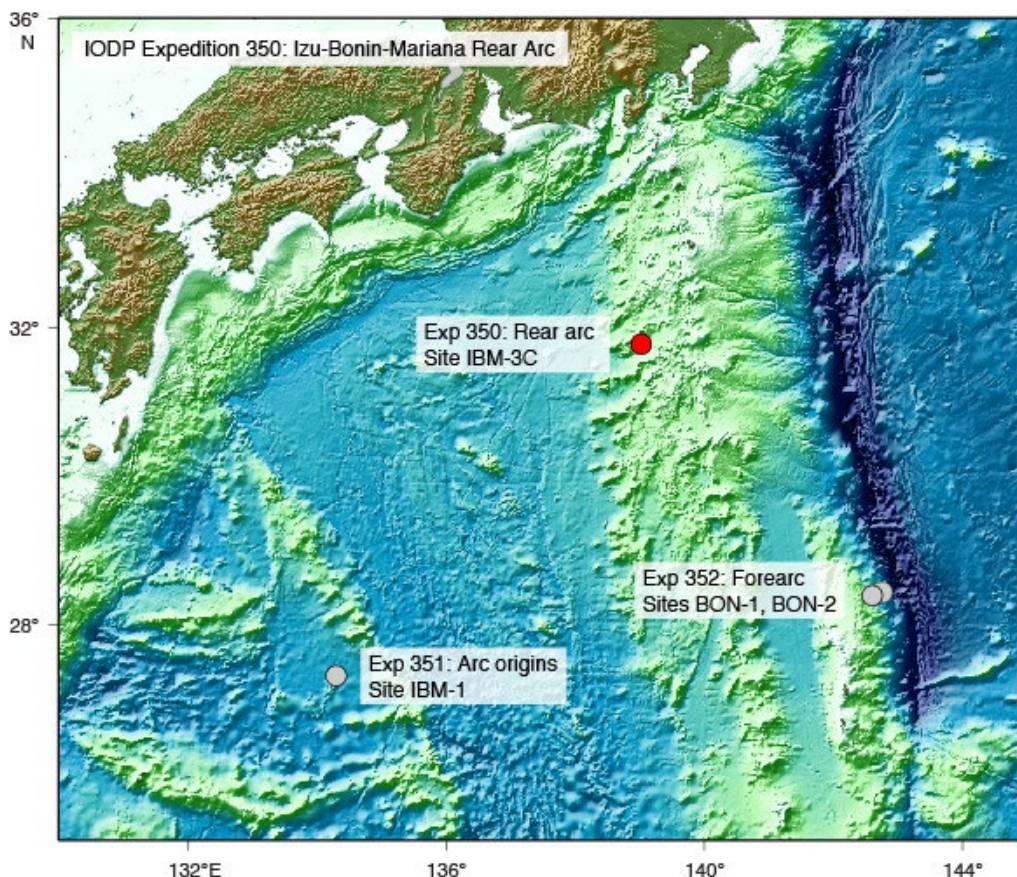
Expedition 350 (IBM Rear Arc) is scheduled to depart Keelung, Taiwan on March 30, 2014, led by co-chief scientists Yoshihiko Tamura (JAMSTEC/IFREE) and Cathy Busby (University of California, Santa Barbara). Expedition 350 will be the first to take a close look at the rear arc area further to the west. By recovering a complete record of rear-arc volcanism from the present back to its likely inception in early Oligocene or Eocene times, the science team hopes to add to our understanding of the development and chemistry of oceanic crust.

Expedition 351 (IBM Arc Origins) will sail from Yokohama, Japan on May 30, 2014, with co-chief scientists Richard Arculus (Australian National University) and Osamu Ishizuka (Geological Survey of Japan) leading the science team. This expedition will drill even further to the west, in the Amami Sankaku Basin, to understand what the oceanic crust looked like before IBM subduction began in the middle Eocene.

Expedition 352 (IBM Forearc) is under the direction of co-chief scientists Julian Pearce (Cardiff University, UK) and Mark Reagan (University of Iowa). Set to depart Yokohama on July 30, 2014, this expedition will drill to the east, very close to the edge of the Philippine Sea Plate. By obtaining core sections through the volcanic stratigraphy of the outer forearc, the science team aims to trace the processes of magmatism, tectonics and crustal accretion caused by subduction initiation in the IBM system.

Two Education and Outreach Officers will join each of these expeditions – one from the US and another from a partner nation. The search for these officers is underway as of press time. These teams will provide daily updates through Facebook, Twitter, and the blog page at www.joidesresolution.org, while coordinating a series of live Ship-to-Shore conversations with schools and museums. For more information on Education and Outreach opportunities, please contact Sharon Cooper: scooper@oceanleadership.org.

This map shows the drill sites for all three Izu-Bonin-Mariana (IBM) expeditions on board the JOIDES Resolution. Beginning with Expedition 350 (IBM Rear Arc) in March of 2014 (site location highlighted in red), the ship will spend a total of six months studying various aspects of this complicated and dynamic tectonic system, where the Pacific Plate subducts beneath the Philippine Sea Plate.



ADVISORY PANELS MERGE IN THE NEW IODP

Susan E. Humphris

Chair, *JOIDES Resolution* Facility Board



The Integrated Ocean Drilling Program encountered a recurring problem: the evaluation of the scientific merit of a proposal independent of an assessment of the site characterization data. Because both are necessary to develop a feasible drilling expedition, this often resulted in proposals being highly ranked scientifically, but then languishing for many years until site survey guidelines were met or the proposal became outdated. This disconnect caused frustration for many proponents who interpreted the advice they received from the two

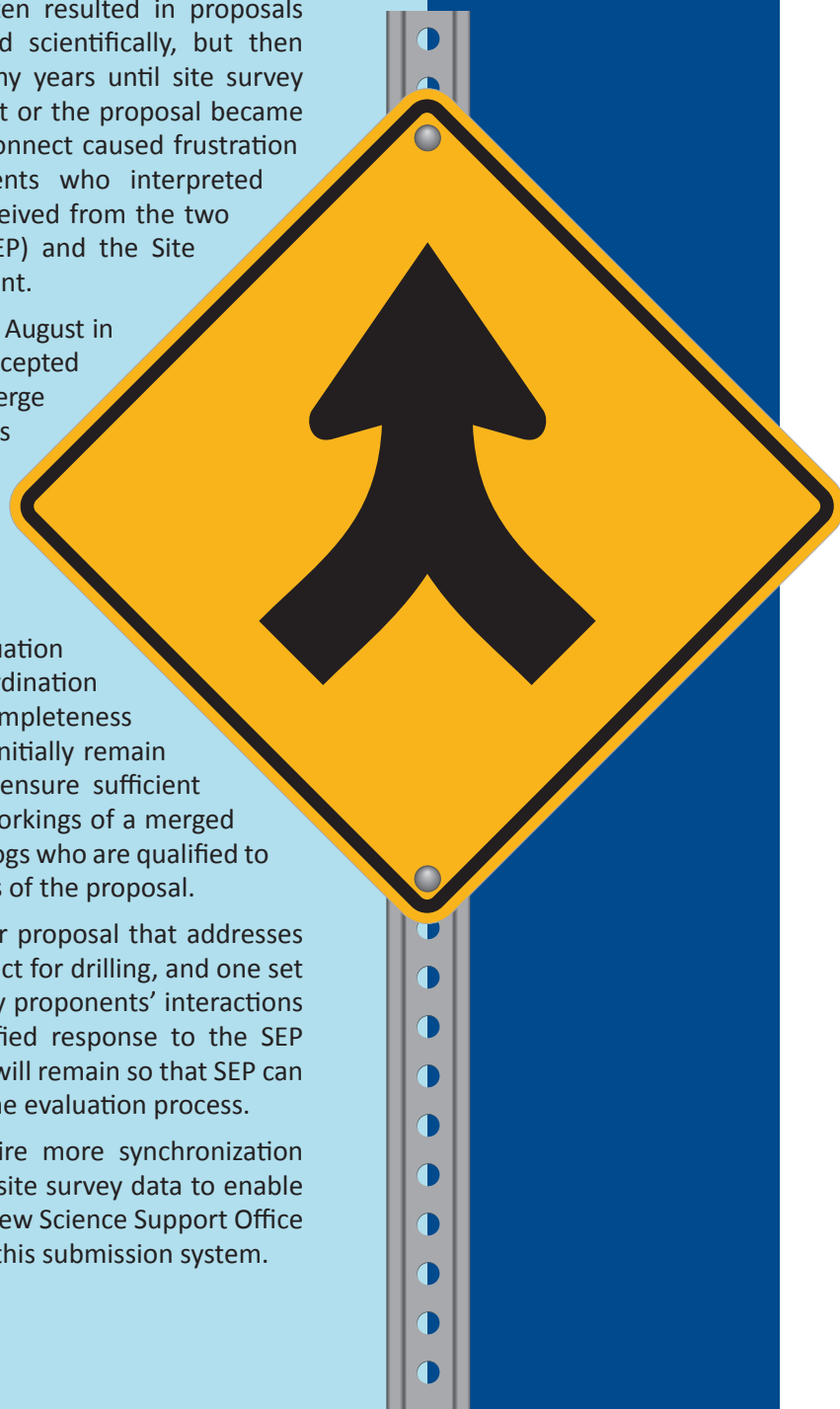
advisory panels – the Proposal Evaluation Panel (PEP) and the Site Characterization Panel (SCP) – as sometimes inconsistent.

This is now going to change. At its second meeting in August in Washington, DC, the *JOIDES Resolution* Facility Board accepted a recommendation from the Chairs of PEP and SCP to merge the two panels. This will better enable a proposal's scientific excellence and feasibility to be evaluated within the context of available and/or planned site survey information. The Chairs believe this will greatly facilitate communications with proponents by providing them with a more holistic review of their proposal.

The new panel, to be known as the Science Evaluation Panel (SEP), will have two Co-Chairs to ensure close coordination between assessment of scientific merit and of the completeness of supporting site survey data. SEP membership will initially remain about the same size as the two original panels to ensure sufficient breadth of expertise, but may be reduced once the workings of a merged panel become clear. Proposals will be assigned watchdogs who are qualified to provide advice and address questions about all aspects of the proposal.

Proponents will now receive one evaluation of their proposal that addresses both the scientific merit and the readiness of the project for drilling, and one set of guidance as to next steps required. This will simplify proponents' interactions with the advisory structure, requiring only one unified response to the SEP evaluation. The pre-proposal and full proposal system will remain so that SEP can provide guidance to the proponents at each stage of the evaluation process.

Such an all-inclusive evaluation scheme will require more synchronization between submission of full proposals and supporting site survey data to enable their complete examination at the SEP meetings. The new Science Support Office is working on the design and implementation plan for this submission system.



DRILL BITS

A New Decade of Discovery

On October 1, 2013, the Integrated Ocean Drilling Program transitioned to the International Ocean Discovery Program, beginning a new decade of international partnerships and collaborations on the program's three platforms. The start of the new program also brought a new member country: Israel became the 27th country to join IODP and the 19th country to join the European Consortium for Ocean Research Drilling (ECORD). Israel, like all member countries, will have representation at the IODP Forum, the international venue for exchanging ideas and views on the scientific progress of the program. As such, the IODP Forum is the custodian of the *2013-2023 IODP Science Plan* and provides advice to the Facility Boards on IODP's implementation across platforms. With new members, new expeditions, and new drilling proposals in the system, IODP is poised to continue its role as a leader in transformative research.



Papua New Guinea Site Survey Cruise

Four graduate students and two post-doctoral researchers participated in an NSF-funded site survey cruise in September, led by Yair Rosenthal and Greg Mountain (Rutgers University). Conducted on board the *R/V Roger Revelle*, the cruise gathered data in support of an IODP drilling proposal near Papua New Guinea. The US Science Support Program provided partial travel support for the students and post-doctoral researchers, who collected multi-channel seismic data and sediment cores. For some of the participants, it was their first experience collecting such data at sea and contributing to the design and implementation of an expedition. For more information, read their blog: <http://pacwarmpool.blogspot.com/>.

IODP Participates in GeoPRISMS Workshop

The IODP scientific community joined more than 170 participants from ten countries participating in a GeoPRISMS workshop in Wellington, New Zealand, earlier this year. The workshop's goal was to develop an implementation plan for the GeoPRISMS New Zealand Primary Site. Four geographic regions emerged as focus areas (Puysegur Trench, Hikurangi Margin, Taupo Volcanic Zone, Kermadec Arc), with several illustrating a strong collaborative relationship with IODP and using ocean drilling to understand subduction processes in the region. The draft implementation plan is available on the GeoPRISMS website (geoprisms.org/past-meetings/newzealand-apr2013.html) and will be discussed at the AGU mini-workshop "Kermadec Arc – Havre Trough Planning" on December 8, 2013.





From the rig floors of the drilling platforms to the desks of member offices worldwide, IODP is a dynamic yet complicated program. This section is designed to explain the “ins and outs” of different aspects of IODP. In each issue, we will select one or two topics to highlight – we invite you to test your IODP knowledge and to learn something new about the program.

Core Logging

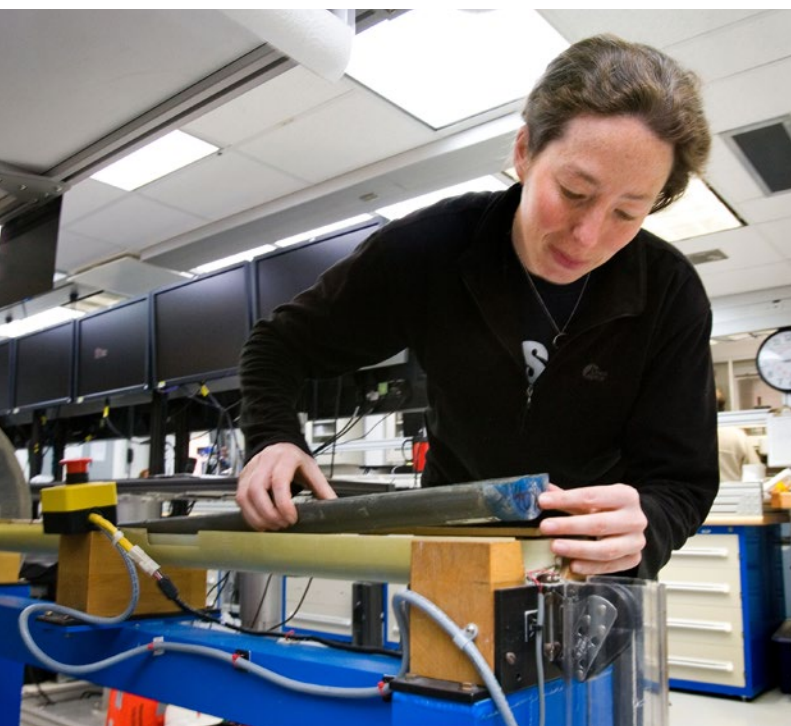
When fresh cores come on board the *JOIDES Resolution*, a lot of data is gathered before the science party begins sampling the core material directly. Indeed, valuable information can be collected even before the core sections are split in half. Every core section is systematically passed through a series of core loggers, each designed for a specific purpose, to gather basic information about the core’s physical properties. Although the same information could be gathered via traditional laboratory methods, this would consume much of the core material – not to mention a lot of time as well.

First the rig crew delivers cores to the catwalk, where the USIO technical staff cuts them into smaller sections (1.5 meters, or about 5 feet) for easier handling. Each section is clearly labeled, and then sits in a rack for at least four hours to equilibrate to room temperature and surface pressure. This ensures constant conditions for measuring physical properties, and also helps prevent pressurized core sections from extruding material that would contaminate the instruments.



The core sections are then sent through a pair of whole-round multisensor loggers that measure density, magnetic susceptibility, porosity, gamma radiation and other characteristics. Next, the cores are split in half lengthwise and photographed with a high-speed, high-resolution camera. These images can assist with core description and frequently appear in scientific publications.

The core halves then pass through a section-half multisensor logger. In addition to color reflectance, this logger also makes more precise, single-point measurements of magnetic susceptibility to supplement the data from the whole-round logger. Finally, the section halves are sent through the superconducting rock magnetometer. This instrument measures natural remanent magnetization, which can help identify each time the Earth’s magnetic field reversed polarity. Because the history of these reversals is well known, the pattern in a given core section can help establish an age range for the hole.



At left, Kirsty Tinto (Lamont-Doherty Earth Observatory, Columbia University) prepares a core section for scanning with the superconducting rock magnetometer, which is pictured above in the JOIDES Resolution’s core lab.

COMMUNITY SPOTLIGHT



LEAH LEVAY

Expedition Project Manager

Leah LeVay is, in her own words, a “big nerd.” While the community knows her as a Staff Scientist for USIO, Leah has been a self-described geology geek since she was 5 years old. At that tender age, she decided to study dinosaurs – and simply never grew out of her fascination with Earth history.

Leah stuck with her instincts and followed that path to where she is today. As a geology major at the University of Nebraska, she veered from dinosaurs to study Earth processes. She went on to study calcareous nanofossils, earning her PhD from Pennsylvania State University in May 2012. She started with USIO just two months later.

Leah got her first taste of IODP as a nanofossil biostratigrapher on Expedition 321 (PEAT 2) in 2009, while still a graduate student. “It was an awesome experience,” she says. “It was eye-opening and I was treated like an equal on the ship – as a real scientist.” Leah also received a Schlanger Fellowship in 2009, further deepening her ties to the program.

Her first experience as a staff scientist was Expedition 341 (Southern Alaska Margin Tectonics, Climate and Sedimentation) this past summer. In this role, she acted as the primary point of contact for the entire science party, managing logistical details and ensuring a smooth expedition for all. “I could not have asked to sail with better people,” she says enthusiastically.

LETTER FROM THE NSF

Dear Colleagues,

This fall marks a pivotal time for scientific ocean drilling, with the conclusion of the Integrated Ocean Drilling Program and the start of the new International Ocean Discovery Program. All three major platforms have been active recently, with the *JOIDES Resolution* concluding Expedition 346 (Asian Monsoon) in late September, the *Chikyu* underway on Expedition 348 (NanTroSeize Stage 3), and the mission-specific platform *Greatship Manisha* underway on Expedition 347 (Baltic Sea Paleoenvironment).

In the wake of the federal government shutdown, NSF is pleased to report that the National Science Board still plans to convene a full meeting in late November, keeping the program timeline on track. As of press time, this meeting has not yet taken place; however, we look forward to discussing the outcomes with you at the American Geophysical Union Fall Meeting in San Francisco. We hope you will join us at the IODP Town Hall on December 10 (5:30pm at the Marriott Union Square, 480 Sutter Street, Union Square Ballroom), where a member of the NSF team will present the most recent updates. Information will also be available at the Ocean Leadership exhibit booth (#111).

Sincerely,

The NSF-ODP Team

James Allan, James Beard, Thomas Janecek



EDUCATION NEWS

IODP and Ocean Leadership Return to USA Science and Engineering Festival

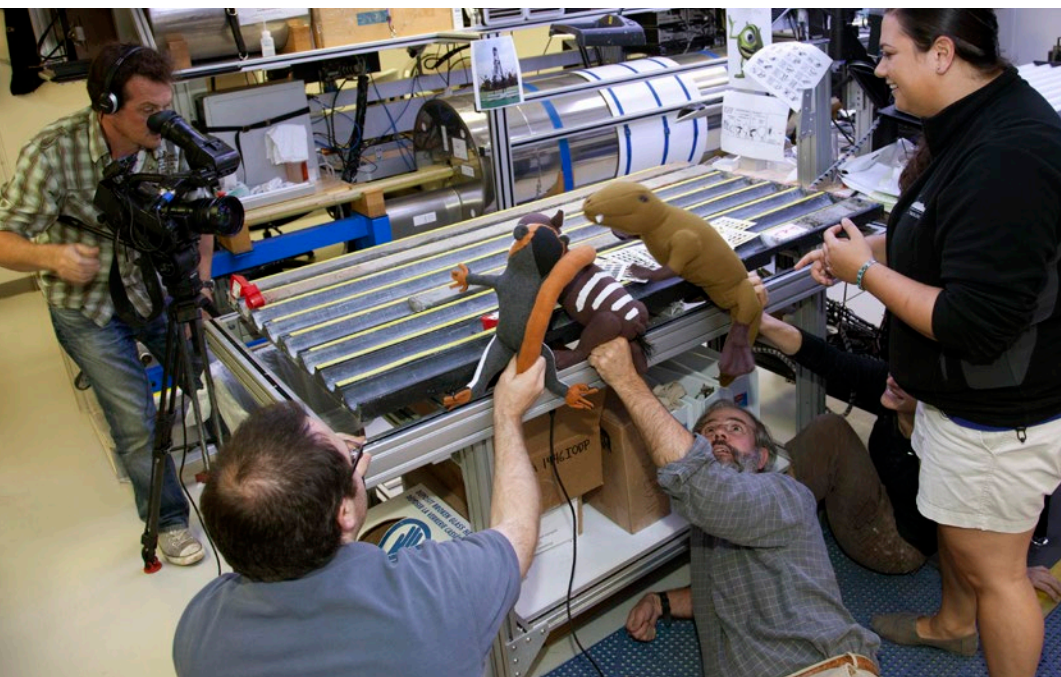
Planning is underway for the third USA Science and Engineering Festival in Washington, DC, April 26-27, 2014. IODP and Ocean Leadership will host an exhibit booth with program information, educational resources and interactive activities. In a featured activity, visitors will use models of the *JOIDES Resolution* to pull up mini cores from a mock ocean, and then consult both reference material and experts at the booth to discover evidence about our planet's past, present and future. See www.usasciencefestival.org for more information.



New Video Content in the Works

Videographer Dan Brinkhuis is hard at work at a new set of videos aimed at highlighting the research and education goals of scientific ocean drilling. The first video, set to debut at the AGU Fall Meeting, is an overview of the new International Ocean Discovery Program. This short clip will cover the program's scientific goals, collaborations, drilling platforms and services offered to the science community and beyond. Another will cover the role of Education and Outreach Officers on board

the *JOIDES Resolution*, including the tools they use, how they reach their audiences and how they contribute to the expedition overall. The final video will use Expedition 342 (Paleogene Newfoundland Sediment Drifts) as a narrative example of how science works in the real world. Teachers can use this video, along with supporting resources, to teach their students about the nature and process of science. Look for these videos on joidesresolution.org and the Ocean Leadership YouTube channel www.youtube.com/user/OceanLeadership in the early months of 2014.



Dan Brinkhuis (far left) shoots a video segment with help from members of the Expedition 342 (Paleogene Newfoundland Sediment Drifts) science party.

EDUCATION WEBSITES TO BE STREAMLINED AND UPDATED

In an effort to make our resources and information more accessible, Deep Earth Academy is integrating all content from deepearthacademy.org into the joidesresolution.org website. Once completed, there will no longer be any need for users to visit both sites. We have created an educator's resource page to serve as "one-stop shopping" for opportunities, materials and resources. Come visit throughout the coming months as joidesresolution.org continues to improve!

Visit: <http://joidesresolution.org/node/3002>

RESEARCH HIGHLIGHT

Wilkes Land Cores Tell the Story of a Planet in Flux

The past year and a half has been busy for the science party of Expedition 318 (Wilkes Land Glacial History), with a series of three papers published in high-profile journals. The expedition, which sailed in early 2010, drilled a series of holes off the eastern coast of Antarctica. Here, sediments scoured by glacial activity have settled to the seafloor, recording significant milestones in the history of Antarctic geology and ecology. The emerging story tells of a dynamic landscape that has fluctuated in response to changes in global climate over the past 55 million years.

In August of 2012, writing in the journal *Nature*, Jörg Pross (Goethe University) and colleagues described an Antarctica that we would barely recognize today. The early Eocene, about 55 to 48 million years ago, was the warmest in Earth's recent history. During this period, the Antarctic winter was so mild – rarely dipping below 50 degrees Fahrenheit – that palm trees and other subtropical plants flourished along the coast. Further inland, beech trees and conifers covered the hillsides.

Atmospheric carbon dioxide concentrations in the early Eocene were more than twice as high as they are today. Studying this chapter in Earth's history can reveal much about what might be in store within a few hundred years, if climate change continues at its present rate.

The balmy climate of the early Eocene eventually gave way to colder temperatures, and glaciers soon covered the once-verdant landscape of Antarctica beginning about 34 million years ago. In April 2013, Alexander Houben (Utrecht University) and colleagues published a study in *Science* describing how this transition completely remodeled the ecology of the Southern Ocean, beginning at the base of the food web.

Many species of plankton died off during this period, known as the Eocene-Oligocene transition, leaving only those capable of tolerating colder temperatures and a shorter, more intense growing season. This shift affected consumer and predator species, and in fact may have spurred the evolution of larger marine species such as whales and penguins.

With the dawn of the Pliocene epoch about 5 million years ago, the Earth again saw the return of warm temperatures. This period offers perhaps the best preview of our world's climate at the end of this century, as a result of increased greenhouse warming. In a rather alarming finding, published in *Nature Geoscience* in July 2013, Carys Cook (Imperial College London) and colleagues suggest that the East Antarctic ice sheet might be much less stable than scientists had long believed.

Compared to the world's other large ice sheets – especially the West Antarctic and Greenland ice sheets – the East Antarctic sheet is larger and thicker, and has lost relatively little of its mass in recent years. However, the latest evidence suggests that the East Antarctic ice sheet could eventually reach a critical point, beyond which it will begin to shrink much more dramatically.

The least populous continent on Earth might seem a strange place to look for clues about our future. Yet it's clear that Antarctica has witnessed much over the past 55 million years, and can help inform us how climate change will continue to shape our world.



References

1. Pross et al., 2012. *Nature* 488, 73-77. doi: 10.1038/nature11300
2. Houben et al., 2013. *Science* 340, 341-344. doi: 10.1126/science.1223646
3. Cook et al., 2013. *Nature Geoscience* 6, 765-769. doi: 10.1038/ngeo1889

LETTER FROM THE USAC CHAIR



Dear Colleagues,

This is a momentous time for the scientific ocean drilling community. With the transition to the new International Ocean Discovery Program, we are pursuing the exciting science proposed in the *2013-2023 IODP Science Plan*, developing new drilling proposals (more than fifteen submitted at the last deadline), expanding the number of member nations (see page 5), and continuing to operate at the forefront of high-impact international science.

As incoming chair of the US Advisory Committee for Scientific Ocean Drilling (USAC), I recognize the currently challenging environment for federally funded science and understand the impact this has on our scientific planning, financial support and outreach plans. The IODP community is actively engaged in providing advice on its priorities, and these views are being heard within the program and at NSF.

NSF has also engaged the National Research Council to develop a list of top ocean science priorities through the Decadal Survey for Ocean Sciences (DSOS). The DSOS committee's report will present a research strategy based on the current state of knowledge, ongoing research activities and resource availability. Within IODP, we recognize that the oceans' influence reaches beyond the seafloor, but we also know that the science we do is a compelling component of any national strategy for scientific investment. Ocean Leadership and USAC will keep you informed of any opportunities to contribute to this process through the US-IODP listserve.

I invite you to share your comments, concerns and suggestions about IODP and the start of the new program with me and the other USAC members. Write us an email or meet with us at the IODP Town Hall Meeting (Marriott Union Square, Main Ballroom, Tuesday, December 10, 5:30pm) during the 2013 AGU Fall Meeting in San Francisco.

All the best,

John Jaeger

Chair, U.S. Advisory Committee for
Scientific Ocean Drilling

USAC MEMBERS

John Jaeger (Chair)

University of Florida

Ivano Aiello

Moss Landing Marine Laboratories

Gail Christeson

University of Texas at Austin

Barbara John

University of Wyoming

Lawrence Krissek

Ohio State University

Beth Orcutt

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Yair Rosenthal

Rutgers University

Peter Sak

Dickinson College

Anja Schleicher

University of Michigan

Evan Solomon

University of Washington

Joseph Stoner

Oregon State University

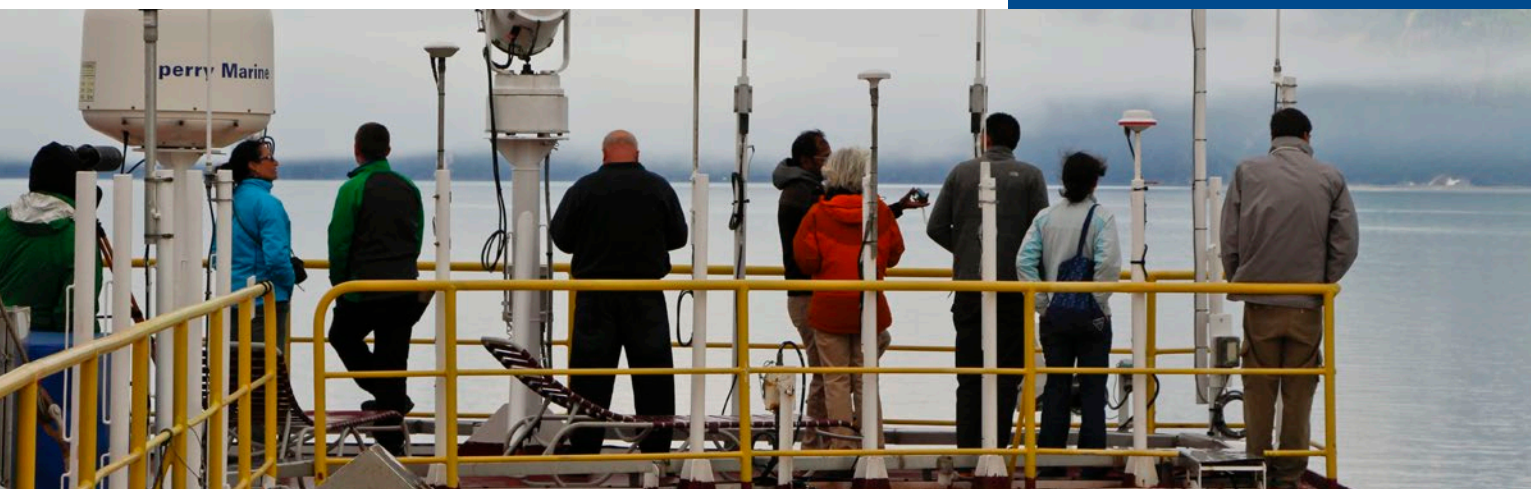


Photo courtesy of IODP-USIO



LETTER FROM THE USIO

Dear Colleagues,

We are pleased to state that the International Ocean Discovery Program has officially begun as of October 1, 2013. Without missing a beat, the *JOIDES Resolution* and crew successfully completed Expedition 346 (Asian Monsoon) with a port call in Busan, South Korea, and then went into dry dock in Subic Bay, Philippines. The ship will be ready for action again by the end of January 2014, in time for Expedition 349 (South China Sea Tectonics).



David Divins



Greg Myers



Planning for the South China Sea and Izu-Bonin-Mariana series of expeditions (350-352) is in full swing, and the program member offices have issued staffing calls for Expedition 353 (Indian Monsoon Rainfall) and Expedition 354 (Bengal Fan), with an application deadline of January 15, 2014. Additional scheduling and operations discussions are slated for the April *JOIDES Resolution* Facility Board (JRFB) meeting. At its last meeting in August, the JRFB approved merging the Proposal Evaluation Panel (PEP) and the Site Characterization Panel (SCP) to create a new, single panel to be known as the Science Evaluation Panel

(SEP). With two Co-Chairs and a broad slate of expertise within its membership, the SEP is well equipped to provide proponents with integrated feedback on both the scientific merit and the suitability of site survey data in their proposals. (See page 4 for more details.) We look forward to working with this new panel.

Finally, it was pleasing to see the *JOIDES Resolution* pictured prominently on the November cover of Explorer Magazine, the monthly periodical of the American Association of Petroleum Geologists (AAPG). The issue featured coverage of Will Sager (University of Houston) and colleagues' work verifying the single-volcano structure of Tamu Massif.

We hope to see you at the AGU Fall Meeting in San Francisco, and especially at the IODP Town Hall on December 10 at the Marriott Union Square. Please also look for us at the Ocean Leadership booth (#111) in the Exhibit Hall.

Best regards,

David Divins
Vice President & Director,
Ocean Drilling Programs

Greg Myers
Senior Technical Expert:
Engineering & Technology



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INDICIA

FSC INFO

IODP Expedition Schedule

Expedition	#	Port of Origin	Dates
JOIDES Resolution			
South China Sea	349	Hong Kong	26 Jan. – 30 Mar. 2014
Izu-Bonin-Mariana Rear Arc	350	Keelung, Taiwan	30 Mar. – 30 May 2014
Izu-Bonin-Mariana Arc Origins	351	Yokohama, Japan	30 May – 30 July 2014
Izu-Bonin-Mariana Forearc	352	Yokohama, Japan	30 July – 29 Sept. 2014
*Indian Monsoon	353	Singapore	29 Nov. 2014 – 29 Jan. 2015
*Bengal Fan	354	Singapore	29 Jan. – 31 Mar. 2015
*Arabian Sea Monsoon	355	Colombo, Sri Lanka	31 Mar. – 31 May 2015
*Indonesian Throughflow	356	Fremantle, Australia	31 July – 30 Sept. 2015
Chikyu			
NanTroSEIZE Stage 3, Plate Boundary Deep Riser	348	Shimizu, Japan	13 Sept 2013 – 20 Jan. 2014
Mission-Specific Platforms			
Baltic Sea Paleoenvironment	347	Kiel, Germany	Begun 12 Sept, 2013

**These expeditions are contingent upon approval for operations of the JOIDES Resolution beyond 30 Sept. 2014 and authorization of funds for these operations by the National Science Board in November 2013.*

Expedition dates, ports of origin, etc. are subject to change. Please see <http://iodp.tamu.edu/scienceops/> and <http://www.iodp.org/expeditions/> for the most up-to-date ship operations schedules.