

## IN THIS ISSUE:

- News: Proposed Wireless System Could Interfere With Key GPS Receivers, p. 315
- In Memoriam: Johann R. E. Lutjeharms (1944–2011), p. 316
- Meeting: Geodesy and Earthquake Hazard Near New Madrid Seismic Zone, p. 317
- About AGU: Careers That Are Out of This World, p. 318
- Book Review: Paleoclimates—Understanding Climate Change Past and Present, p. 318
- Research Spotlight: Contaminant Spread, a Stormier Europe, and More, p. 324

VOLUME 92 NUMBER 38 20 SEPTEMBER 2011

## A Multidisciplinary Earth Science Research Program in China

Because China occupies a large and geologically complex region of central and eastern Asia, the country may hold the keys to resolving many basic problems in the Earth sciences, such as how continental collision with India produced China's interconnected array of large intraplate structures, and what links exist between these structures and natural resources. To learn more, the Chinese government has launched SinoProbe, a major research initiative focusing on multidisciplinary imaging of the three-dimensional (3-D) structure and composition of the Chinese continental lithosphere and its evolution through geologic history. This effort is also motivated by China's need for a comprehensive and systematic evaluation of its natural resources and a better understanding of potential geohazards.

SinoProbe is funded by the Chinese Ministry of Finance, managed by the Chinese Ministry of Land and Resources, and organized by the Chinese Academy of Geological Sciences. More than 960 investigators and engineers are currently involved with the program, not counting international collaborators. Most of them are affiliated with the Chinese Academy of Geological Sciences, the Chinese Academy of Sciences, the Ministry of Education (i.e., universities), and the China Earthquake Administration. The initial phase of the program (2008–2012), with funding equivalent to about US\$164 million, is testing the feasibility of new technologies

in geophysical and geochemical exploration and deep continental drilling by focusing on a series of profiles (Figure 1).

### SinoProbe Initial Phase

The initial phase of the SinoProbe program includes nine technical components. One component involves magnetotellurics (MT) and features a  $4^\circ \times 4^\circ$  MT array to provide a reference framework of electromagnetic parameters (Figure 1) and a denser network ( $1^\circ \times 1^\circ$ ) covering northern China and the Qinghai-Tibetan plateau. Another component deals with seismic imaging that features a series of deep seismic reflection and refraction profiles with a total length of about 5500 kilometers, augmented by arrays of broadband seismometers using passive sources (Figure 1). The program also includes 3-D exploration for mineral resources to specifically target deep-seated crustal structures, which will help scientists investigate the concentrated multiminerals deposits in the major metallogenic belts in China.

Other technical components include building geochemical survey networks that are aimed at establishing a benchmark across the country for more detailed surveys in the future and deep scientific drilling; for the latter, pilot holes (2000–2500 meters deep) are being drilled in seven target areas

**Research in China** cont. on page 314

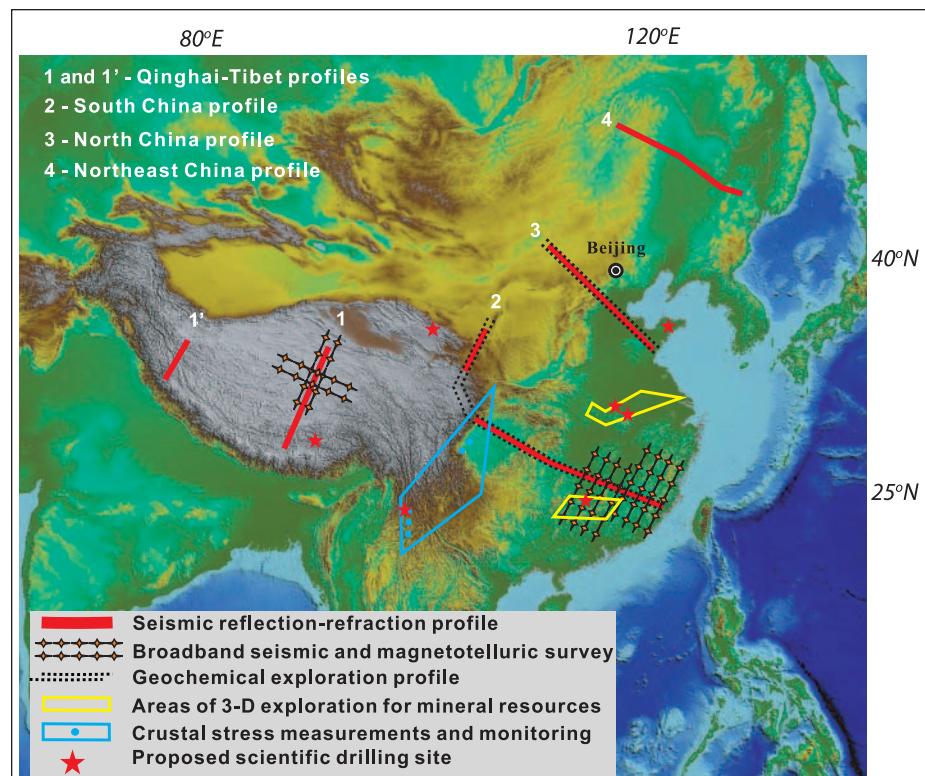


Fig. 1. Index map of the profiles, arrays, drilling sites, and regions being investigated by SinoProbe.

## Using Mobile Phones to Engage Citizen Scientists in Research

Mobile phone-based tools have the potential to revolutionize the way citizen scientists are recruited and retained, facilitating a new type of "connected" citizen scientist—one who collects scientifically relevant data as part of his or her daily routine.

Established citizen science programs collect information at local, regional, and continental scales to help answer diverse questions in the geosciences and environmental sciences. Hundreds of thousands of citizen scientists contribute to recurring research projects such as the Audubon Society's annual Christmas Bird Count, which drew more than 60,000 observers in 2009, or the U.S. Environmental Protection Agency's Volunteer Monitoring program, through which trained volunteers improve the monitoring of water quality in lakes and streams across the United States. These programs have relied on traditional recruiting techniques and written observations. New methods for engaging participants through technology, specifically, mobile applications, or apps, provide unprecedented ways for participants to have immediate access to their own and others' observations and research results.

A close look at three examples of citizen science campaigns show how they are leveraging digital technology and mobile connectivity to increase both data quality and the recruitment and retention of participants.

### What's Invasive!

The What's Invasive! project (<http://whatsinvasive.org>) was started in 2009 as a collaboration between the Center for Embedded Networked Sensing (CENS) and the National Park Service (NPS) to engage thousands of national park visitors in combating invasive species. CENS is a research center within the Computer Science Department at the University of California, Los Angeles (UCLA) focusing on the use of mobile phones for environmental, social, and health-related sensing. UCLA graduate students develop and implement both the mobile and back-end support for CENS sensing campaigns. The first step in combating invasive species is early detection; users of the What's Invasive! Android and iPhone apps collect data on the location of specific invasive plants and animals by first indicating the species by touching its name on the screen and then, if they wish, snapping pictures of the invasives with their smartphone. Users then transmit the pictures via the app, which automatically records the location at which the picture was taken. To facilitate easy participation, only a "top ten" list of invasives is displayed based on the phone's location, rather than the much larger list of all invasives for a given region.

There are currently more than 1900 registered users who have collected more than 6000 observations in 50 locations around the world (see Figure 1). The Web site displays the data in maps and sorted lists that can be downloaded by anyone. Images are stored in Flickr to avoid managing the large amount of storage space required, and the invasive location data are stored in a MySQL Structured Query Language (MySQL) database hosted at UCLA. In a 14-day pilot study, 10 volunteers at the Santa Monica Mountains National Recreation Area made 975 weed observations—about 18% of what was collected by the NPS staff in a previous 2-year survey. Observations were subsequently confirmed by park staff and contributed to the park's mapping efforts. High school and university students have also added hundreds

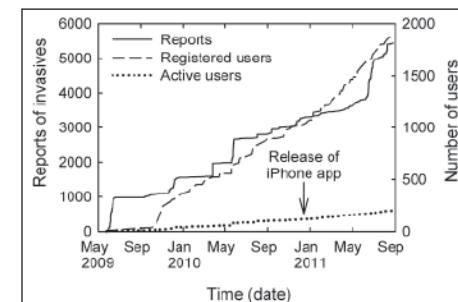


Fig. 1. Number of reports of invasive species (solid line) plotted with user participation for the What's Invasive! project. Registered users (dashed line) have established an account through the mobile phone app or Web site, and active users (dotted line) have made at least one report of an invasive species using the mobile phone app. The release date of the iPhone app in addition to the already existing Android app is indicated by an arrow.

of new weed observations. Classroom use is facilitated by the easy establishment through the Web site of new lists of invasives for data collection. Invasive species names and photos are provided by the Center for Invasive Species and Ecosystem Health at the University of Georgia (<http://www.bugwood.org>).

One of the main issues faced by outdoor mobile data collection is poor cell phone reception. What's Invasive! thus does not rely on Web-based "live" displays but caches species lists and allows users to turn off uploading (GPS location services are unaffected) to store their observations until they get to an area with better reception.

### Project BudBurst

Project BudBurst (PBB; <http://budburst.org>) is an online network of almost 10,000 registered participants who monitor plants as the seasons change. It is designed to engage citizen scientists in the collection of climate change data based on the timing of leafing, flowering, and fruiting of plants (plant phenology)—it encourages users to upload photos and data to a database via their personal computers. PBB is co-managed by the National Ecological Observatory Network (NEON, a nonprofit that manages large-scale ecological observing networks and experiments) and the Chicago Botanic Garden.

Recently, PBB has collaborated with CENS to develop a recently released Android app to make data collection and record keeping easier and to engage a broader range of participants through online social interactions. The PBB app encourages users to share photos of their observations while adding user-contributed data (notes and plant phenophases) and device-contributed data (time, date, and GPS coordinates). Connecting the activity of sharing a photo with the collection of scientific data will likely result in the recruitment and retention of even more citizen scientists. For example, on a local level, Facilities Management at UCLA is using the PBB app to work with students and volunteers to update a map of the trees on its campus.

As an already established online community, PBB is well positioned to use mobile technology to enhance the user experience because it is just expanding its database interface to include phones as well as computers. Further, it is anticipated that the mobile app will encourage participation by nontraditional citizen science

**Mobile Phones** cont. on page 314

# EOS

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*Eos, Transactions, American Geophysical Union* (ISSN 0096-3941) is published weekly by the American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009, USA. Periodical Class postage paid at Washington, D.C., and at additional mailing offices. POSTMASTER: Send address changes to Member Service Center, 2000 Florida Ave., NW, Washington, DC 20009, USA. Member Service Center: 8:00 A.M.–6:00 P.M. Eastern time; Tel: +1-202-462-6900; Fax: +1-202-328-0566; Tel. orders in U.S.: 1-800-966-2481; E-mail: service@agu.org. Information on institutional subscriptions is available from the Member Service Center. Use AGU's Geophysical Electronic Manuscript Submissions system to submit a manuscript: <http://eos-submit.agu.org>.

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Christine W. McEntee, Executive Director/CEO

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## Research in China

cont. from page 313

(Figure 1) to aid in locating and designing an extremely deep drill hole (>12 kilometers deep) for the next phase of SinoProbe. A sixth component involves gathering and monitoring in situ stress measurements within the crust using hydraulic fracturing techniques in boreholes that are being drilled to depths of 300–800 meters.

Two components deal with processing data: (1) geodynamic modeling to simulate the deformation and thermal evolution in the lithosphere with finite element models and (2) data integration, dissemination, and management to establish the cyberinfrastructure needed to compile, analyze, and integrate SinoProbe data with existing data. Uniting all aspects of SinoProbe is an instrumentation development focus that promotes new technologies, innovative analysis methods, data integration platforms, and modern instrumentation.

Details of these SinoProbe components can be found at <http://www.sinoprobe.com.cn/en/summary.shtml>.

## A Large-Scale Controlled-Source Seismic Experiment in Northern China

SinoProbe provides a broad platform for international collaboration with Chinese Earth science research and education, as illustrated by a recent joint geophysical survey with U.S. researchers. In December 2009, the SinoProbe seismic imaging group conducted a large-scale controlled-source seismic experiment in northern China under the leadership of the Chinese Academy of Geological Sciences in cooperation with the University of Oklahoma and the University of Missouri. This experiment will serve as an example for future efforts, which consisted of three coordinated seismic recording activities along a profile more than 400 kilometers long that extended from near Beijing northwestward to the Mongolian border (Figure 2).

The profile began near the eastern edge of the western block of the north China Precambrian craton in rocks about 2 billion years old. It crossed the craton to the Permian Solonker suture zone (a feature ~260 million years old) and ended in the central Asian orogenic belt (CAOB). The CAOB is one of the world's most prominent sites of the formation of juvenile Paleozoic and Mesozoic (~300- to 180-million-year-old) continental crust. South of the Solonker suture zone, the area around the city of Zhangbei is the most seismically active region in northern China (498 magnitude >3 earthquakes in the past 40 years).

The experiment, successfully carried out in difficult winter field conditions, used a combination of 2-D deep seismic reflection imaging, refraction, and wide-angle reflection methods to image the structure and velocity of the crust to depths of about 50 kilometers. The deep reflection profile (Figure 2, black line) used explosive sources, each recorded at 600–1200 locations, to create a common midpoint (CMP) stacked image. Such images usually extend to a depth of about 40 kilometers and provide the most detail about geologic structures of any seismic technique. For the refraction and wide-angle reflection portion of the experiment, 400 vertical component

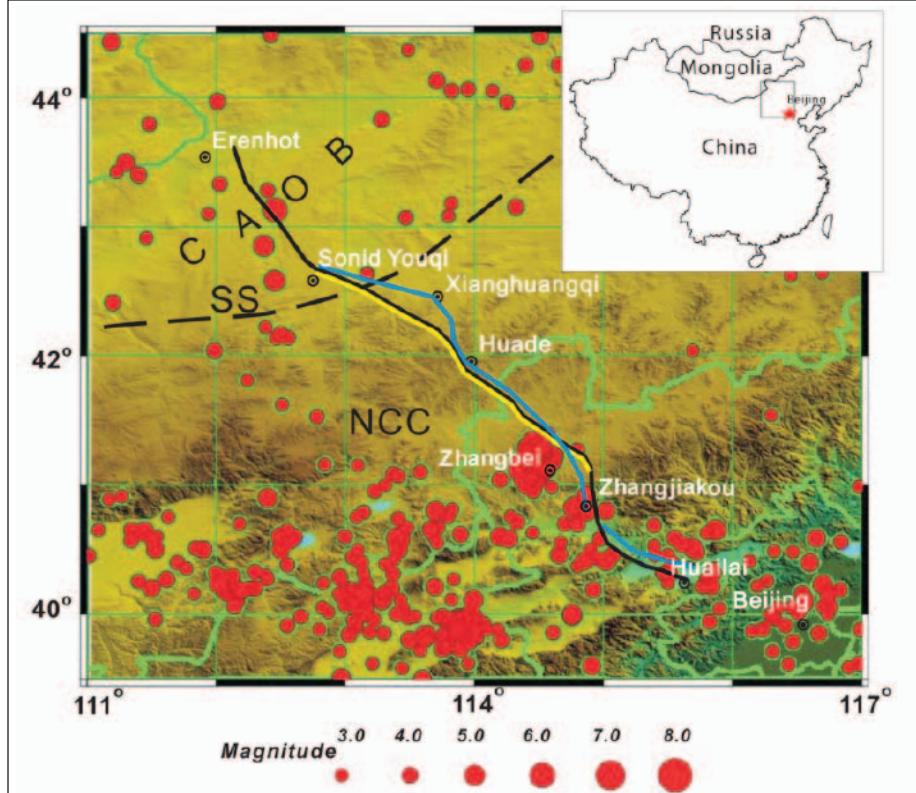


Fig. 2. Map showing deep seismic reflection and refraction profiles across northern China. Shown are the reflection profile (solid black line), the shallow (upper crust) three-component refraction profile (yellow line), and the deep (crust and uppermost mantle) refraction profile (blue line). Earthquake epicenters (red circles) are from the China Seismic Network Earthquake Catalog (1970–2010; see <http://www.csndmc.ac.cn>). Major structures, including the central Asian orogenic belt (CAOB), north China craton (NCC), and Solonker suture zone (SS; see dashed line), are also labeled.

seismic recorders provided by the Incorporated Research Institutions for Seismology Program for Array Seismic Studies of the Continental Lithosphere (IRIS/PASSCAL) were placed at approximately 1-kilometer intervals during four deployments (Figure 2, blue line), and eight large shots served as sources. In addition, 120 recording systems with vertical as well as two horizontal components were deployed as part of the reflection data recording effort (Figure 2, yellow line). The refraction and wide-angle reflection data are being used to determine the velocities of seismic waves through the region and to image major velocity discontinuities.

## Future Directions

These field experiments and subsequent data processing and modeling have involved exchange visits and collaboration between both Chinese and U.S. graduate students and young scientists. SinoProbe will host an international workshop on lithospheric exploration and imaging in November 2011 to foster collaboration among interested scientists and organizations from foreign countries (details can be found at <http://www.sinoprobe.org>). Building on sessions at the 2010 AGU Fall Meeting, several new threads of research on the structure and tectonic evolution of China's lithosphere will be presented at the 2011 Fall Meeting.

Funding for individual researchers or research teams in China is based on the intellectual merit of the proposed work. Special programs are also set up to encourage international cooperation that will bring new

experimental approaches and analytical tools, as well as advanced exploration technology, into the program.

SinoProbe is expected to lead to the full launch of China's ambitious initiative of crust and lithospheric exploration in 2013. The goals are to reveal the fine structure of the crust and mantle lithosphere beneath continental China along numerous long profiles orthogonal to the initial ones (Figure 1) and to establish a series of geochemical and geophysical benchmarks across the country through systematic surveys. Focused research activities will also be conducted to dissect the 3-D structure of large orogenic belts, important oil- and gas-bearing basins, and large mineral deposits.

## Acknowledgments

The authors acknowledge SinoProbe and National Natural Science Foundation of China grant 40830316. We also thank the following U.S. participants: Galen Kaip, Stephen Holloway, Steven Harder, Jefferson Chang, and Catherine Cox, who were funded by a U.S. National Science Foundation Partnerships for International Research and Education grant (0730154).

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## Mobile Phones

cont. from page 313

audiences. The Education and Public Engagement program of NEON will be assessing and evaluating the recruitment and retention of participants who use the app. In addition, metadata from the PBB app will allow scrutiny of the data quality that will inform future citizen science efforts using mobile devices.

PBB is also experimenting with adding game playing to their data collection with the goal of increasing the recruitment of participants who might not normally be interested in observing plants, and retaining participants through constant engagement. For example, a geocaching-like game, called "floracaching," being built into the PBB app will have participants search for and observe "community" plants that have been established in public areas.

## Picture Post

Digital Earth Watch (DEW) and the Picture Post network (<http://picturepost.unh.edu>) support environmental monitoring by citizens, students, and community organizations through repeat digital

photography and satellite imagery. A Picture Post is an octagon-shaped platform on top of a stand-alone post or attached to an existing structure and used as a location marker for visitors to take a series of photographs using their digital camera or smartphone in fixed orientations, panning the landscape. It provides a means to obtain a standardized series of digital

images for observing and measuring changing vegetation over time.

By taking pictures on a regular basis at Picture Post sites and uploading them to the network, citizen scientists are creating a photographic library of short- and long-term changes in their local area and

## Mobile Phones

cont. on next page



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**Mobile Phones**

cont. from page 314

contributing to coordinated monitoring programs. Posts have been set up to monitor trails, forests, water, wetlands, gardens, and landscapes. DEW is partnering with the USA National Phenology Network (<http://usapn.org>) and PBB to share observations. Research projects using Picture Posts are under way at the Wells National Estuarine Research Reserve in Wells, Maine, and at the University of New Hampshire (UNH) to investigate coastal wetland health, correlate ground observations with remote sensing, and characterize habitats that promote Lyme disease.

The DEW photo database and Web site are housed at UNH. A Google map displays all Picture Post locations, and each post has its own page that shows the photo time series. By combining daily satellite-based

Moderate Resolution Imaging Spectroradiometer (MODIS) images with photographers' notes, user comments, and new crowd-sourcing features such as "tagging" pictures with plant species or events, DEW will enable citizens and their mobile devices to become important sensors in climate change studies.

The Santa Fe Complex in New Mexico is beta testing a DEW app that has been in development for about 6 months. Requirements for the app are that it be "location aware," meaning that it recognizes its location and that of nearby posts on a map, and also use the accelerometer in the phone to help the user position the camera correctly when taking pictures. Users can create "virtual" Picture Posts in the absence of a designated structure, thereby opening up the concept of Picture Posts at sites where a permanent structure is not feasible or desirable, such as in a nature preserve.

**A Potential Wealth of New Collaborations and Data**

Expectations about what a mobile phone or digital camera can do are evolving rapidly, and constant connectivity is turning into a reality even in remote areas. Because interactivity with the Web and exchange of data are becoming more expected, mobile app connectivity to social networking, with real-time feedback and data sharing, is ushering in a new level of collaboration among scientists, citizen science programs, and technology partners.

The need to constantly evaluate, revise, and refine mobile tools based on what users are willing to do, what they can do with confidence, and what they expect in return, while also meeting the data requirements of the scientific community, makes developing mobile apps for citizen science projects an interesting challenge. For example,

when people "escape" to parks or other natural areas where making plant observations might be useful, they often want to leave technology behind. How do app developers motivate people to use their mobile phones to make citizen science observations?

Ultimately, mobile technologies have the capacity to greatly improve scientific literacy and to support research by broadening educational opportunities and participation in citizen science field campaigns. These endeavors can investigate not only the connection between climate and the living environment but other disciplines as well, such as community ecology, biogeography, and resource management.

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# NEWS

## Proposed Wireless System Could Interfere With Key GPS Receivers, U.S. Officials Testify

A proposed \$14 billion network that would increase broadband wireless access poses significant interference problems for existing GPS signals used for some critical U.S. federal science and public safety systems, said officials from NASA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS) and other experts at an 8 September hearing of the House of Representatives' Committee on Science, Space, and Technology.

The officials cautioned that a terrestrial wireless network plan proposed by LightSquared LLC—which includes using frequencies adjacent to the GPS band—needs additional testing before it is given a green light by the Federal Communications Commission (FCC). In addition, the officials said that although they hope there is a win-win solution to increasing broadband wireless options without harming GPS signals, a recently revised plan that LightSquared indicates would reduce interference to a large majority of GPS receivers still would present problems for a number of high-precision GPS systems.

Jeffrey Carlisle, executive vice president for regulatory affairs and public policy at LightSquared, testified that his company believes that the proposed network and GPS can coexist. He said LightSquared has proposed a number of mitigation measures—including agreeing to a "standstill" in terrestrial use of the upper 10 megahertz of its frequencies that are immediately adjacent to the GPS band, a reduction in the company's authorized power, and working with federal agencies toward a solution—to lessen the interference to GPS.

In addition, Carlisle objected to having to deal with a moving target in terms of meeting GPS user concerns. He testified that LightSquared "is doing everything it can to work with GPS to address issues raised only a few months ago" and that the GPS industry had previously known about the scope of the company's network and about its planned power levels and had not raised objections.

In an interview with *Eos*, Carlisle said his company will continue to work with federal agencies, including those testifying at the hearing, along with the FCC and others "to try to figure out, Okay, what's the solution here? Can we implement it and can we move forward and deploy our network?" He said there "absolutely" needs to be a win-win situation. "There's got to be. The stakes are too high," he said.

At the hearing, members of Congress indicated that they would like to move forward with the LightSquared proposal if it does not cause interference with key GPS signals. "We have to find a way to open up more spectrum for broadband but not at the expense of GPS," said committee chairman Rep. Ralph Hall (R-Tex.). Committee ranking member Rep. Eddie Bernice Johnson (D-Tex.) said that if there is no way for LightSquared to move forward without damaging GPS, the FCC should not approve the proposal. However, she added that she hopes GPS can coexist side by side with the LightSquared network. Rep. Donna Edwards (D-Md.) suggested the federal government has some responsibility to help find a way to allow LightSquared to move forward while protecting vital GPS signals.

Mary Glackin, NOAA deputy undersecretary for operations, said in testimony that the original spectrum plan proposed by LightSquared would have seriously degraded or caused a total loss for a wide range of NOAA operational systems, including putting the agency's entire fleet of meteorological satellites at risk. She added that the company's revised spectrum plan "still raises issues for high-precision GPS receivers that feature a wideband design."

At least five major NOAA systems or functions require wideband GPS equipment, Glackin said. These include the Constellation Observing System for Meteorology, Ionosphere, and Climate; the monitoring of sea level trends; the Ground-Based GPS Meteorology project; the issuance of the U.S. Total Electron Content product used for informing

surveyors and others about space weather conditions affecting GPS accuracy; and the maintenance of the National Spatial Reference System. She said that a radio filtering technique suggested by LightSquared could prevent a receiver from detecting a GPS signal.

Victor Sparrow, director of the spectrum policy and planning division within NASA's Human Exploration and Operations Mission Directorate, testified that NASA relies on GPS for navigation services and for monitoring and improving the understanding of Earth science, including climate change, earthquakes, and volcanic activity. He said none of the identified mitigation options to prevent disruption of GPS "have yet been demonstrated to be effective in mitigating potential interference to GPS."

Although limited testing was conducted by a technical working group on the susceptibility of some GPS devices to the use of only the lower 10-megahertz LightSquared channel, which is farther from GPS signals, "limitations—such as filters that have yet to be designed or are theoretical or speculative in nature—prevented adequate testing of this mitigation approach," he said. "NASA believes it would be premature to allow the use of only the lower 10-megahertz channel as a solution until testing has been completed and it is established that there is no negative impact on GPS users."

David Applegate, associate director for natural hazards with the USGS, noted that the Department of the Interior (of which USGS is part) "has significant concerns" about the LightSquared proposal. Applegate stressed that GPS technology is an essential tool for many USGS mission responsibilities including stream gages and water quality monitors, the Advanced National Seismic System, and volcano observatory monitoring.

He told *Eos* that the agency's big concern is that "there has just not been adequate testing" to know whether LightSquared's proposed solution to use a lower band frequency will solve the problem. "In fact, the

indications at this point are that [the company's proposal is] not going to be adequate," he said. Applegate added that he, too, would like to see if a win-win solution can be found, stating that the agency would benefit from having national broadband Internet coverage for GPS stations. "We just can't have it at the expense of the high-precision capabilities that we need to have. Whether it's possible to have a win-win in that portion of the spectrum, I don't know."

Also weighing in at the hearing was Anthony Russo, director of the National Coordination Office for Space-Based Positioning, Navigation, and Timing. The office oversees U.S. agency interest in GPS services and was established to help with implementation of the Obama administration's National Space Policy objectives, which call for "protection of radio navigation spectrum from disruption and interference." The administration issued that policy on 28 June 2010, the same day it issued a policy statement regarding expanding the spectrum for wireless broadband use while ensuring no loss of critical existing and planned government capabilities.

Russo testified that the National Space-Based Positioning, Navigation and Timing Systems Engineering Forum (NPEF) found that "LightSquared's proposed system would create harmful interference throughout all three phases of its planned deployment." Further, he said, NPEF "could not identify any feasible option that would mitigate harmful interference for all or even most GPS users and still allow LightSquared to meet their system requirements."

After the hearing, Russo elaborated to *Eos* that federal experts disagree on whether there is a possible solution to move forward with the LightSquared network without harming vital GPS receivers. He said it is not clear "whether it's a physics issue, that it's just too tough to do, or whether it's an engineering issue, that if you put enough money into it, spend enough time, that you could figure out a way" to resolve the problem.

—RANDY SHOWSTACK, Staff Writer

## CALL FOR NOMINATIONS New AGU Climate Communication Prize

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## REMOTE SENSING OF THE TERRESTRIAL WATER CYCLE

New and emerging satellite missions will soon produce a clearer picture of the hydrosphere than ever before. It is necessary at this time to synthesize the current status of hydrologic remote sensing and determine the necessary next steps for the study of the water cycle.

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## Johann R. E. Lutjeharms (1944–2011)

Johann R. E. Lutjeharms, South Africa's leading physical oceanographer, died at the age of 67 at his home in Stellenbosch on World Oceans Day, 8 June 2011, after a 10-year battle with a complicated form of cancer. His work was central in the process of enlightening the oceanographic and climate system community to the global importance of the complex, energetic, eddy-rich environment of the Agulhas Current. He aptly referred to this current system, including the transfer of Indian Ocean water into the South Atlantic, as the "Greater Agulhas System."

Johann was born on 13 April 1944 in Bloemfontein, South Africa, where he attended Grey College. At the University of Cape Town (UCT), he completed his bachelor's degree in physics followed by a M.Sc. (cum laude) in oceanography in 1971. His work there led to his first research article (on the variability of the water movement in the southwest Indian Ocean), which appeared in *Nature*. Many papers would follow, covering a broad range of aspects of the oceans around South Africa. His curriculum vitae lists 177 articles published in peer-reviewed international journals, many of them in AGU's *Journal of Geophysical Research (JGR)* and *Geophysical Research Letters*, including his most frequently cited ones.

In 1972, Johann received several overseas bursaries that enabled him to study for a Ph.D. in physical oceanography at the University of Washington. He was awarded a Ph.D. in 1977; his thesis dealt with mesoscale dynamics in the Southern Ocean. Returning to Stellenbosch, he continued his research

at the National Research Institute for Oceanology, where he stayed until 1990, when he was appointed a full professor in ocean climatology at UCT. There he founded the Centre for Marine Studies, becoming its first director in 1993.

In 1992, UCT awarded Johann its most prestigious D.Sc. degree for a dissertation on "contributions to the study of the oceans around southern Africa." The title accurately describes his main field of research, in which he remained active, transforming the Greater Agulhas System from a regional to a global topic.

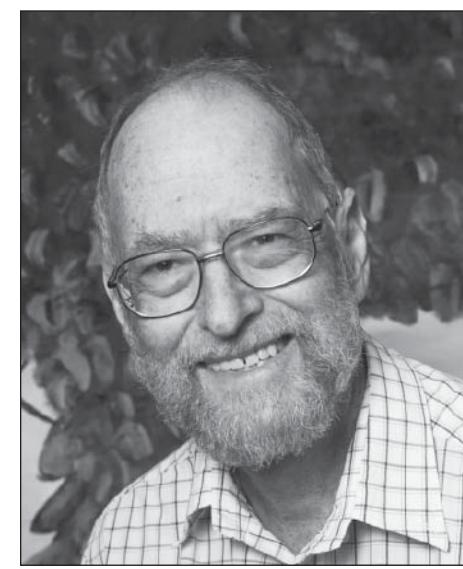
Scientists' views and understanding of the dynamically complex area of the Agulhas Current and its retroflection (its looping back into the Indian Ocean) have evolved considerably over the past decades. Johann's research was a major contribution to that developing story. In his studies he was a pioneer in combining in situ hydrographic data and satellite observations to reach unique descriptions and analyses of the mesoscale phenomena in the Agulhas Retroflection region. He also derived and formulated hypotheses about these dynamics, challenging many theoreticians and modelers around the world and stimulating a series of international research and observational programs that continues to this day. He collaborated with these groups in a fruitful and mutually rewarding way. Moreover, he had an active interest in the effect eddies and related coherent phenomena have on the ecosystem structure of the adjacent continental shelf as well as large

ocean-to-atmosphere fluxes and regional climate variability.

Johann was an advocate for the importance of small-scale and mesoscale anomalies in the Agulhas Current for the characteristics of Agulhas Retroflection and ring shedding. He studied the fate and impact of the Agulhas Rings in the southeastern Atlantic, within the "Cape Cauldron" of the Cape Basin, as well as the upstream sources of the Agulhas and their controls on the retroflection and ring shedding.

Of particular global significance are his papers in *JGR* on the interocean exchange of heat and salt between the Indian and Atlantic oceans by Agulhas Rings and filaments that are shed at the Agulhas Retroflection. Quantification of these fluxes and their variability at interannual and longer time scales and identification of the governing physical processes are key components of Johann's research as well as of present-day ocean and climate research. Variations at the "choke point" around the southern tip of Africa are expected to have both a strong regional and global impact through their influence on the stability of the Atlantic overturning circulation.

As the global research community's interest in the Agulhas System grew, Johann often operated as the national and international coordinator. He was very successful in setting up an active global network of researchers and maintained it in an effective and charming way. Collaboration was essential to put the efforts of the UCT oceanography department onto the international map. In spite of his small local group and limited resources, Johann was admirably successful in joining forces with observational and modeling groups from all over the world to establish relatively large programs to study his beloved Greater Agulhas System.



Johann R. E. Lutjeharms

All these activities culminated in his writing the authoritative and much acclaimed book *The Agulhas Current*, published by Springer in 2006. *The Agulhas Current* is the magnum opus of Johann Lutjeharms. It is a comprehensive and passionate survey of the collected knowledge of the greater Agulhas Current System, in which the development of knowledge of this complex environment is placed in historical context, another of his passions.

It should come as no surprise that he was awarded several prestigious international research prizes, including a Fulbright Scholarship from the United States, the German Alexander von Humboldt award, and the Nansen Medal of the European Geosciences Union as well as honorary doctorates from Rhodes University and the universities of Pretoria and Johannesburg. On his retirement he was awarded the Order of Mapungubwe by President Jacob Zuma, the highest civil honor in South Africa.

Last but not least, it is important to note that Johann entrained many students at UCT in his research. He created and maintained an international network in which they could participate and flourish. Many of Johann's papers were written jointly with his students, quite often with the student as first author. A former student recalled a memory from a research cruise: "Johann appeared on the bridge after being away for a while. Wearing a beanie and looking like a real old sea dog. I noticed his complexion was most definitely green and suddenly I felt better. 'I guess misery does love good company,' he said jokingly." That was the kind of remark typical of Johann, supportive and humorous while suffering himself. Those qualities also characterized the last decade of his life, in which he never lost his passion for the Greater Agulhas System.

Johann is survived by his wife, Ronel, and two children, Wilhelm and Maria. Through his death we have lost a true ambassador for international science, a gentleman, and a friend.

—WILHELMUS P.M. DE RUITER, Institute for Marine and Atmospheric Research, Utrecht University, Utrecht, Netherlands; E-mail: w.p.m.deruijter@uu.nl; CHRIS REASON, ISABELLE ANSORGE, and RAYMOND ROMAN, Oceanography Department, University of Cape Town, Cape Town, South Africa; and ARNOLD L. GORDON, Lamont-Doherty Earth Observatory, Columbia University, Palisades, N.Y.

## 3rd International Symposium on Shallow Flows: June 4 - 6, 2012

The University of Iowa, Iowa City, Iowa USA

### Conference Topics

- 1-Laboratory and eddy resolving (DNS, LES, hybrid RANS-LES) numerical investigations of fundamental physical processes and transport mechanisms in
- a) Shallow mixing layers
- b) Shallow wakes
- c) Shallow jets
- d) Shallow open channels
- 2-Experimental and numerical investigations of transport of heat, solutes and pollutants in canonical shallow flows or simplified geometries
- 3-Field studies and numerical investigations of shallow flows at field conditions and/or in realistic geometries.
- 4-Experimental and numerical aspects of sediment transport and morphodynamics in shallow flows
- 5-Scale effects in shallow flows
- 6-Quasi two-dimensional flows in the atmosphere
- 7-Shallow flows and stratification
- 8-Ecological aspects of shallow flows
- 9-Engineering applications of shallow flows (more applied experimental and numerical –RANS modeling- studies)
- 10-Analytical modeling of shallow flows
- 11-Innovative field and laboratory instrumentation for the study of shallow flows
- 12-Shallow flow models for prediction of flood related phenomena and flood mitigation



Conference Web Site : <http://old.iuhr.uiowa.edu/shallowflowsconference>

Conference E-mail: [iuhr-issf@uiowa.edu](mailto:iuhr-issf@uiowa.edu)

Symposium Chairman: Prof. G. Constantinescu,  
The University of Iowa

Technical Program Chairman: Prof. H.J.S. Fernando,  
The University of Notre Dame

**Key Dates:**  
Oct 1st, 2011      Deadline for submission of extended abstracts  
Dec 15th, 2011      Deadline for submission of papers  
June 4-6, 2012      Symposium

The third International Symposium on Shallow flows (ISSF 2012) follows the meetings in Delft and Hong Kong.

ISSF has been established as a major meeting event in the area of environmental hydraulics and environmental fluid mechanics.

EOS\_11017

## Workshop Announcement

### Assessing the History of the Greenland Ice Sheet through Scientific Ocean Drilling

November 7-9, 2011; Corvallis, Oregon

The response of the Greenland Ice Sheet to global warming represents one of the greatest uncertainties in predicting future sea-level rise. Observations extend back only decades and terrestrial geologic records rarely exist beyond the last deglaciation. Therefore, a marine-based paleo perspective is required to elucidate the response of this ice sheet to climate change. Based on the emphasis put forward in the IODP Science Plan, a workshop is being convened to discuss the utility and application of ocean drilling in reconstructing the paleo-history of the Greenland Ice Sheet.

Full and partial travel funding is available for a limited number of U.S. and international scientists. Postdoctoral scholars and graduate students are encouraged to apply. Interested attendees should contact conveners Joseph Stoner ([jstoner@coas.oregonstate.edu](mailto:jstoner@coas.oregonstate.edu)) and Anders Carlson ([acarlson@geology.wisc.edu](mailto:acarlson@geology.wisc.edu)) by September 30, 2011.

<http://iodp-ussp.org/workshop/greenland>

Application Deadline: September 30, 2011



## Assistant or Associate Professor

The Oceanographic Center (OC) at Nova Southeastern University (NSU), ([www.nova.edu/ocean](http://www.nova.edu/ocean)) invites applications for two 12-month positions at the ASSISTANT or ASSOCIATE Professor levels. Applicants for these research/teaching positions must have a doctoral degree and must excel in both research and teaching. Post-doctoral experience is preferred. Fields of research interest include any subdiscipline of Marine Ecotoxicology or Marine Ecology/Environmental Sciences. Because NSU OC has a concentration in coral reef research, related expertise is of interest.

Responsibilities will consist of 50% undergraduate teaching and other responsibilities at the NSU Farquhar College of Arts and Sciences ([www.undergrad.nova.edu](http://www.undergrad.nova.edu)) with the remaining 50% graduate teaching and extramurally-funded research at the Oceanographic Center.

Please apply online to position #993403 (Marine Ecotoxicology) or #993402 (Marine Ecology/Environmental Sciences) on [www.nsujobs.com](http://www.nsujobs.com) and include curriculum vitae, one-page each for research and teaching statements, and the names and emails of three individuals willing to provide letters of recommendation. Questions should be addressed to: **Biology Search Committee**, NSU Oceanographic Center, 8000 N. Ocean Drive, Dania Beach, FL 33004, or emailed to [spieler@nova.edu](mailto:spieler@nova.edu).

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# MEETING

## Studying Geodesy and Earthquake Hazard in and Around the New Madrid Seismic Zone

**Workshop on New Madrid Geodesy and the Challenges of Understanding Intraplate Earthquakes; Norwood, Massachusetts, 4 March 2011**

Twenty-six researchers gathered for a workshop sponsored by the U.S. Geological Survey (USGS) and FM Global to discuss geodesy in and around the New Madrid seismic zone (NMSZ) and its relation to earthquake hazards. The group addressed the challenge of reconciling current geodetic measurements, which show low present-day surface strain rates, with paleoseismic evidence of recent, relatively frequent, major earthquakes in the region. The workshop presentations and conclusions will be available in a forthcoming USGS open-file report (<http://pubs.usgs.gov>).

A fundamental observational constraint on intraplate strain is geodetic measurements of crustal deformation. Workshop

participants noted that the relative motions between most of the 55 GPS station pairs in the NMSZ are less than approximately 0.2 millimeter per year. At best the uncertainties are of the order of 0.2 millimeter per year but are difficult to estimate reliably. Two baselines within the NMSZ show potentially significant relative motions of approximately 0.3–0.4 millimeter per year. Some workshop participants proposed that this reflects a physical process, while others suggested that it is the expected statistical behavior of a random distribution with zero mean.

Observations of stress and strength of the crust are important aspects of this problem. Workshop presentations showed that there

is effectively no difference in the orientation of principal stresses in the NMSZ when compared to that of the surrounding region. Thus, the stress state in this region results from the same large-scale geologic processes stressing the central and eastern United States. Workshop attendees also noted that with respect to the stress field, slip on faults in the NMSZ is consistent with the faults' having high frictional strength, similar to faults throughout the region. Further, meeting presentations showed that limited available heat flow data do not show the NMSZ to be warmer (and thus weaker) than its surroundings.

Models that relate low long-term strain to the occurrence of earthquakes in the NMSZ include those that invoke crustal heterogeneity, glacial isostatic adjustment, erosion following retreat of the glaciers, and sinking of the Farallon plate. However, some participants noted that these processes may be responsible for triggering rather than sustaining repeated large earthquakes. Furthermore, observations of earthquake migration in China and models of stress evolution following the 1811–1812 earthquakes suggest that future earthquakes could occur on other faults in the region. However, scientists lack the ability to tell if and when these might occur.

Although there remains considerable uncertainty as to the ultimate driving force of these intraplate earthquakes, most participants agreed that it is reasonable to expect that processes responsible for strain accumulation prior to 1811–1812 are still active today. Overall, the attendees agreed that the current density of geodetic monitoring is inadequate to address the apparent discrepancy between models inferred from geodetic and geologic data. To improve models of intraplate strain, geodetic monitoring should be densified in key locations by a combination of continuous and less expensive, periodic campaign GPS deployments. In conjunction, new physically based models of intraplate seismogenesis and data that constrain intraplate earthquake generation and recurrence are needed.

The authors of this meeting report gratefully acknowledge feedback from attendees of the workshop and support from the remainder of the organizing committee: Eric Calais, John Langbein, Seth Stein, and Mark Zoback.

—OLIVER SALZ BOYD, U.S. Geological Survey, Memphis, Tenn.; E-mail: olboyd@usgs.gov; and HAROLD MAGISTRALE, FM Global, Norwood, Mass.

## G E O P H Y S I C A L Y E A R M E E T I N G S C A L E N D A R

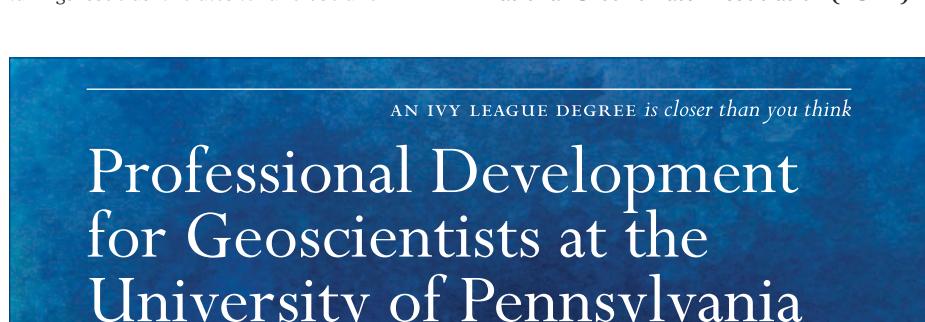
This column announces upcoming meetings and symposia of interest to Earth and space scientists. To submit an announcement for the Geophysical Year Meetings Calendar, go to <http://www.agu.org/cgi-bin/geosoc/cal-submit?cal=gycal>. There is no fee for these brief listings.

■ 18 November 2011 **Fourteenth Annual Conference on Litigating Takings Challenges to Land Use and Environmental Regulations**, Washington, D.C., USA. Sponsors: Vermont Law School; Georgetown University Law Center. (John D. Echeverria, Vermont Law School, 164 Chelsea St., PO Box 96, South Royalton, VT 05068, USA; Tel.: +1-802-831-1386; Fax: +1-802-831-1140; Web site: <http://www.vermontlaw.edu/Takings2011>)

This conference will explore the regulatory takings issue as it relates to land use and

environmental regulation. Topics include takings claims generated by major flooding events of the Mississippi River, including Hurricane Katrina and the Mississippi floods of 2011; the takings issues raised by the threat of climate change; and the tension between traditional notions of public rights in water resources and modern takings cases arising from regulation of water uses.

■ 29 November to 2 December 2011 **63rd National Groundwater Association (NGWA)**



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**Ground Water Expo and Annual Meeting**, Las Vegas, Nevada, USA. Sponsors: Baroid; Laube Corporation; Mud Puppy; others. (Cliff Treyens, NGWA, 601 Dempsey Rd., Westerville, OH 43081, USA; Tel.: +1-614-898-7791 ext. 554; Fax: +1-614-898-7786; E-mail: [ctreyens@ngwa.org](mailto:ctreyens@ngwa.org); Web site: <http://groundwaterexpo.com/>)

This expo is for groundwater professionals throughout the industry, including contractors, manufacturers, suppliers, scientists, and engineers.

■ 3–8 June 2012 **Third International Glacial Archaeology Symposium: Frozen Pasts**, Whitehorse, Yukon Territory, Canada. Sponsors: Kwanlin Dün First Nation; Government of Yukon. (David R. Leverton, 35 McIntyre Dr., Whitehorse, YT Y1A 5A5, Canada; Tel.: +1-867-633-7878; Fax: +1-867-633-6601; E-mail: [david.leverton@kwanlindun.com](mailto:david.leverton@kwanlindun.com); Web site: <http://www.kwanlindunculturalcentre.com/frozenpasts/>)

The symposium will highlight discoveries by North American glacial archaeologists and showcase the opening of a new Yukon First Nation cultural center featuring ice patch discoveries. Abstract deadline is 31 October.

■ 13–17 August 2012 **Asia Oceania Geosciences Society (AOGS)—AGU (Western Pacific Geophysics Meeting) Joint Assembly**, Singapore, Singapore. Sponsors: AOGS; AGU. (AOGS Secretariat Office, 1 Commonwealth La., Singapore 149544, Singapore; Tel.: +65-6472-3108; Fax: +65-6472-3208; E-mail: [info@asiaoceania.org](mailto:info@asiaoceania.org); Web site: <http://www.asiaoceania.org/society/index.asp>)

This meeting will provide an opportunity to serve the needs of geophysicists interested in studies on the western Pacific region.

## Opening Space Research: Dreams, Technology, and Scientific Discovery

George H. Ludwig, with a foreword by James A. Van Allen

Drawing on firsthand materials, such as George Ludwig's voluminous collection of laboratory notes and the Van Allen archive, this highly detailed volume provides an authoritative and unique account of the early development of space-based electromagnetic physics, the first U.S. space launches, and the discovery of the Van Allen radiation belts.

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2011, 478 pp., softcover, ISBN 978-0-87590-733-8  
List Price \$60.00 • AGU Member Price \$42.00



## Natural and Engineered Carbon Sequestration Minneapolis, Minnesota, October 7–8, 2011 Sponsored by the National Science Foundation

The purpose of this workshop is to develop a strategic plan to help guide funding in the upcoming SEES program (Science, Engineering and Education for Sustainability). The workshop will focus on two interrelated avenues of research relevant to the Earth's natural and human-influenced carbon cycle and its role in climate change: (1) studies of **the natural carbon cycle** (so we can calibrate and predict levels of naturally sequestered CO<sub>2</sub> and potentially enhance these natural avenues of sequestration), and (2) studies of **the engineered carbon cycle** (mechanical carbon capture and sequestration as a means to mitigate further increases in pCO<sub>2</sub>). In both cases, a foundation of knowledge about sedimentary systems and their carbon storage capacities is a high priority. The intent of the workshop is to assemble researchers working on these two distinctive aspects of the carbon cycle to help shape funding directions for the SEES program.

For further information, and to register for the workshop,  
please visit our website at  
<http://www.earth.northwestern.edu/news/stories/sees-workshop.html>

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# ABOUT AGU

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—PAUL COOPER, Career Services Coordinator,  
Membership and Marketing Department, AGU;  
E-mail: [careers@agu.org](mailto:careers@agu.org)

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## AGU FALL MEETING 2011

San Francisco, California, USA | 5-9 December

### Mark your calendar!

The heads and chairs of Earth and space science departments will meet again before the Fall Meeting on **Sunday, 4 December 2011**.

Register by 14 October at <http://bit.ly/HCRegistration>

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### Professor – Ocean Acidification (Level E)

*Hobart* (Ref No HAS 298/11)

\$168,491 plus 17% superannuation, with the option of an additional 3% salary loading in exchange for 14% instead of 17% superannuation

A unique opportunity exists for an eminent scientist to build an Ocean Acidification research program at the University of Tasmania (UTAS). Located in Hobart, this position will take advantage of the large critical mass of marine and Antarctic scientists at UTAS, Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine & Atmospheric Research, and Australian Antarctic Division (AAD). As a senior member of our academic staff, the person appointed to this position will be expected to take a strong strategic leadership role at UTAS, nationally, and internationally. The position will also contribute to the teaching program at UTAS, particularly at the graduate level, and take a key role in the supervision of graduate students, especially with the CSIRO-UTAS PhD program in Quantitative Marine Science and the new AAD-UTAS PhD program in Quantitative Antarctic Science.

In the Australian region the impacts of ocean acidification are expected to be most pronounced in the Southern Ocean. Existing research efforts in Hobart concentrate on coccolithophorids, foraminifera, pteropods, and krill, but future impacts could be felt through the entire Southern Ocean ecosystem, as well influence the critical climate roles this polar system provides to our Planet. The successful applicant will be expected to initiate and conduct independent and original research on Ocean Acidification with a focus on the Southern Ocean. Expertise in the disciplines of biogeochemistry, impact on commercially important living marine resources, impacts on micronutrient availability, and/or system modeling are especially encouraged.

The appointee will have an outstanding record of research in a mainstream field within marine science, a strong commitment to research and effective research training, and personal qualities necessary for collegial and effective relations with all sectors of academia, industry, and government. These attributes will enable the appointee to provide academic leadership to the promotion of marine and Antarctic education, training, research, and development, both nationally and internationally.

The appointment will be offered on a full-time basis for a five (5) year contract, with renewal depending on funding and merit, and be located at IMAS in Hobart. The position offers an attractive salary package, together with excellent employment conditions and a pleasant working environment.

For further information about either of these positions, please contact the Executive Director, Professor Mike Coffin, on +61 3 6226 2959 or email [Mike.Coffin@utas.edu.au](mailto:Mike.Coffin@utas.edu.au)

The closing date for receipt of applications is 15 December 2011.

### Marine Geoscientist (Level A) (Re-advertised)

*Hobart* (Ref No HAN 135/11)

\$55,386 - \$73,993 plus 17% superannuation, with the option of an additional 3% salary loading in exchange for 14% instead of 17% superannuation

Applications are invited for appointment to this position, which will be offered on fixed-term, full-time basis for a period of five years, with the possibility of an extension.

We seek a highly motivated postdoctoral researcher or research fellow in the general field of marine geoscience to contribute to improving understanding of the Earth beneath the sea. Experience investigating episodic Earth-ocean system phenomena and processes including, but not limited to, large igneous provinces (LIPs), subduction initiation, continental breakup, bolide impacts, and/or oceanic anoxia, is desirable, but not necessary. The position will involve observational, experimental, and/or modelling work. The position is an academic staff appointment in the new Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania.

Hobart's marine and Antarctic research community numbers ca 1000 staff at the University of Tasmania, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research, and the Australian Antarctic Division.

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# BOOK REVIEW

## Paleoclimates: Understanding Climate Change Past and Present

 Thomas M. Cronin  
Columbia University Press; 2010; xviii + 441 pp.; ISBN 978-0-231-14494-0; \$95.

Imagine contracting a fever and having no prior knowledge of whether your body's reaction will be severe or benign. Fortunately, having had fevers before, we know how our body reacts and we know how to treat the symptoms. Now consider global warming over the past century and the likelihood of it continuing for decades to centuries, with temperatures rising beyond anything humanity has experienced in the past. From this perspective, an investigation into past planetary fevers (and chills), what caused them, and how the planet responded—in short, paleoclimatology—becomes imperative. Although not the first book on the topic, Cronin's *Paleoclimates* is an up-to-date, comprehensive, and authoritative accounting of past climates.

The book has 12 chapters, an appendix on climate proxies, and a considerable reference list. After an introductory chapter on the climate system and a chapter on

methods in paleoclimatology, the author takes readers on a trip through ancient climates, beginning with a chapter on the Precambrian (more than ~542 million years ago) and its faint Sun paradox and snowball Earth, Phanerozoic climate change, oceanic anoxic events, and Mesozoic equable climates. The fourth chapter focuses on the Cenozoic (~66 million years ago to the present), with its warm beginnings and stepwise cooling, to the Pleistocene (~2.6 million to ~11,000 years ago), which is the focus of the next three chapters. Chapter 5 examines orbital forcing of climate on multimillennial timescales, whereas chapters 6 and 7 home in on millennial events during glaciation and deglaciation, respectively. Holocene (~11,000 years ago to the present) climate variability is the topic of chapter 8, introducing readers to more recent intervals of Earth's climate history

**Book Review** cont. on next page

**Book Review**

cont. from page 318

that have captured the most attention of climate scientists: the Medieval Warm Period, the Little Ice Age, the Maunder Minimum, etc. Before the final two chapters (11 and 12), on the "Anthropocene" (the epoch of human modification of the global environment), Cronin addresses two important concepts: abrupt climate change in chapter 9 and internal modes of climate variability in chapter 10 (e.g., El Niño–Southern Oscillation, the North Atlantic Oscillation, and the Pacific Decadal Oscillation). The final chapters cover global and hemispheric temperature trends and climate and hydrological changes of the past 2000 years. Through

the progression from the Archean (~3.8–2.5 billion years ago) to the Anthropocene, there is an appropriate intensification of the depth of presentation, the density of supporting data, and the exposition of causal mechanisms.

The deep time perspective in this book sets it apart from previous books on paleoclimatology: Many books on climates of the past begin with the Pleistocene ice ages. Cronin recognizes that the future may hold climate changes not experienced during the Pleistocene, e.g., hyperthermia rather than hypothermia. Another nice feature of the book is the identification and brief synopsis, located at the end of each chapter, of a landmark paper on the topic of that chapter. I especially liked sections of the book that identified

uncertainties, mysteries, and paradoxes of past climates.

The book could use more diagrams and images to relieve the reader of an otherwise heavy dose of squiggly lines (the EKGs of paleoclimatology). Although the book is largely descriptive, there are cameo appearances of equations and formulae that are welcome but in most cases are not used in later parts of the book and so are of questionable value (especially given the publishing maxim that authors lose 25% of their audience for every equation, on average, per chapter of a textbook). Similarly, some data-rich figures, for example, one showing cross sections of the Atlantic Ocean with phosphate concentrations, glacial carbon isotopes, and cadmium–calcium ratios, are not discussed at all in the main text. Perhaps a second edition could use boxes to

present quantitative treatments or vignettes of proxies and their interpretations. If you are expecting to find a curve of global temperature through Earth history, you will be disappointed, but don't fault the author: No such curve exists. Constructing Earth's temperature record would be a monumental task but one that the paleoclimate community should embark upon so that projections of future warming can be placed into their proper perspective.

For those considering offering a class on paleoclimatology or searching for a thorough and up-to-date introduction to this timely topic, Cronin's book may be just what the planetary doctor ordered.

—LEE R. KUMP, Department of Geosciences, Pennsylvania State University, University Park; E-mail: lkump@psu.edu

**Submit a Workshop Proposal**

The Consortium for Ocean Leadership is currently accepting workshop proposals submitted to the U.S. Science Support Program (USSP) associated with the Integrated Ocean Drilling Program (IODP). The submission deadline is October 1, 2011.

The primary goal of the workshop program is to identify promising new scientific objectives and research opportunities. Proposed workshops should promote the development of new ideas to study the Earth's processes and history via scientific ocean drilling. Workshops may support the goals and themes of current or future scientific ocean drilling programs. Broad-based scientific community involvement, co-sponsorship by related programs, and the active participation of graduate students are strongly encouraged. For more information, please visit:

<http://iodp-ussp.org/funding/workshops/>



IODP  
INTEGRATED OCEAN  
DRILLING PROGRAM



**Deadline: October 1, 2011**

**CLASSIFIED****ADVERTISING INFORMATION**

*Eos* is published every Tuesday. For a classified or display advertisement to be published in a future issue of *Eos*, electronic copy must reach us by 7:00 PM, Eastern Time, 9 days prior (Sunday) to publication. No cancellations accepted after deadline.

Display and in-column advertising specs, pricing, and submission guidelines can be found online at [www.agu.org/pubs/eos-news/advertising](http://www.agu.org/pubs/eos-news/advertising).

Email: [advertising@agu.org](mailto:advertising@agu.org)

Phone: +1-202-777-7536

Facsimile: +1-202-777-7399

**POSITIONS AVAILABLE****Atmospheric Sciences**

**Department Head and Professor.** The Department of Atmospheric Sciences at South Dakota School of Mines and Technology in Rapid City, SD invites applications for a full-time (12 month) Department Head/Professor. A PhD. in earth or atmospheric sciences or a related discipline, and a record of scholarship, teaching, and service sufficient to warrant a tenured appointment is required.

Individuals interested in this position must apply on-line at <http://sdmines.sdsmt.edu/sdsmst/> employment. Human Resources can provide accommodation to the on-line application process and can be reached at (605) 394-1203. Review of applications will begin September 30, 2011, and will continue until the position is filled. Employment is contingent upon a satisfactory background investigation.

SDSM&T is an EEO/AE/ADA employer & provider.

**Faculty Positions in the Atmospheric and Oceanic Sciences.** The Department of the Geophysical Sciences at The University of Chicago invites applications for faculty positions in the atmospheric and oceanic sciences. Areas of special interest include, but are not limited to:

o Physical oceanography, including the role of the oceans in Earth's climate system

o Atmospheric science pertaining to aerosols, clouds, or chemistry, with particular emphasis on experimentation or analysis of field measurements

o General circulation and climate dynamics of planetary atmospheres

Candidates must have completed a Ph.D. prior to appointment.

Applicants must apply through the University's Academic Careers website and upload a cover letter; a curriculum vitae; statements of research and teaching interests; and names and contact information for at least three referees. Consideration of applications will begin November 1, 2011. For a position at the rank of Assistant Professor, please apply at [academiccareers.uchicago.edu/applicants/Central?quickFind=51832](http://academiccareers.uchicago.edu/applicants/Central?quickFind=51832). To be considered for a tenured rank, please apply at [academiccareers.uchicago.edu/applicants/Central?quickFind=51837](http://academiccareers.uchicago.edu/applicants/Central?quickFind=51837). The University of Chicago is an Affirmative Action/Equal Opportunity Employer. For more information on the Department, please visit <http://geosci.uchicago.edu>.

**Colorado State University Open Rank Atmospheric Science Faculty Positions,**

**College of Engineering.** The Department of Atmospheric Science at Colorado State University invites applications for several tenure-track faculty positions. The positions can be filled at any faculty rank, from assistant professor to full professor. Candidates are sought with interests that complement and expand upon current research and teaching activities in the department. Research areas of interest include atmospheric dynamics, climate dynamics, atmospheric radiation, atmospheric chemistry, boundary layer processes, and cloud processes. Further information about the Department and the open positions can be found at [www.atmos.colostate.edu](http://www.atmos.colostate.edu). Applications and nominations will be considered until the positions are filled; however, applications should be received by October 31, 2011 to ensure full consideration. Application materials of semifinalist candidates, including letters of recommendation, will be made available for review by the faculty of the Department of Atmospheric Science. Applicants should submit a cover letter, one to two page statements of research and teaching interests, and curriculum vitae to:

Professor Jeffrey L. Collett, Jr., Head  
Department of Atmospheric Science Colorado State University Fort Collins, CO 80523-1371  
[facultysearch@atmos.colostate.edu](mailto:facultysearch@atmos.colostate.edu)

More information on Fort Collins is available at: [www.ftcollins.com](http://www.ftcollins.com). CSU is an EO/EA/AA employer. Colorado State University conducts background checks on all final candidates.

**Post-Doctoral Fellowship in Atmosphere-Surface Exchange.** Applications are sought for a PDF to participate in a project designed to experimentally quantify and model size-resolved particle fluxes to forests. The research will be conducted using a flux tower, and laboratory chamber facilities. The successful applicant will hold a Ph.D. in atmospheric science or related subject. Experience in experimental flux methodologies and particle sizing instrumentation is highly desirable. The preferred start date is 1 November 2011. Salary commensurate with experience. For full consideration, please send a letter of application, a current curriculum vitae, and the names and contact information of three references to: Professor S.C. Pryor, Multidisciplinary Science Building II, 702 N. Walnut Grove, Indiana University, Bloomington, IN 47405. Email: [spryor@indiana.edu](mailto:spryor@indiana.edu). Applications will be processed until the position is filled but those received by October 15, 2011 will receive full consideration.

Indiana University is an Equal Employment Opportunity/Affirmative Action Employer and we strongly encourage applications from women and minorities.

**Scientist I.** USRA seeks an entry-level Research Scientist in its Goddard Earth Sciences Technology and Research (GESTAR) program. This is a full time appointment for up to 3 years to support research on surface spectral shortwave radiation problems in a fully 3D cloud environment.

**Duties and Responsibilities:**

o Combine and analyze data from DoE's Atmospheric Radiative Measurements (ARM) new scanning radars, shortwave spectrometers, and microwave radiometers.

o Conduct radiative transfer calculations leading to a better representation of clouds in shortwave radiative transfer models.

**Knowledge and Skills Desired:**

o Ph.D. in Atmospheric Physics or a related field

o Experience with atmospheric radiation is required

o Experience with cloud microphysics is highly desirable

o Knowledge of radar retrievals is desirable

How to apply: Applicants should submit a resume with three professional references to [hr@usra.edu](mailto:hr@usra.edu).

USRA offers an excellent compensation package commensurate with experience and capabilities including generous fringe benefits. USRA is an Equal Opportunity Employer.

**Biogeosciences**

**Assistant Professor and Curator of Paleontology.** The Department of Geological Sciences at California State University, Fullerton, seeks a full-time, tenure-track Assistant Professor with expertise in vertebrate Paleontology to join the faculty in Fall, 2012 and serve as the Curator of Paleontology for the newly established John D. Cooper Archaeology and Paleontology Curation Center. The successful candidate will have the following credentials and capabilities:

o A Ph.D. in Geology or a related field with emphasis in Vertebrate Paleontology;

o experience in vertebrate fossil curation, accession, and management;

o a vigorous, research program in vertebrate paleontology that can involve undergraduate and graduate students;

o a strong interest in teaching and achieving excellence in teaching; and

o the interest and ability to interact effectively with an ethnically and culturally diverse campus community.

An important responsibility of the successful candidate's will be performing and directing research and curation of the paleontology collection at the Cooper Center, including oversight of an Associate Curator of Paleontology, interns, students, and volunteers. The Collection contains fossils in various stages of curation, from large jacketed specimens to fully curated fossils. Known strengths of the collection include Miocene marine mammals and reptiles, many from previously unrecognized taxa; numerous unprepared, jacketed blocks from an Eocene non-marine bone bed; and a paleobotanical collection of unknown extent. More information on the Cooper Center can be found at <http://coopercenter.fullerton.edu/>.

The successful candidate is expected to develop an externally funded research program

**Classified** cont. on page 320



The Department of Earth and Environmental Sciences invites applications for a tenure-track faculty position in paleoceanography and ocean science. The rank of the position is open, with a start date on July 1, 2012. We are interested in a dynamic educator and researcher who can build an externally funded program through strong links to the international ocean science and global change communities. Preference will be given to applicants who can contribute to the development of a new program in global sustainability and can build cross-disciplinary programs involving undergraduate and graduate students that complement the University of Rochester's existing programs in climate science, geodynamic-climate interactions, geohazards, and Earth and planetary evolution. See <http://www.ees.rochester.edu> for more information about the Department's strengths in climate science, geochemistry, geophysics, petrology, sedimentology, and tectonics. The University of Rochester is a highly ranked research university, and Rochester's cultural, educational, and recreational assets consistently place the city in the top 10 places to live within the U.S. Applicants should submit materials via: <https://www.rochester.edu/fort/ees/>. Materials include a curriculum vitae, select reprints, statements of research and teaching goals, and the names and contact information of four references. An additional statement is requested that describes your view of sustainability education in Earth science and how it can be integrated with broader education in sustainability. The review of applicants will begin December 15, 2011 and will continue until the position is filled. The University of Rochester, an equal opportunity employer, has a strong commitment to diversity and actively encourages applications from candidates from groups underrepresented in higher education.

**Classified**

cont. from page 319

focusing on specimens curated at the Cooper Center and resulting in peer-reviewed publications in refereed journals. Teaching responsibilities may include some of the following: physical geology, historical geology, paleontology, and upper-division and graduate courses in the new faculty member's area of expertise. Expected service activities include promotion of the Collection within the scientific community and outreach to the regional educational community. CSU Fullerton is a large urban university dedicated to the preeminence of learning. A designated Hispanic-Serving Institution, Cal State Fullerton is noted both for the diversity of its student body and its engagement of undergraduate students in research. Located 22 miles southeast of metropolitan Los Angeles, Fullerton is a full-service city renowned for its unique mix of residential, commercial and industrial, educational, and cultural environments that provide residents with an outstanding quality of life. The Department has thirteen full-time faculty members with expertise in traditional and applied areas of the geological sciences. The nearby geological provinces provide abundant opportunities for field-based research, which the department emphasizes in its curriculum. There are over 100 undergraduate geology majors and approximately 20 MS students in the Department. Additional information is available from our web page at <http://geology.fullerton.edu/>.

To apply, please send the following:

1. a detailed curriculum vita including a record of your past external funding; 2. a letter of application that explains how you meet the qualifications outlined above and specifically addressing your qualifications as Curator of Paleontology for the Cooper Center; 3. a statement of your future research plans and goals as they relate to the collections in the Cooper Center; 4. a statement of your teaching philosophy including a list of courses you would feel comfortable teaching; 5. letters of recommendation from at least three references familiar with your research, curation, and teaching experience -- referees should send their letters directly to the address below.

Send application to: Dr. Nicole Bonuso, Search Committee Chair, Department of Geological Sciences, California State University, PO Box 6850, Fullerton, California 92834-6850. Review of completed applications will begin on November 18, 2011. Applications received after this date will be reviewed only if the position is not filled from the original pool of applicants.

California State University, Fullerton is an Affirmative Action/Equal Opportunity Employer. All personnel policies conform to the requirements of Executive Order 11246, the Americans with Disabilities Act (ADA) of 1990, Title IX of the Higher Education Amendments of 1972 and other federal regulations regarding nondiscrimination.

**Assistant Professor in Aqueous Geochemistry/ Biogeochemistry.** The Department of Earth and Ocean Sciences invites applications for a tenure-track, Assistant Professor position in Aqueous Geochemistry or Biogeochemistry. We seek an individual with outstanding research and teaching capabilities and broad interests related to the ways in which Geochemical and Biogeochemical processes mediate chemical exchange between the Hydrosphere, Lithosphere, and Biosphere. Areas of interest may include characterization of natural systems over long (geologic) and short (environmental) time scales and the influences of climate change and human activity on elemental cycling.

The successful candidate is expected to teach undergraduate and graduate courses in earth science and to direct an active externally funded research program. Potential collaborative interactions exist within the department (<http://www.geol.sc.edu>); with other interdisciplinary programs housed within the School of the

Earth, Ocean and Environment (<http://www.cas.sc.edu/soee/>), including the Environment and Sustainability Program and the Marine Science Program; and with other departments, including Civil and Environmental Engineering, Geography, and Biological Sciences. Teaching responsibilities will likely include introductory Earth or environmental science courses as well as upper-level undergraduate and graduate level courses related to the candidate's specialty. A Ph.D. is required at the time of appointment, and postdoctoral experience is desirable. Applicants should submit a vita, statements of research and teaching interests, and the names, addresses and phone numbers of at least three references (in a single pdf file) to [geochem@geol.sc.edu](mailto:geochem@geol.sc.edu). For more information please contact: Alicia M. Wilson, Geochemistry Search Committee Chair, Department of Earth and Ocean Sciences, University of South Carolina, Columbia, SC 29208.

To ensure full consideration, applications should be received by November 15, 2011. We will review files until a candidate is selected. The University of South Carolina is an affirmative action, equal opportunity employer. Women and minorities are encouraged to apply. The University of South Carolina does not discriminate in educational or employment opportunities or decisions for qualified persons on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, or veteran status.

**Assistant Professor, Marine Microbiology/ Biogeochemistry.** The Department of Earth, Ocean, and Atmospheric Science is seeking applications for a Ph.D. level marine microbiologist/biogeochemist to fill a nine-month, tenure-earning appointment at the Assistant Professor level to begin as soon as August of 2012. We are particularly interested in a person who combines genomics, molecular ecology, microbiology and biogeochemistry in research addressing the role of microorganisms in marine ecological processes and in influencing the cycles of C, N, P, Si, etc. This position has traditionally served as a "bridge position" between our chemical oceanography and biological oceanography groups. The position involves research, teaching (at the graduate and undergraduate level), and service. Please send the pdf-files of your letter of application, curriculum vitae, research concept, teaching philosophy, and contact information for three references to [mhuettel@fsu.edu](mailto:mhuettel@fsu.edu). Review of applications will begin November 1, 2011, however, the search process will remain active until the position is filled. Women and members of minority groups are especially encouraged to apply. An Equal Opportunity/Access/Affirmative Action Employer, Florida State University subscribes to Equal Opportunity and complies with the Americans with Disabilities Act. All eligible candidates are invited to apply for position vacancies as appropriate. Florida State University is a public records agency pursuant to Chapter 119, Florida Statutes.

**Post-doctoral Research Associate in Soil Geochemistry.** The Rice University Isotope Biogeochemistry group invites applications for a postdoctoral scholar to work on analytical and organic geochemical aspects of soil carbon sequestration. A solid background in analytical chemistry is essential for this position; a background in Earth science is desired. The successful applicant must be enthusiastic, self-motivated, a good communicator, and able to work independently. For more information see [terra.rice.edu](http://rice.edu/department/faculty/masiello/RIBG/). The initial appointment is for 1 year, renewable with satisfactory performance. Evaluation of applications will begin immediately and continue until the position is filled. Applications should send a CV, description of doctoral research, list of publications, and three letters of reference to [masiello@rice.edu](mailto:masiello@rice.edu). Rice University is a highly-ranked, non-sectarian private research university located in Houston, Texas, a dynamic, cosmopolitan city that is the 4th largest in the nation. Rice occupies a 300 acre tree-shaded

campus adjacent to Houston's Museum District and the Texas Medical Center, the world's largest medical complex. Rice has a highly diverse and international student body and strong culture of cross-disciplinary collaboration. Rice University is an equal opportunity, affirmative action employer, and women and minorities are encouraged to apply.

**(PIRE) Postdoctoral Research Associate.**

The Institute of the Environment at Montana State University in Bozeman, Montana, WildFIRE Partnership in International Research and Education (PIRE) Program, [www.wildfireire.org](http://www.wildfireire.org). Start Date: Est Jan 1, 2012. Appointment: Full-time (1.0 FTE). Grant funded renewable annual appointment contingent on funding, need, and performance. The vacancy announcement for the PIRE Postdoctoral Research Associate position is currently posted on the MSU web site at <http://www.montana.edu/jobs/research/11192-33>.

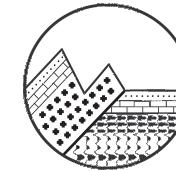
**Vising Assistant Professor in Geology:**

**Paleontology/Soft-Rock Geology.** The Department of Geology invites applications for a one-year, non-tenure track, Visiting Assistant Professor in paleontology and soft-rock geology beginning 1 September 2012. The successful applicant will be expected to teach a core-curriculum Paleontology course (200-level: Record of Life) with laboratory and an upper division course of his/her choice for geology majors during the academic year. The upper division course should complement those already offered in the department. The remainder of the teaching assignment will be an introductory course offering (100-level) for potential majors and non-majors. Additionally, the candidate may have the opportunity to direct one or more independent research projects. Colby is a highly selective liberal arts college recognized for excellence in undergraduate education and for close student-faculty interaction. A Ph.D. with teaching experience at time of employment preferred; ABDs encouraged to apply. Applicants should submit a letter of application, curriculum vitae, statements of teaching and research interests, and three letters of reference to Dr. Robert A. Gastaldo, Chair, Department of Geology, 5807 Mayflower Hill Drive, Waterville, ME 04901. Review of applications will begin on 14 November 2011 and will continue until the position is filled. Colby is an Equal Opportunity/Affirmative Action employer,

committed to excellence through diversity, and strongly encourages applications and nominations of persons of color, women, and members of other under-represented groups. For more information about the College, please visit the Colby Web site: [www.colby.edu](http://www.colby.edu).

**Geochemistry****Lithospheric System Dynamics, University of Southern California.**

The Department of Earth Sciences in the Dana and David Dornsife College of Letters, Arts, and Sciences of the University of Southern California (ZHS, 3651 Trousdale Pkwy Los Angeles, CA 90089-0740) seeks applications for a full-time tenure-track faculty appointment at the Assistant Professor level from applicants with research interests in the dynamics of Earth's crust and lithosphere, for an anticipated start date in the 2012-2013 academic year. The appointee will be expected to establish a vigorous research program supported by extramural funding and to contribute to the Department's overall research effort in Lithospheric System Dynamics. The successful appointee will have expertise in the chemistry or physics of Earth materials, geochronology, and/or related areas. They will also be expected to contribute to undergraduate and graduate teaching, particularly in the areas of mineralogy, petrology, and geochemistry. Candidates must hold a Ph.D. in Earth Sciences or a related field, and have the ability to develop and support laboratory facilities in their research area. Applications should include a curriculum vitae, publication list, statement of teaching and research interests, and three or more names of individuals familiar with the applicant's work who could be contacted for letters of reference. Applications should be directed to: Chair, Search Committee, c/o Karen Young ([kayoung@usc.edu](mailto:kayoung@usc.edu)). Review of complete applications will begin December 1, 2011. In order to be considered for this position, applicants are also required to submit an electronic USC application; follow this job link or paste in a browser: <https://jobs.usc.edu/applicants/Central?quickFind=61196>. USC strongly values diversity and is committed to equal opportunity in employment. Women and men, and members of all racial and ethnic groups are encouraged to apply.

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**ConocoPhillips**  
SCHOOL OF  
GEOLOGY &  
GEOPHYSICS  
The University of Oklahoma

**FACULTY POSITION IN GEOPHYSICS**

The University of Oklahoma invites applications and nominations for a tenure-track or tenured faculty position in geophysics. The rank and salary are open but preference will be given to candidates at the Assistant or Associate Professor level. Exceptionally well-qualified applicants may be appointed to an endowed professorship. A Ph.D. degree in geophysics or a closely related field is required.

The successful candidate is expected to add significantly to the University's long-standing geophysics and geology education and research programs. The successful candidate must have an excellent, demonstrated research record in relevant areas such as exploration geophysics or crustal seismology, and is expected to establish and lead a strong multidisciplinary research program. The position includes many opportunities to work closely with geophysical, geological, and engineering colleagues within the Mewbourne College of Earth and Energy. Our preferred applicant will have demonstrated, hands-on expertise in one or more fields such as 3D seismic acquisition, processing, modeling, seismic imaging, array seismology, or seismic tomography. The candidate will be expected to supervise M.S. and Ph.D. students, be an excellent educator, and have a dual commitment to both undergraduate and graduate education.

The Mewbourne College of Earth & Energy possesses extensive industry-standard software and well-equipped and maintained computing labs for seismic reflection processing, analysis, and interpretation on both PC and LINUX platforms as well as seismic refraction data analysis and rock properties laboratory facilities. Excellent field equipment for seismic and potential studies is also available. Additional information about the College and the entities that it houses can be found at <http://mcee.ou.edu>.

Review of candidates will begin November 1st, 2011 and continue until the position is filled. The anticipated starting date is August 1st, 2012. Applicants are requested to submit a complete vita/resume, statement of research and teaching interests, and a list of five references who can be contacted, including names, phone numbers, e-mail addresses, and complete mailing addresses. Questions or requests for additional information and nominations may be addressed to Dr. G. Randy Keller at (405) 325-3821, or [gkeller@ou.edu](mailto:gkeller@ou.edu). Applications should be addressed to Dr. Keller at University of Oklahoma, Sarkeys Energy Center, 100 E. Boyd Street, Norman, OK, 73019-1008.

The University of Oklahoma is an Affirmative Action, Equal Opportunity Employer. Women and Minorities are encouraged to apply.



**Pathfinder Graduate Student Fellowships**  
**Travel Grants to Support Multisite or Multidisciplinary Water Science Research**

Graduate training in water science often focuses on a single field site, analytical or modeling approach. To assist graduate students in enhancing their research program by moving beyond this "one site, one view" approach, CUAHSI will provide travel support for graduate students to make an extended visit (ca. 1 – 3 months) to broaden their research. Travel may be to an additional field site to conduct comparative research, to collaborate with a research group using alternate approaches or modeling methods, or to work with researchers on adding an interdisciplinary dimension to a water science research project. CUAHSI will fund up to five graduate students, with a \$5000 maximum award for each recipient, to cover travel costs. CUAHSI encourages applicants from across the broad range of water science.

**Additional application information available at [www.cuahsi.org/pathfinder.html](http://www.cuahsi.org/pathfinder.html)**  
**Inquiries and applications should be emailed to [pathfinder@cuahsi.org](mailto:pathfinder@cuahsi.org)**  
**Deadline for submission of all application materials is October 7, 2011**

Consortium of Universities for the Advancement of Hydrologic Science, Inc.  
[www.cuahsi.org](http://www.cuahsi.org)

## Post Doctoral Fellow

### Atmospheric CO<sub>2</sub> Modelling

**Fixed-term, Two-years**  
**Wellington, New Zealand**

NIWA is a leading environmental research institute and key provider of atmospheric, freshwater and marine research and consultancy services in New Zealand. NIWA has a strong programme of measurement and modelling of emissions to the atmosphere and atmospheric composition, including greenhouse gases. This is linked to a wider effort to improve knowledge of human impacts on the environment, both globally and in the South Pacific region in order to guide and verify national and international strategies aimed at reducing greenhouse gas impacts on the climate system.

NIWA is seeking a Post Doctoral Researcher in the area of regional atmospheric CO<sub>2</sub> modeling to undertake Lagrangian modeling to interpret surface and total column observations of CO<sub>2</sub>, assess regional uptake of CO<sub>2</sub> by the terrestrial biosphere and oceans and investigate relationships between climate drivers and terrestrial CO<sub>2</sub> uptake in New Zealand. This position will collaborate with Dr. Sara Mikaloff Fletcher and Dr. Vanessa Sherlock and will be primarily based in Wellington, with some time also spent in Lauder, South Island.

The successful candidate will have a Ph.D. in Atmospheric Science or a related field; strong analytical, statistical and programming skills and the ability and aptitude to network with other New Zealand experts on the terrestrial carbon cycle. A background or interest in Lagrangian modeling, carbon modeling, or in situ and/or remote-sensing trace gas measurements is also desirable.

For further information, a detailed position description and online applications, please visit [www.careers.niwa.co.nz](http://www.careers.niwa.co.nz)

**NIWA**  
Taihoro Nukurangi

Leading Environmental Science      [www.careers.niwa.co.nz](http://www.careers.niwa.co.nz)

**Classified**

cont. from page 320

**Petrology Post-Doctoral Researcher.** The Geology Department at Southern Illinois University, Carbondale invites applications for a post-doctoral fellowship in petrology. The successful candidate will work with Dr. Justin Filiberto in NASA-funded efforts, focusing on analytical and experimental studies of martian basalt degassing as the source of 'acid fog' and of halogens in the soil. These efforts focus on volatile elements (specifically halogens) in planetary magmas, Martian meteorites, terrestrial analogs, and experimental studies, starting with analyses by optical microscopy and electron microprobe. The candidate will be encouraged to design and conduct their own research in petrology. Applicants must hold a Ph.D. in geology or a related field or show that they will complete all degree requirements by the time of appointment. The applicant must specialize in petrology or geochemistry; experience with planetary materials and/or experimental equipment is recommended. The position would be for one year, with possible extension up to four years depending on performance and funding.

Effective Date of Appointment: November 1, 2011. Application Deadline: Review of applications will begin immediately and continue until the position is filled.

Application Procedure: Applicants should submit a curriculum vitae, a statement of research interests, and the names and contacts of at least three referees to (email is preferred): Dr. Justin Filiberto, Southern Illinois University Carbondale, Department of Geology, Mailcode 4324 1259 Lincoln Drive, Carbondale, IL 62901, Fax: 618-453-7393, Email: filiberto@siu.edu. SIUC is an Affirmative Action/Equal Opportunity employer that strives to enhance its ability to develop a diverse faculty and staff and to increase its potential to serve a diverse student population. All applications are welcomed and encouraged and will receive consideration.

**Research Isotope Geologist, US Geological Survey (USGS).** The Central Minerals and Environmental Resources Science Center (CMERSC) of the USGS has an immediate opening for a research isotope geologist position in Denver, Colorado. The CMERSC is equipped with state-of-the-art facilities for geo-analytical chemistry, including a Nu Plasma high-resolution multi-collector ICP-MS (HR-MC-ICP-MS), a recently purchased Finnigan Element 2 high-resolution single collector ICP-MS, and a class 100 cleanroom.

With this new Research hire we are seeking to complement our existing expertise in isotope geology/geochemistry, economic geology, and analytical chemistry. Candidates must have significant research experience with HR-MC-ICP-MS analyses of rock samples, including a demonstrated ability to develop new instrumental routines for isotopic analyses and to develop and use new separation methods to prepare geologic samples for isotopic analysis. Candidates will collaborate with other USGS scientists, including geologists, petrologists, geochemists, and biologists to develop innovative research studies incorporating radiogenic or non-traditional isotope investigations. Excellent skills in writing and oral presentation of scientific findings are also required.

Applications for this vacancy must be received on-line via USAJOBS before midnight Eastern Time (Washington, D.C. time) on the closing date of this announcement. If you fail to submit a complete on-line resume, you will not be considered for this position. Requests for extensions will not be granted. If applying on-line poses a hardship for you, please speak to someone in the Servicing Personnel Office listed on the announcement prior to the closing date. For assistance and questions, contact the Office of Human Resources at 303-236-9579, or ekgregory@usgs.gov.

Effective September 12, 2011, the online application can be accessed at <http://www.usajobs.opm.gov>. Announcement number PAC-2011-0552. This is a full-time permanent position (Research Geologist, GS-1350-13) with a salary range of \$87,815-\$114,158 depending upon qualifications. The

closing date is September 30, 2011. U.S. Citizenship is required. USGS is an Equal Opportunity Employer.

**Senior Research Laboratory Manager - Stable Isotopes.**

Applications are invited for the post of Senior Laboratory Manager in the Godwin Laboratory for Palaeoclimate Research. The Laboratory is a world leader in the field of stable isotopes with the main area of research focused on Palaeoclimatology/Palaeoceanography involving the preparation & analysis of marine sediment cores. The Laboratory Manager would be responsible for the administration, safety & management of a number of technical and research staff involved within a busy research laboratory; as well as the management of the day to day financial budget, including overseeing funding from a number of research grants & commercial sources. They would also be involved in the future development of new methods & instrumentation in order to maintain the laboratory's position at the forefront of its area of research. The successful candidate should hold a degree or equivalent qualification in a relevant field and have considerable practical knowledge of stable isotope ratio mass spectrometry & proven experience of laboratory management & administration. Application details: <http://www.admin.cam.ac.uk/offices/hr/jobs/vacancies.cgi?job=8577>. Closing date: 5 Oct 2011

**Ocean Sciences****Faculty Position in Biological Oceanography.**

The Department of Marine, Earth, and Atmospheric Sciences (MEAS) at North Carolina State University is seeking to fill a tenure-track faculty position at the assistant professor level in biological oceanography in the areas of microbial and/or plankton ecology. Possible research areas include, but are not limited to: microbial/plankton activity in marine productivity, food webs or other ecosystem functions; the microbial/plankton role in marine biogeochemical cycling within the context of global climate change; or microbial/plankton evolution, diversity, biochemistry, genetics, and physiology in the context of marine ecology. Skill in the application of developing technologies, including visualization, biochemical or molecular biological approaches and proven experience in interdisciplinary research, are preferred, as is a strong interest in interdisciplinary collaborations across and beyond the geosciences. The position is available 1 August 2012.

Applicants must hold a Ph.D. degree in the oceanographic or related sciences. The successful candidate must demonstrate strong potential for outstanding accomplishments in research, research supervision, and teaching. Specific course offerings should include undergraduate or graduate general marine biology or biological oceanography, and other classes commensurate with the candidate's interest and expertise.

Opportunities exist for disciplinary and interdisciplinary interactions with more than 30 marine, earth, and atmospheric scientists in the MEAS department on problems relating to global and regional environmental change, environmental processes and prediction, and the interactions among components of the Earth system. Additional information about the department and its facilities can be found on our web page: <http://www.meas.ncsu.edu>. Marine research facilities and opportunities for collaboration in the marine sciences are available at the Center for Marine Sciences and Technology (CMAST) in Morehead City, NC: <http://www.c mast.ncsu.edu>.

Review of applications will begin 15 October 2011; the position will remain open until filled. Applications, including cover letters, curriculum vitae, teaching and research statements (1 page each), and contact information for three references must be submitted online at <https://jobs.ncsu.edu/>. Please search for position number: 1518.

NC State University is an equal opportunity and affirmative action employer. All qualified applicants will receive consideration for employment without

regard to race, color, national origin, religion, sex, age, veteran status, or disability. NC State University welcomes all persons without regard to sexual orientation. Applications from women, minorities, and persons with disabilities are encouraged. The College of Physical and Mathematical Sciences welcomes the opportunity to work with candidates to identify suitable employment opportunities for spouses or partners.

**Faculty Positions in the Atmospheric and Oceanic Sciences.** The Department of the Geophysical Sciences at The University of Chicago invites applications for faculty positions in the atmospheric and oceanic sciences. Areas of special interest include, but are not limited to:

oPhysical oceanography, including the role of the oceans in Earth's climate system

oAtmospheric science pertaining to aerosols, clouds, or chemistry, with particular emphasis on experimentation or analysis of field measurements

oGeneral circulation and climate dynamics of planetary atmospheres

Candidates must have completed a Ph.D. prior to appointment.

Applicants must apply through the University's Academic Careers website and upload a cover letter; a curriculum vitae; statements of research and teaching interests; and names and contact information for at least three referees. Consideration of applications will begin November 1, 2011. For a position at the rank of Assistant Professor, please apply at [academiccareers.uchicago.edu/applicants/Central?quickFind=51832](http://academiccareers.uchicago.edu/applicants/Central?quickFind=51832). To be considered for a tenured rank, please apply at [academiccareers.uchicago.edu/applicants/Central?quickFind=51837](http://academiccareers.uchicago.edu/applicants/Central?quickFind=51837). The University of Chicago is an Affirmative Action/Equal Opportunity Employer. For more information on the Department, please visit <http://geosci.uchicago.edu>.

**Head of the Coastal and Ocean Remote Sensing Branch, Naval Research Laboratory in Washington, DC, Code 7230.**

The Remote Sensing Division of the Naval Research Laboratory in Washington, D.C. is seeking applicants for a research leadership position as Head of the Coastal and Ocean Remote Sensing Branch. The Branch conducts a broad spectrum of basic and applied research centered on environmental remote sensing of the littoral zone (both land and in-water). Current Branch research programs include all aspects of littoral remote sensing including instrument design and fabrication, instrument calibration, conducting field experiments, both land and in-water in situ instrumentation for data validation and spectral library development, atmospheric correction algorithm development, data validation and spectral library development, atmospheric correction algorithm development, data exploitation and analysis algorithm development, and hydrodynamics research to understand, interpret, and exploit remote sensing signatures. Key facilities included the Hyperspectral Imager for the Coastal Ocean (HICO) currently operational on-board the International Space Station, an airborne sensor suite including VNIR and SWIR hyperspectral sensors and thermal cameras, NIST traceable VNIR and IR calibration facilities, and an instrumented wave tank facility.

The Branch Head is responsible for the formulation of the scientific goals of the Branch, and works in collaboration with the Section Heads and other senior Branch members to conceive, plan, implement, and adjust short-term and long-range research goals of the program projects. The projects frequently entail collaboration with other parts of NRL and international research organizations. He/she is also encouraged to maintain an independent research program.

The Branch Head is responsible for assuring that the Branch research programs are adequately represented at national and international meetings, conferences, and committees in order to further the exchange of ideas and advances in the field

**Classified** cont. on page 322



## The Endowed Leone Family Chair in Energy and Mineral Engineering

The John and Willie Leone Family Department of Energy and Mineral Engineering (EME; <http://www.eme.psu.edu>) in the College of Earth and Mineral Sciences (EMS) at The Pennsylvania State University invites applications for a faculty position at the full professor level. The candidate will hold the John and Willie Leone Family Chair in Energy and Mineral Engineering. The successful applicant for the Leone Chair is expected to further scholarly excellence through contributions to instruction, research and public service and lead efforts to integrate business and engineering education. The candidate will be expected to teach undergraduate and graduate-level courses, supervise graduate students at the MS and PhD levels and pursue a world-class research program in his/her area of specialization.

The successful candidate should be an accomplished international scholar with a sustained record of professional achievement; possess an outstanding research and publication record, teaching and/or industrial leadership record; have demonstrated ability and willingness to establish and lead externally funded research programs; and have an earned PhD in either an energy-related engineering or business discipline or the combination thereof. Potential candidates with high-level engineering and business, economics or finance experience in an energy-intensive industry are also encouraged to apply. The successful candidate will be expected to collaborate with other energy-related faculty in the EME Department and across the University.

EME is a unique interdisciplinary department that is home to Penn State's undergraduate degree programs in Energy Business and Finance, Energy Engineering, Energy and Sustainability Policy, Environmental Systems Engineering, Mining Engineering, and Petroleum and Natural Gas Engineering. The department also offers the MS and PhD degrees in Energy and Mineral Engineering with options in energy management and policy, environmental health and safety engineering, fuel science, mining and mineral process engineering, and petroleum and natural gas engineering. With the Leone Endowment, EME is strengthening the integration of engineering and business education and research in a variety of energy fields.

Applications should include: (1) a curriculum vitae with educational background, employment history and publications; (2) a statement on research and teaching interests; (3) names and addresses of at least three referees; and (4) samples of refereed publications. Send applications at the earliest via regular mail or electronically to: Chair of the Leone Chair Search Committee, EME Department, 117 Hosler Building, University Park, PA 16802, USA; Fax: (814) 863 5709; E-mail: amm277@psu.edu. Review of applications will continue until the position is filled.

Penn State is committed to affirmative action, equal opportunity and the diversity of its workforce.

**PENN STATE Making Life Better**

**Postdoctoral Researcher in Regional Climate Modeling****Project Description:**

The Computational Earth Sciences group of the Computer Science and Mathematics Division at Oak Ridge National Laboratory seeks to hire a Post Doctoral Researcher to participate in research involving the development of approaches to investigate natural and anthropogenic hydroclimate variability at regional and local scales. Using a suite of global-to-regional scale climate models and observational datasets, this research will improve the quantitative understanding of nature of interactions between fine-scale hydroclimate processes and large-scale climate forcing, and role of such interactions in the occurrence of high-intensity low-frequency hydro-climate extremes at multi-decadal time scales.

**The successful candidate will be expected to:**

- 1) Play a key role in the planning and execution of multi-model-driven ultra-high resolution global and regional climate modeling experiments
- 2) Analyze, present and publish research results in scientific conferences and peer-reviewed journals
- 3) Coordinate and collaborate with researchers at ORNL and other DOE National Labs.

**Required Skills:**

- Strong understanding of current climate modeling techniques with demonstrated expertise in the use and application of a Regional Climate Model.
- Demonstrated ability to perform comprehensive analysis of large climate datasets through advanced data analysis techniques and evaluation matrices.
- Excellent oral and written communication skills.
- Good publications record in peer-reviewed journals.
- Expertise in one of the programming languages such as Fortran, C, and analysis packages such as MATLAB, IDL, NCL.
- Candidate must have received a PhD degree in Atmospheric and Oceanic Sciences or a related field within the past five years from an accredited college or university.

**Desired Skills:**

- Knowledge of North American climate and global monsoon systems
- Experience in the use of Global Climate Models data
- Experience in the use of climate models output in process-based hydrological applications and statistical hydrology
- We anticipate it to be a two years' position, dependent on continuing funding. Applications will be accepted until the position is filled.

**How to Apply:**

Qualified applicants must apply online at [https://www3.orau.gov/ORNL\\_ToppS/Account/LogOn](https://www3.orau.gov/ORNL_ToppS/Account/LogOn). All applicants will need to register before they can begin the online application.

This appointment is offered through the ORNL Postgraduate Research Participation Program and is administered by the Oak Ridge Institute for Science and Education (ORISE). The program is open to all qualified U.S. and non-U.S. citizens without regard to race, color, age, religion, sex, national origin, physical or mental disability, or status as a Vietnam-era veteran or disabled veteran.



**Classified**

cont. from page 321

and to nurture fruitful collaborations. The Branch Head is also responsible for planning, directing and coordinating the effective administration of the Branch Programs ensuring the modification and construction of new facilities as required, and assisting the recruitment of post-docs and scientists.

The Branch consists of approximately 25 primarily Ph.D. level scientists and engineers divided into four Sections, each with a Section Head reporting to the Branch Head. The Branch Head administers an annual budget of ~\$10M with the assistance of a Branch Secretary and additional budgeting and administrative support from the Division level.

This position offers the opportunity to lead and define a littoral remote sensing program at a major national Laboratory. The successful candidate will preferable have a Ph.D. in oceanography with background and expertise demonstrated by peer-reviewed publications, representations on panels, history of successful proposal writing, etc., in littoral environmental research with an emphasis on optical oceanography. Demonstrated experience in leading scientific programs and in personnel management is also strongly preferred, and familiarity with Naval METOC requirements would be an important advantage. This federal government position is at the NP-IV level, which is equivalent to GS 14-15, with a salary range from \$103,536 to \$155,000 per annum, which includes the Washington, D.C. area locality adjustment.

Interested parties should transmit via e-mail a cover letter describing their interest in the position and a CV to Dr. Davidson Chen, NRL Remote Sensing Division Associate Superintendent and Head of the search committee [Davidson.chen@nrl.navy.mil; telephone (202)404-8127]. Applications will be considered until the position is filled.

The Naval Research Laboratory is an Equal Opportunity Employer.

**OMO Project Manager.** The Incorporated Research Institutions for Seismology (IRIS) is seeking a talented Project Manager for our newly established Ocean Bottom Seismograph Instrument Pool (OBSIP) Management Office (OMO). The Ocean Bottom Seismograph Instrument Pool is a multi-institutional facility

that provides sensors and recording systems for long-term deployment in the deep ocean for use in research projects to explore earthquakes and deep Earth structure. The OMO will work with the National Science Foundation, the scientific community, and the instrument contributors from oceanographic institutions to coordinate the development, operation, maintenance and deployment of a pool of approximately 200 instruments and ensure maximum scientific benefit from the OBSIP.

This is a managerial position responsible for providing technical advice and leadership in the development and evolution of OMO. The Project Manager supervises a small OMO staff at IRIS headquarters in Washington DC, manages the awards to the instrument contributors, encourages teamwork among the contributors, principal investigators, and NSF, schedules experiments, and represents OMO with national and international organizations. To learn more about this outstanding opportunity, please visit <http://www.iris.edu/hq/employment> for a full job description.

The ideal candidate must have an advanced degree in engineering or science and 10 years of managerial and technical experience. Experience in geophysics and ocean engineering is preferred.

Interested applicants should email a cover letter, their CV, and contact information for 3 references to [hr@iris.edu](mailto:hr@iris.edu). Review of applications will begin October 10th.

**Post Doctoral Research Fellow University of Massachusetts Boston.** The Environmental, Earth, and Ocean Sciences (EEOS) department at the University of Massachusetts Boston invites applicants for a Post-Doctoral Scholar position in the field of ocean optics and ocean color remote sensing and applications. We are seeking an outstanding scientist with a recent doctorate in marine science, remote sensing, or a closely related field to work on federal and local government funded projects. The successful candidate is expected to use current standard satellite ocean-color products or to generate innovative products to address interdisciplinary Earth and Environmental Science questions. The successful candidate should demonstrate excellence in field measurements, satellite data process and analysis, and scholarly productivity. Minimum Qualifications: Ph.D. in oceanography or a closely related field. Please apply online with your resume, cover letter, and list of three professional references at: <http://umb.interviewexchange.com>. Click "Search Employment

Opportunities" and enter keyword "Postdoctoral Scholar."

UMass Boston is an Affirmative Action, Equal Opportunity Title IX Employer.

**Program Director - National Science Foundation Division of Ocean Sciences Chemical Oceanography Program.** The National Science Foundation is seeking qualified candidates for the position of Program Director for the Chemical Oceanography Program within the Division of Ocean Science, Directorate for Geosciences.

The Chemical Oceanography Program supports research into the chemical components, reaction mechanisms, and geochemical pathways within the ocean and at its interfaces with the solid Earth and the atmosphere.

Appointment to this position may be on a one or two year Visiting Scientist appointment, an Intergovernmental Personnel Act, or a Federal Temporary appointment. Applicants must have a Ph.D. or equivalent experience in chemical oceanography, marine chemistry, marine geochemistry, or related disciplinary fields. In addition, six or more years of successful research, research administration, and/or managerial experience pertinent to the program are required. A broad understanding of the current status of the relevant United States academic scientific community and its inter-relationship with NSF, other

federal agencies, and international planning efforts is desirable.

Announcement OCE-2011-0006 with position requirements and application procedures is located on the NSF Home Page at: [http://www.nsf.gov/about/career\\_opp.s](http://www.nsf.gov/about/career_opp.s). Vacancy Opening/Closing Dates: 09/06/11 - 10/04/11. Telephone inquiries may be referred to the Executive and Visiting Personnel Branch at 703-292-8267. For technical information, contact Dr. Donald L. Rice ([drice@nsf.gov](mailto:drice@nsf.gov)). Chemical Oceanography Program at 703-292-8582. Hearing-impaired individuals should call TDD at 703-292-5090. Applications must be received by October 4, 2011. NSF is an Equal Opportunity Employer.

**Solid Earth Geophysics****Geodetic Infrastructure Program Director**

**UNAVCO.** We seek a visionary leader to sustain and enhance a newly established Geodetic Infrastructure Program at UNAVCO, a university consortium that operates NSF's national geodesy facility for investigator and community research support. UNAVCO enjoys national recognition for excellence. The program portfolio includes sustaining and enhancing the Plate Boundary Observatory, COCONet, Africa Array, and PI

geodetic investigations from pole to pole. Currently

**Classified** cont. on next page

**PENNSTATE**

University Park

**DIRECTOR, JOHN A. DUTTON  
e-EDUCATION INSTITUTE**

The Pennsylvania State University, University Park, invites applications for Director of the John A. Dutton e-Education Institute. Since 2000, the Dutton Institute has been developing and offering award-winning online programs across undergraduate and graduate levels in the College of Earth and Mineral Sciences. Currently the Institute includes over 50 personnel worldwide. E-Education is a major strategic College and University priority.

The Director candidate should present a record of effective leadership and accomplishments in the identification, development, and operation of high-quality online programs. Experience leading curricular design and development, as well as program administration and delivery that meets market opportunities, is crucial. The candidate should have the knowledge and vision to work across the College's disciplines and should possess background and research skills in distance education. This position is located in the College of Earth and Mineral Sciences and is coordinated with the University's World Campus.

A master's degree or higher is required. Strong strategic development skills, communication capacity, and business acumen are imperative.

Applications should include a letter describing experience and qualifications and the address/email of three referees. Applicants should request that the reference letters be forwarded directly at time of application. All materials should be submitted electronically to Deb Sipe at [sipe@ems.psu.edu](mailto:sipe@ems.psu.edu). Review of applications will begin on November 11, 2011.

The Pennsylvania State University is committed to affirmative action, equal opportunity, and the diversity of its workforce.

Opportunities as **limitless as Penn State.**

**www.psu.jobs**

**IRETHERM**

Developing a strategic and holistic understanding of Ireland's geothermal energy potential through integrated modelling of new and existing geophysical and geological data

Dublin Institute for Advanced Studies (DIAS) invites applications for a

**Post-Doctoral Research Fellowship (four year position)  
(multivariate data analysis and modelling)**

to undertake geothermal energy research within the exciting Science Foundation Ireland-funded IREtherm project ([www.iretherm.ie](http://www.iretherm.ie)). Join our dynamic team of over 20 scientific collaborators, post-doctoral fellows and PhD students in developing a holistic understanding of Ireland's low-enthalpy geothermal energy potential through innovative, integrated modelling of geophysical and geological data, supported by development of multivariate modelling tools.

We are seeking highly numerate and motivated candidates with excellent academic records from a wide range of backgrounds (physics, applied mathematics, computational sciences and geophysics). Prior geothermal energy research experience is advantageous, but not essential.

**Research role.** Develop new approaches and numerical codes for joint integration/inversion of multiple geophysical properties (resistivity, density, seismic-velocity) to derive robust estimates of rock porosity/permeability, constrained by borehole information. The codes will be applied to assess the geothermal energy potential of deep aquifer targets in Ireland. Associated research also provides the opportunity to advance joint magnetotelluric-gravity inversion approaches together with other DIAS collaborators. The role envisaged offers much flexibility in defining a research focus and includes IREtherm supervisory responsibilities, providing a strong basis to establish/cement a significant academic research career. The position supports international travel to major conferences and for scientific collaboration.

**Requirements.** Experience in one or more of the following areas: multivariate data analysis; numerical and inverse code development; investigation and modelling of geophysical and petrophysical relationships (particularly porosity/permeability); geophysical data modelling. Extensive software programming knowledge and experience essential.

**Applications.** Please email the following information to [geosecretary@cp.dias.ie](mailto:geosecretary@cp.dias.ie): complete CV, cover letter outlining your interest in the project (highlight relevant experience and accomplishments), contact details of three referees, with **IRETHERM-PDF** in the subject line.

**Four year, fixed-term contract. Salary: €35,730 per annum (or €40,691 with extensive experience) with annual increments. Applications received before 30 October 2011 will receive full consideration,** and the position will remain open until filled. For more information please contact Dr. Mark Muller ([mark.muller@dias.ie](mailto:mark.muller@dias.ie)) or Prof. Alan Jones ([alan@cp.dias.ie](mailto:alan@cp.dias.ie)).

**UCAR VISITING SCIENTIST PROGRAMS**

**Applications are Invited**

**2012 Postdoctoral Fellowships**

*Training the next generation of researchers*

**Postdocs Applying Climate Expertise (PACE)**

**Jack Eddy Fellowship (NASA)**

**NOAA Climate & Global Change (C&GC) Fellowships**

Visit the VSP website for details. All programs have January deadlines.

[vsp.ucar.edu](http://vsp.ucar.edu) ~ 303-497-8649

**VSP**  
UCAR Visiting  
Scientist  
Programs

**Classified**

cont. from page 322

supported geodetic observations include campaign, continuous, and high-rate, low-latency GPS; terrestrial laser scanning; strain and borehole seismic data; meteorological observations; and geodetic imaging (SAR and LiDAR) acquired from a variety of platforms. The successful candidate will be a member of the UNAVCO Senior Management team, and supervise project managers and engineering staff in the development and operation of geodetic observing networks and systems. Screening begins October 11, 2011, and continues until the position is filled. To learn more and to apply visit: [www.unavco.org](http://www.unavco.org). UNAVCO is an AA/EEO Institution.

**Geologist I.** The Kentucky Geological Survey (KGS) at the University of Kentucky invites applications for a permanent position in seismology/geology (Position#: 51013243). In cooperation with the Department of Earth and Environmental Sciences, KGS maintains and operates the Kentucky Seismic and Strong Motion Network, including the Central United States Seismic Observatory ([www.uky.edu/KGS/geologic/hazards/equake3.htm](http://www.uky.edu/KGS/geologic/hazards/equake3.htm)). We seek an individual who has a broad background in seismology and experience in seismic network maintenance and operation; and data process, archive, and analysis. The successful candidate will be expected to interface with other research groups within the survey and at UK. Minimum Requirements: B.S. in geophysics/geology and 6 months of professional experience. Preference will be given to candidates with experience in seismic network operation and maintenance. Please visit our website at <http://ukjobs.uky.edu/> for application information. Application review will begin September 30th, and will remain open until the position is successfully filled.

**Tenure-Track Geophysicist.** The Department of Earth & Space Sciences seeks candidates to fill the Leon and Joanne V.C. Knopoff Term Chair in Physics and Geophysics at UCLA. It is anticipated the appointment will be made at the level of Assistant Professor. Joint appointment in the Department of Physics and Astronomy will be considered for suitable candidates. Applicants are invited from all sub-disciplines of geophysics, but preference will be given to candidates who complement existing strengths in seismology, geodynamics, tectonophysics, and mineral physics. The application of methods of condensed matter physics to solid Earth problems such as the earthquake source is of particular interest. Applicants should have a Ph.D. or equivalent in geophysics or physics, or a related field. Selection will begin on October 31, 2011. Please include curriculum vitae, complete list of publications, names and addresses of three referees, electronic or paper copies of up to five significant publications, and a cover letter addressing how your experience fits the job description. We accept both mail and electronic applications. UCLA welcomes and supports diversity and seeks applications from women and minorities. Please send applications to:

Chair of the Geophysics Search Committee,  
Reference Job # 0995-1112-01, Department of  
Earth and Space Sciences, 595 Charles Young  
Drive, East UCLA, Los Angeles, CA 90095-1567.  
Email: [geophysics@ess.ucla.edu](mailto:geophysics@ess.ucla.edu). The University  
of California is an Equal-Opportunity/Affirmative  
Action employer

**Space Physics**

**Joint Tenure Track Assistant/Associate Professor of Physics and Space Physics.** The Geophysical Institute and the Physics Department of the University of Alaska Fairbanks invite applications to fill a joint tenure-track position

in physics and space physics. The successful applicant will join the Geophysical Institute as part of the Space Physics and Aeronomy Group, and will become a faculty member in the Physics Department of the College of Natural Science and Mathematics. Duties will include conducting research in aeronomy or space physics, teaching graduate and undergraduate courses in physics, and supporting the University's wider mission through service. The position is targeted at the assistant professor level, although appointment at a higher rank may be considered for suitably qualified candidates. Current research activities of the Space Physics and Aeronomy Group include optical and radar observations of the neutral atmosphere, ionosphere, and aurora; space plasma simulations; ionospheric modeling; rocket experiments; and analysis of ground and space based observational data sets. Applications are invited from researchers working on topics relevant to these areas, with ground-based optical and radar aeronomy being of particular interest for this position. The successful applicant will be committed to pursuing external funding to continue his or her research programs at the University of Alaska. Existing facilities available for research use include Poker Flat Research Range, the NSF's Poker Flat Incoherent Scatter Radar (PFISR) rocket launch facilities, the Davis Science Center, and a lidar observatory. The Geophysical Institute has an instrumentation laboratory, a machine shop, and an electronic shop. In addition, UAF is the home of the Arctic Region Supercomputing Center, which can provide resources for large-scale computing needs. Opportunities exist for collaboration with other groups within the Geophysical Institute, such as Atmospheric Sciences, as well as other units from the wider university, notably the School of Engineering.

This position will be open until filled. Review of applications will begin December 19, 2011. A complete job description and application instructions can be found at the following web page: [www.uakjobs.com](http://www.uakjobs.com) under posting #0062559. For further information on the position, please contact the search committee chair, Dr. Mark Conde at: [Mark.Conde@gi.alaska.edu](mailto:Mark.Conde@gi.alaska.edu). Questions about the application process may be addressed to Donna Laiti, HR Consultant, Geophysical Institute, University of Alaska Fairbanks, P.O. Box 757320, Fairbanks, AK 99775-7320, telephone: (907) 474-7791 or e-mail: [dglaiti@alaska.edu](mailto:dglaiti@alaska.edu).

The University of Alaska Fairbanks is an Equal Opportunity/Affirmative Action Employer.

**Interdisciplinary/Other**

**Assistant, Associate, or Full Professor.** The Department of Civil & Environmental Engineering and the Geological Engineering Program of the University of Wisconsin-Madison invites applications for two faculty members with expertise in soil and/or rock engineering with ability to maintain a strong research program and distinguished record for creative research and scholarship. Must be committed to both undergraduate and graduate instruction along with a vigorous research program. Specialty areas of primary research interest include (but are not limited to) emerging areas in soil and/or rock engineering relating to sustainability, conventional and renewable energy resources, extraction and reclamation of mineral resources, innovative environmental technologies including issues such as carbon sequestration, groundwater resources, and sustainable infrastructure. Positions are available at all ranks with primary appointment in the Department of Civil & Environmental Engineering and joint appointment in the interdisciplinary Geological Engineering Program. Applicants in any field of specialty within geotechnical, geoenvironmental, and geological engineering will be considered. Information on the UW Geo-engineering Program and the position available can be found at: <http://www.engr.wisc.edu/ceel/>. Apply by November 15, 2011 to ensure consideration. UW-Madison is an equal opportunity/affirmative action employer.

We promote excellence through diversity and encourage all qualified individuals to apply. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality. Please submit application letter, CV, statement of research and teaching interests, and list of at least three references to: [geosearch@engr.wisc.edu](mailto:geosearch@engr.wisc.edu).

**NSF Workshop on Geothermal Energy from Sedimentary Basins.** Please consider applying to the NSF-SEES workshop "Tracking an Energy Elephant" which will define the science and engineering challenges in tapping the geothermal energy of sedimentary basins. The workshop is intended to develop priorities and strategies for basic energy research within the new NSF SEES program. Expenses will be covered for successful applicants, but space is also limited to these applicants. Application for the workshop can be made at: <http://www.SedHeat.org>. Review of applications will start September 26th.

**Post-doctoral Position in Planetary Science.** Purdue University's new program in planetary science is pleased to host part of NASA's GRAIL mission to obtain precision data on the Moon's gravity field. We seek two post-doctoral researchers with backgrounds in geophysics and interest in probing the subsurface structure of the Moon's large craters and basins by combining GRAIL gravity and LOLA topographic data sets. A Ph.D. in physics, geophysics, or planetary science is required and familiarity with computer languages such as FORTRAN or C, along with the LINUX operating system is essential. The positions are available immediately and will run for approximately 1 year. Please send a vita, bibliography and the names of three referees to: Professor H. Jay Melosh, Earth and Atmospheric Sciences Department, 550 Stadium Mall Drive, West Lafayette, IN 47907, or email to: [jmelosh@purdue.edu](mailto:jmelosh@purdue.edu) by December 31, 2011. Employment in this position is subject to the results of a mandatory background check. Purdue University is an Equal Opportunity/Equal Access/Affirmative Action employer fully committed to achieving a diverse workforce.

**Professor (rank open).** The University of Illinois at Urbana-Champaign (UIUC), the Department of Civil and Environmental Engineering (CEE) invites applications for four full-time tenured or tenure-track faculty members; all ranks will be considered. The Department seeks to expand its expertise in emerging areas that are increasingly interdisciplinary to address critical global challenges with societal, national, and international dimensions through innovative education and research. Information about the Department may be found at: <http://cee.illinois.edu>.

Please visit: <http://jobs.illinois.edu> to view the complete position announcement and application instructions. The closing date for this position is October 30, 2011.

Illinois is an AA-EOE: [www.inclusiveillinois.illinois.edu](http://www.inclusiveillinois.illinois.edu).

**Tenure-Track Faculty Position.** The Department of Geological and Atmospheric Sciences at Iowa State University invites applications for a tenure-track faculty position at the assistant professor level to begin August 2012. The position will be in one of two broad areas: sedimentary geology or low-temperature geochemistry, with particular emphasis placed on research relevant to paleoclimatology, environmental geochemistry, or contaminant hydrogeology. An essential requirement is the potential of applicants to establish a successful, externally funded research program. Ideally that program would complement existing strengths in the department, including climate modeling, paleoclimatology, glaciology, hydrogeology, geophysics, economic geology, tectonics, and geoscience education. We also encourage interactions with researchers and faculty

**Classified** cont. on page 324



Faculty of Science and Engineering  
School of Environmental Sciences

**Chair of Volcanology/Magmatic Processes****Salary Negotiable**

The School of Environmental Sciences seeks a professorial appointment to its Earth Interior Dynamics research cluster. You will have an established international scientific reputation, will provide intellectual leadership in establishing a distinctive research group at Liverpool and will foster collaborative linkages outside of the University. You will have a track record of securing research funding and supervising research students.

We seek a volcanologist whose research interests may include the improved prediction of the timing and scale of volcanic eruptions and their potential impact, the physics of magma ascent, the interactions of magma with faults in the shallow Earth, the fluid dynamics of particulate dispersions and the setting of plutonism in volcano evolution. Other potential research linkages within the School include those with earthquake and crustal-deformation geophysical studies of volcanoes and destructive plate margins, rock deformation and sediment transport and deposition.

You will contribute to teaching in degree programmes including BSc and MEarthSci in Geology, Geophysics and Physical Geography.

Job Ref: A-501409/EOS

Closing Date: 31 October 2011

For full details, or to request an application pack, visit [www.liv.ac.uk/working/job\\_vacancies/](http://www.liv.ac.uk/working/job_vacancies/) or e-mail [jobs@liv.ac.uk](mailto:jobs@liv.ac.uk)  
Please quote job ref in all enquiries.

COMMITTED TO DIVERSITY AND EQUALITY OF OPPORTUNITY

**Postdoctoral Researcher in hydro-climate predictions and impact assessments.****Project Description:**

The Computational Earth Sciences group of the Computer Science and Mathematics Division at Oak Ridge National Laboratory seeks to hire a Post Doctoral Researcher to participate in research on understanding the roles of natural and anthropogenic forcing in near-term decadal-scale regional hydro-climate variability over continental United States and South Asia. In addition, the research will also focus on the projection of potential impacts of decadal-scale regional hydro-climate variability on energy, water resources and associated critical infrastructures. This research will use a suite of Earth system models and statistical techniques to downscale predictions from a multi-model ensemble of IPCC-AR5 GCMs to an ultra-high horizontal resolution of 4 km over the United States and the South Asia.

**The successful candidate will be expected to:**

- 1) Develop and perform experiments with regional and hydrological models on Oak Ridge Leadership Computing Facility (OLCF)
- 2) Present the research at national and international conferences
- 3) Report results in peer reviewed journals, technical manuals, and conference proceedings.

**Qualifications:**

This position requires a PhD in Atmospheric and Hydrological Sciences or a related field within the past five years from an accredited college or university. Candidate is expected to have a strong understanding of North American climate and/or South Asian monsoon system. Experience in the use and application of a regional climate model and/or a hydrological model, and ability to perform advanced data analysis on large datasets is required. Excellent interpersonal skills, oral and written communications skills, organizational skills, and strong personal motivation are necessary. Ability to work effectively and contribute to a dynamic, team environment is required. Ability to assimilate new concepts and adapt to a rapidly evolving scientific and computational environment is necessary. Experience with numerical methods, parallel algorithms, MPI, FORTRAN, C, C++, and parallel software development on large scale computational resources will be an advantage.

We anticipate it to be a two years position, dependent on continuing funding. Applications will be accepted until the position is filled.

**How to Apply:**

Qualified applicants must apply online at [https://www3.orau.gov/ORNLTopp\\$/](https://www3.orau.gov/ORNLTopp$/). All applicants will need to register before they can begin the online application.

This appointment is offered through the ORNL Postgraduate Research Participation Program and is administered by the Oak Ridge Institute for Science and Education (ORISE). The program is open to all qualified U.S. and non-U.S. citizens without regard to race, color, age, religion, sex, national origin, physical or mental disability, or status as a Vietnam-era veteran or disabled veteran.

**Postdoctoral Researcher in Synchrotron Imaging and Geologic Carbon Sequestration**

The Earth Science Division at Lawrence Berkeley National Laboratory has an exciting opportunity for a Postdoctoral Researcher who will focus on applying synchrotron imaging techniques, mainly x-ray microtomography and radiography, to experimentally characterizing pore-scale processes in earth materials, particularly mineral precipitation and multi-phase flow in supercritical CO2/brine systems.

The successful candidate will be involved in intense collaboration with modelers examining these processes from a numerical perspective as well as computational researchers exploring image processing algorithms. The focus of the research effort will be understanding geological carbon sequestration (GCS) on the micron to cm scale, in particular the feedbacks between reactive chemistry, pore-scale transport, and macroscopic properties (flow & mechanical) relevant to modeling as well as monitoring GCS. The position will be part of the Center for Nanoscale Control of Geologic CO2; more information is available at <http://esd.lbl.gov/research/facilities/cncgc/>.

**Qualifications:**

- Recent Ph.D. in hydrogeology, geophysics, civil engineering, petroleum engineering, geology, or a related field.
- Solid background in rock physics, subsurface flow, x-ray imaging techniques and numerical modeling.
- Experience with pore-scale numerical modeling of hydrological and/or geophysical/geomechanical processes.
- Record of productivity and the capacity to initiate and conduct experimental studies with limited supervision.
- Ability to identify and creatively solve problems, use observational data for improving models, and implement alternative solutions.
- Ability to collaborate with a multidisciplinary team of scientists, and author technical reports and peer-reviewed publications.
- Flexibility to travel for experimental work at non-local sites.

**BERKELEY LAB**

Lawrence Berkeley National Laboratory

For more information and to apply, please go to: <http://go.lbl.gov/73517>

Berkeley Lab is an affirmative action/equal opportunity employer committed to the development of a diverse workforce

**Classified**

cont. from page 323

in other units on campus, such as Agricultural and Biosystems Engineering; Agronomy; Chemistry; Civil, Construction and Environmental Engineering; Ecology and Evolutionary Biology; Natural Resources Ecology and Management; the Iowa Water Center; the Leopold Center for Sustainable Agriculture; and the National Laboratory for Agriculture and the Environment. A commitment to excellence in teaching at the undergraduate and graduate levels is also essential. Information about the Department appears at <http://www.ge-iastate.edu>.

Candidates must hold a Ph.D. by the time of appointment. All applications must be submitted electronically at: [www.iastatejobs.com](http://www.iastatejobs.com) (search vacancy ID# 110650). Please be prepared to enter or attach a letter of application including concise teaching and research statements, curriculum vitae, and the names, addresses, e-mail addresses, and phone and fax numbers of at least three references.

The positions will remain open until filled. Full consideration will be given to those applications received by November 13, 2011. We encourage applications from minorities, women, veterans, and persons with disabilities. Iowa State University is an equal opportunity/affirmative action employer.

**Tenure-Track Position Earth Systems Scientist Structural Geology/Tectonics, Department of Earth and Environmental Sciences, Boston College.** The Department of Earth

and Environmental Sciences at Boston College invites applications for a tenure-track position in the area of Structural Geology/Tectonics to start in Fall 2012. The successful candidate will be expected to develop an externally-funded research program integrated with excellence in teaching within the geological sciences and environmental geoscience curriculum at both the undergraduate and graduate levels. Teaching responsibilities include courses in structural and field geology as well as others in the candidate's area of expertise. Specific research subfields of the successful applicant could include crustal dynamics, thermochronology, tectonic history of orogenic belts, tectonic-climate interactions, paleoseismology, and/or active deformation/geodesy. The department is equipped with a mineral separation laboratory including Wilfley table, heavy liquids separation lab, Franz magnetic separator, and stereomicroscope. Other labs in the department include state-of-the-art petrographic microscopes, a laser Raman micro-spectroscopic imaging system, and an isotope ratio mass spectrometer for light stable isotope analyses. Information on the department, its faculty and research strengths can be viewed at: [www.bc.edu/eesciences](http://www.bc.edu/eesciences). Applicants should send a curriculum vita, statements of teaching and research interests, and the names and contact information of at least three references as a single PDF file e-mail attachment to [tectonics-position@bc.edu](mailto:tectonics-position@bc.edu). Review of applications will begin on October 28, 2011. Department faculty will be available at the GSA and AGU Fall meetings to meet with applicants. Boston College is an academic community whose doors are open to all students and employees

without regard to race, religion, age, sex, marital or parental status, national origin, veteran status, or handicap.

**STUDENT OPPORTUNITIES**

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**Graduate Research Opportunity in Nanogeoscience at Baylor University.** The Baylor University Geology department anticipates a graduate research position starting January 2012. The graduate student will work with Dr. Hockaday (analytical/organic geochemistry) and Dr. Lau (nanogeoscience) studying the fate and transport of mineral nanoparticles in aquatic systems. Review of applications will begin September 30th, and continue until the position is filled. Candidates are encouraged to submit their CVs to: [boris\\_lau@baylor.edu](mailto:boris_lau@baylor.edu) and [william\\_hockaday@baylor.edu](mailto:william_hockaday@baylor.edu). Please use "Lau-Hockaday Research Opportunities" in the subject line.

**Graduate Student Position in High Resolution Ocean Modeling, The University of Michigan.**

Applicants are sought for a graduate student position in a new physical oceanography research group at the University of Michigan. The position is funded by the United States Navy and involves running state-of-the-art high resolution ocean models on state-of-the-art supercomputers to understand the impacts of tides on ocean forecast models used by the Navy. Valuable opportunities for networking across the oceanographic community are provided through our collaborations with scientists at the Naval Research Laboratory and at Florida State University. Interested potential students should apply to the University of Michigan (UM) Department of Earth and Environmental Sciences (<http://www.lsa.umich.edu/earth/graduate/applicationinfo>) or send inquiries to: Dr. Brian Arbic ([arbic@umich.edu](mailto:arbic@umich.edu); <http://www.geo.lsa.umich.edu/~arbic>). The University of Michigan is an equal opportunity employer.

**Internship and Fellowship Opportunities in IODP for Minority Students at US Universities/ Colleges.** The Integrated Ocean Drilling Program - U.S. Implementing Organization (IODP-USIO) is currently accepting applications for the IODP-USIO Diversity Internship (October 21, 2011 deadline), and the Minorities in Scientific Ocean Drilling Fellowship (October 31, 2011 deadline). Both initiatives are designed to promote ethnic and racial diversity in IODP. For full details about these opportunities including the application process, visit: <http://www.oceanleadership.org/education/diversity/>.

# RESEARCH SPOTLIGHT

**Highlighting exciting new research from AGU journals**

## Estimating contaminant spreading by subsurface water

Spills of fuels, solvents, and solid waste continually emit pollutants into groundwater, the major source of drinking water for most of the world. These contaminants can react with dissolved oxygen or other chemicals present in groundwater, leading to natural attenuation. Previous research has shown that in the case of a continuous source of contamination, the most important chemical mixing occurs perpendicular to the direction of groundwater flow. Therefore, estimating transverse mixing in groundwater is important for assessing the danger associated with a contaminant source.

The flow of groundwater and the transport of dissolved compounds strongly depend on the small-scale features of the soil. Water flows through gravel, sand, and clay with different velocities, and the distribution of these materials determines the path of least resistance through the crust. Changes in aquifer properties cause the contaminant-carrying flow to be focused or spread out, affecting the distance over which transverse mixing is able to occur and the rates of possible chemical reactions. Over the past few decades, much

work has gone into understanding how contaminants can be spread in groundwater, but little has gone into sorting out the rates of mixing in the direction perpendicular to the main flow path.

Using theoretical analyses and two-dimensional simulations of how water flows through soils with widely varying properties, Cirpka *et al.* isolate the impact of the spreading and squeezing due to soil heterogeneities on contaminant mixing. Their analysis relates the rate of transverse mixing to the variance of the soil's hydraulic conductivity, which is controlled by soil structure. The authors find that heterogeneities in the soil can increase the amount of transverse mixing. Those same heterogeneities, however, also significantly increase the uncertainty surrounding mixing rate calculations such that high diversity could actually lead to less transverse mixing than in homogeneous soil. The analysis suggests that the rate of transverse mixing does not depend on the distance traveled in the flow direction, contrary to previous research.

(*Water Resources Research*, doi:10.1029/2010WR010279, 2011) —CS

## Magnetic behavior transitions identified in natural rock formations

How the magnetic properties of minerals such as magnetite change with grain size is of fundamental importance to understanding magnetic fields of the past and present, which are useful for tracking the movement of tectonic plates and in teasing out the histories of changing environmental factors. Materials ideal for experimental work on size-dependent properties are difficult to find, as natural materials tend to be messy mixtures of different magnetic minerals, with variable concentrations, chemical purities, and wide distributions of grain sizes, all of which serve to blur magnetic properties.

However, on the western base of Yucca Mountain lies the Tiva Canyon Tuff, a 12.7-million-year-old deposit of volcanic material that provides an ideal study site for investigations of grain size-dependent magnetic properties. The ash deposits of the Tiva Canyon Tuff contain abundant volcanic glass, within which the average particle size of magnetite nanoparticles increases systematically with height above the base of the tuff.

By drawing samples across a range of depths, Till *et al.* analyzed how the magnetic properties of the rock changed with height and thus with grain size. The authors identified two stratigraphic layers that marked distinct transitions in magnetic behavior. At 0.8 meter from the base of the tuff, where the grains were 40 nanometers long, they found a peak in magnetic

susceptibility—a measure of how easy it is to change the magnetization of a population of grains. This indicates a transition from superparamagnetic to stable single-domain behavior. The magnetic moments of superparamagnetic grains are able to change direction with weak external forcing, while stable single-domain grain moments are static, each essentially pointing in one fixed direction. Above 3.25 meters, with grain sizes between 250 and 500 nanometers, the authors found a peak in the rock's remanence—how much magnetization the rock retains when any external fields are removed—marking the end of the single-domain regime.

The fieldwork largely confirms previous theoretical and experimental findings by identifying regime boundaries, though some differences were found to be due to the idiosyncrasies of natural formations. (*Geochemistry, Geophysics, Geosystems*, doi:10.1029/2011GC003648, 2011) —CS

## Melting glaciers can change Earth's gravity field

The Earth's rotation causes mass from the ductile mantle to bulge at the equator, making the radius of the Earth about 21 kilometers greater at the equator than at the poles. Over the past 20,000 or so years, the Earth has been becoming more round as it adjusts to the withdrawal of vast continental glaciers after the last ice age: Without the weight of ice pressing down, land has rebounded to give the Earth a more spherical shape. This in turn means

that the Earth's geoid—the average gravity field across the globe—also became more round. However, in the early 1990s, scientists began to notice that postglacial rebound was starting to become offset by something else, causing the Earth's gravity field to cease changing shape.

To learn more about what could be causing this change, Nerem and Wahr studied measurements of gravity variations from the Gravity Recovery and Climate Experiment (GRACE) satellite. The authors' observations show that water from ice melting in Greenland and Antarctica flows into the oceans, changing the Earth's gravity field as mass once concentrated at the poles becomes spread over the entire Earth. They suggest that this transfer of mass away from high latitudes, which causes a flattening effect on the geoid, balances postglacial rebound at the poles and is the reason the Earth's gravity field is no longer becoming rounder. (*Geophysical Research Letters*, doi:10.1029/2011GL047879, 2011) —MK

## Slowly but steadily, a stormier Europe

One anticipated consequence of global warming is a rise in the strength and frequency of wind storms striking Europe, bringing about associated increases in property damage, choppy seas, and coastal flooding. Previous research, mostly based on long-term pressure observations, has sought, to no avail, the signal of a persistent increase in European storms. Using the 20th Century Reanalysis, a recently developed atmospheric reconstruction stretching back to 1871, Donat *et al.* identified a significant increase in both the strength and frequency of wintertime storms for large parts of Europe.

For six regions spread across Europe the authors calculated two different measures of storminess: the magnitude of extreme wind speeds and the frequency of storm events. They found a distinct increase in wind storm activity since the late nineteenth century. The authors also found that regional increases in storm frequencies and extreme wind speeds showed a gradient across Europe, with the largest increases in the northwest, near western Norway, decreasing toward the edge of the study area in central Germany. They found an average increase in storm frequency of between 0.1 and 0.5 storm day per year per decade for the different regions, corresponding to 1.4–6.8 additional storm days per year over the course of the study period, which they suggest could be attributed to global warming or natural variability. (*Geophysical Research Letters*, doi:10.1029/2011GL047995, 2011) —CS

## Explaining the cause of asymmetry in the electron foreshock

As the solar wind nears the edge of Earth's magnetosphere, it creates a bow shock, a region in which the solar wind

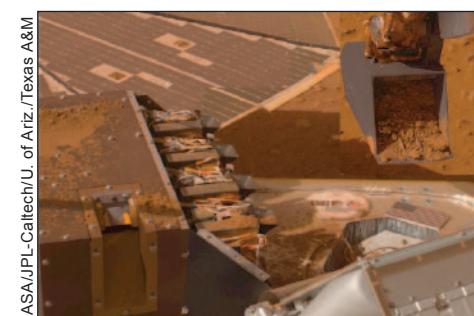
speed drops abruptly. Some solar wind electrons bounce off the bow shock; these reflected electrons interact with oncoming solar wind in a region known as the electron foreshock. In the electron foreshock the reflected electrons generate plasma wave activity that results in radio wave emission.

A new study shows that the sunward and antisunward wings of this electron foreshock differ. Analyzing wave and electron measurements from the Wind spacecraft, Pulupa *et al.* show that the asymmetry is due to the strahl, a beam of high-velocity electrons that is a component of the solar wind. Strahl electrons bounce off the bow shock only into the sunward wing of the foreshock, and this asymmetry leads to enhanced plasma wave activity in the sunward wing. (*Geophysical Research Letters*, doi:10.1029/2011GL048029, 2011) —EB

## Martian soil oxidation-reduction potential not too extreme for life

Ever since the NASA Viking mission, which reached Mars in 1976, there has been considerable interest in the composition of Martian soils. Some Viking measurements indirectly suggested that the soils contained highly oxidizing compounds, which could present extremely harsh conditions for life. Recent observations from the Phoenix Mars Mission pointed to evidence of perchlorate, a potentially highly oxidizing compound, in the Martian soils. However, some studies have noted that because perchlorate is highly stable, its presence in Martian soils cannot explain the Viking measurements.

Quinn *et al.* present a new analysis of Mars soil samples using the Wet Chemistry Laboratory, a component of the Microscopy, Electrochemistry, and Conductivity Analyzer on the NASA Mars Phoenix Lander. They found that although low levels of oxidizing compounds may be present, the oxidation-reduction potential of the soil is moderate and well within the range expected for habitable soils. (*Geophysical Research Letters*, doi:10.1029/2011GL047671, 2011) —EB



NASA/JPL-Caltech/U of Ariz/Texas A&M  
Delivery of Martian soil to the Wet Chemistry Laboratory on the deck of the NASA Phoenix Lander

—ERNIE BALCERAK, MOHI KUMAR, and COLIN SCHULTZ, Staff Writers