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Seafloor Seismometers Monitor Northern Cascadia Earthquakes

The $M_w = 9.0$ earthquake of 11 March 2011 at the Japan Trench and its devastating tsunami underscore the importance of understanding seismogenic behavior of subduction faults and realistically estimating the potential size of future earthquakes and tsunamis. For the Cascadia subduction zone (Figure 1a), a critical knowledge gap is the level of microseismicity offshore, especially near the megathrust, needed to better understand the state of the locked zone. In 2010 the first detailed seafloor earthquake monitoring campaign along the northern Cascadia subduction zone recorded nearby earthquakes in the local magnitude (M_L) range from possibly around zero to 3.8 (Figures 1b and 1c) and larger earthquakes from outside this region.

Preliminary analyses indicate that the network appears to have yielded a fairly complete catalog for events with $M_L > 1.2$. Only a few tens of these events occurred beneath the continental shelf and slope (Figure 1a). The majority of the earthquakes were located along the margin-perpendicular Nootka fault zone. The relatively low seismicity away from the Nootka fault is consistent with a fully locked megathrust. Land-based GPS measurements cannot resolve the question of whether the offshore part of the megathrust seismogenic zone is narrow and fully locked or wider and only partially locked (slowly creeping). If it were only partially locked, the seafloor seismometer data should show many more small earthquakes along the interface than were actually detected.

The SeaJade Project

The Seafloor Earthquake Array–Japan-Canada Cascadia Experiment (SeaJade) is a multiyear, two-phase collaboration involving the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), University of Victoria, Geological Survey of Canada (GSC), and Woods Hole Oceanographic Institution (WHOI). The first phase of SeaJade consists of the successful deployment of 32 short-period ocean bottom seismometers (OBSs) from JAMSTEC and 10 broadband instruments from WHOI, plus the use of the permanent broadband seismometers of the North-East Pacific Time-series Undersea Networked Experiments (NEPTUNE) Canada cabled seafloor observatory (http://www.neptunecanada.ca).

The array is located mostly on the continental slope (Figure 1a). The short-period OBSs detected more than 1500 earthquakes from July to October 2010. Data from the broadband OBSs, deployed from July 2010 to July 2011, are being processed. The next SeaJade deployment of OBSs is planned for 2013.

SeaJade Targets

Future analyses in this project will include a comparative study of Japan's Nankai subduction zone. The Cascadia margin is similar to Nankai in many ways, including the young age of the subducting plate, a moderate convergence rate, ample trench sediments, a large accretionary sediment prism, and the occurrence of episodic tremor and slip (ETS). A large amount of information has been gathered through OBS monitoring at Nankai, including numerous small earthquakes previously undetected by land-based networks, very low frequency (VLF) earthquakes likely occurring in the accretionary prism, and shallow subseafloor seismic tremor [e.g., *Obana et al.,* 2006; *Obana and Kodaira,* 2009]. To better understand the seismogenic behavior of convergent margins, it is important to know whether similar phenomena are present at Cascadia.

A clear difference between the Cascadia and Nankai margins is that many more earthquakes, mainly in the downgoing plate, are recorded in similar monitoring campaigns at the fully locked Nankai subduction zone [e.g., *Obana et al.,* 2006] than at Cascadia. This may reflect different states of stress relaxation due to the different elapsed times since the previous great earthquakes, which occurred only 6 decades ago at Nankai but 3 centuries ago at Cascadia. This explanation is consistent with geodetically determined upper plate deformation where strain rates due to fault locking are larger at Nankai [*Wang,* 2007]. For understanding subduction earthquake processes, differences between the two margins are as important as their similarities. Another difference, not detailed in this report, is the role of the Nootka fault as a major shear zone in the subducting plate.

A fortuitous aspect of the first SeaJade deployment is that the August–September 2010 Cascadia ETS occurred during the OBS recording. Although the ETS sources are landward of the locked seismogenic zone, a pertinent question is whether there are accompanying seismic signals offshore. Some tremor-like signals were noticed in the OBS records, but the nature of these signals requires more thorough analyses.

On the Cascadia margin, there has not been an extensive search for VLF events and offshore tremor, although some evidence for a VLF event has been found using seismograms of the land-based network [*Kao et al.,* 2008]. Detection of VLF events is a primary target in the analysis of the 10 broadband OBSs from WHOI.

Several margin-wide deep seismic surveys and offshore drilling legs also contribute to the seismic characterization of the northern Cascadia margin. For example, a borehole observatory on the continental slope, newly installed under the Integrated Ocean Drilling Program and soon to be connected to NEPTUNE Canada, has enabled long-term monitoring of pore fluid pressure variations associated with seismic and aseismic strain [*Davis and Petronotis,* 2010]. An integrated analysis of events recorded by land-based networks, NEPTUNE Canada, and SeaJade will significantly improve understanding of seismicity in northern Cascadia.

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Does Gender Bias Influence Awards Given by Societies?

AGU is a participant in a U.S. National Science Foundation (NSF)–funded project called Advancing Ways of Awarding Recognition in Disciplinary Societies (AWARDS), which seeks to examine whether gender bias affects selection of recipients of society awards. AGU is interested in learning why there is a higher proportion of female recipients of service and education awards over the past 2 decades. Combined with a lower rate of receipt of research awards, these results suggest that implicit (subconscious) bias in favor of male candidates still influences awardee selection.

Six other professional societies (American Chemical Society, American Mathematical Society, American Society of Anesthesiologists, Mathematical Association of America, Society for Neuroscience, and Society for Industrial and Applied Mathematics) are participating in the project. Volunteers from each participant society attended an Association for Women in Science (AWIS)–sponsored workshop in May 2010 to examine data and review literature on best practices for fair selection of society awardees. A draft proposal for implementing these practices will be brought before the AGU Council and the Honors and Recognition Committee at their upcoming meetings.

While the data are interesting, their implications are manifold. Not only can this study help AGU leadership ensure that awards are given in a manner that does not subconsciously favor one gender over the other, but also results can guide AGU members who nominate candidates for awards. Further, AGU members involved with the leadership of their institutions or of other societies may find results useful for averting bias in their own award selections. Collecting the data is the first step in determining whether bias exists.

The Data: Categories of Awards With Recipients by Gender

There are eight AGU medals awarded to senior scientists (e.g., the Harry Hess, Inge Lehmann, and William Bowie medals), each of which has one awardee per year. There were no women recipients of any of these medals from 1991 to 2000; there were eight (11%) from 2001 to 2010 (Table 1). Ten percent of Fellows from 1997 to 2000 were women; 11% of Fellows from 2001 to 2010 were women (Figure 1). Fellow status is awarded when a senior AGU member receives a medal, if he or she is not already a Fellow.

Are these numbers high or low? The answer depends on the comparison population. Women were 15–20% of AGU membership from 1999 to 2010. Compared to membership, the proportion of women receiving these awards appears low. But medals and Fellow status are generally conferred upon more senior scientists. During this decade, women composed 5–9% of full professors at research-intensive universities (Figure 1). Compared to full professors, 11% is about right, if not on the high side.

There is a higher proportion of women recipients of early-career awards: 18% from 1991 to 2001 and 27% from 2001 to 2010 (Table 1). By contrast, women made up 25–36% of Ph.D.s and 24%–30% of postdocs from 2001 to 2010 [*NSF,* 2011a, 2011b]. Compared to the values of the later years of those decades, the numbers of awards appear to be low.

Women received a higher proportion of service and education awards: 22% from 1991 to 2010 (Table 1). The twofold difference between receipt of scholarly awards by senior scientists versus service and teaching awards is not unique to AGU; every scientific society in the AWARDS study had twice as many women receiving awards for service, teaching, mentoring, and communication as those receiving awards that recognize senior scholarship and research.

Implications

Where does bias exist: in those who nominate candidates for awards or in how awardees are selected? Data on the numbers and gender of people nominated for awards are lacking—these data were simply not collected prior to AGU's participation in this study. In 2010, when the data began to be collected, a total of four women were nominated for two of the seven medals awarded that year that went to senior scientists. On average, five people were nominated for each of these awards, and 7% of the nominees were women. Women made up 20% of the nominees for one early-career medal; a woman won that medal, one of three that were awarded in 2010. Women were nominated for no other early- or advanced-career awards or medals. Women composed 37% of the nominees for service and education awards. The low nomination rate for women for research awards suggests that geoscientists overlook their female colleagues when it comes to nominating their peers for disciplinary awards but are ready to nominate women for the roles that traditional stereotypes hold as more applicable to women: service and education.

The difference between service and education awards and research awards suggests that unintended associations (implicit biases) may be influencing awardee selection. These arise from subconscious efforts to simplify sensory inputs by creating mental shortcuts. An example of a mental

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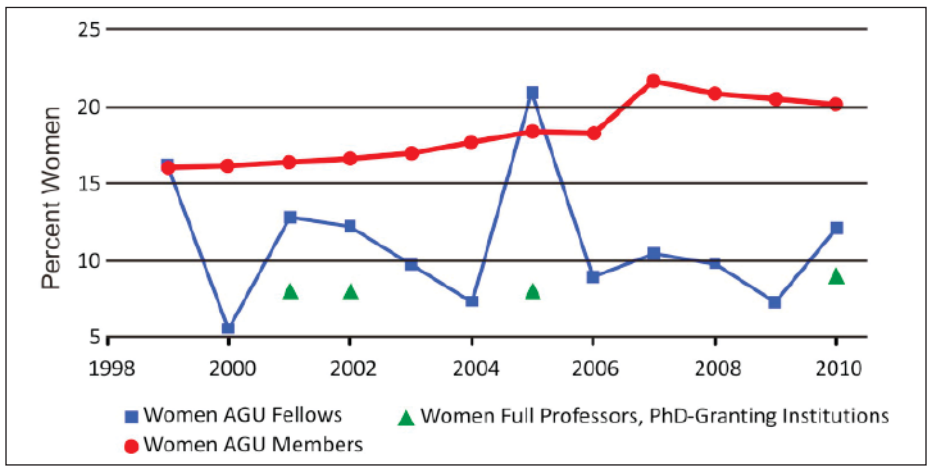

*Fig. 1. Proportion of AGU members and Fellows who are women. Proportion of women at Ph.D.-granting institutions [*Holmes et al., *2008] provided for comparison to Fellow recipients.*

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AGU American Geophysical Union

Earthquakes

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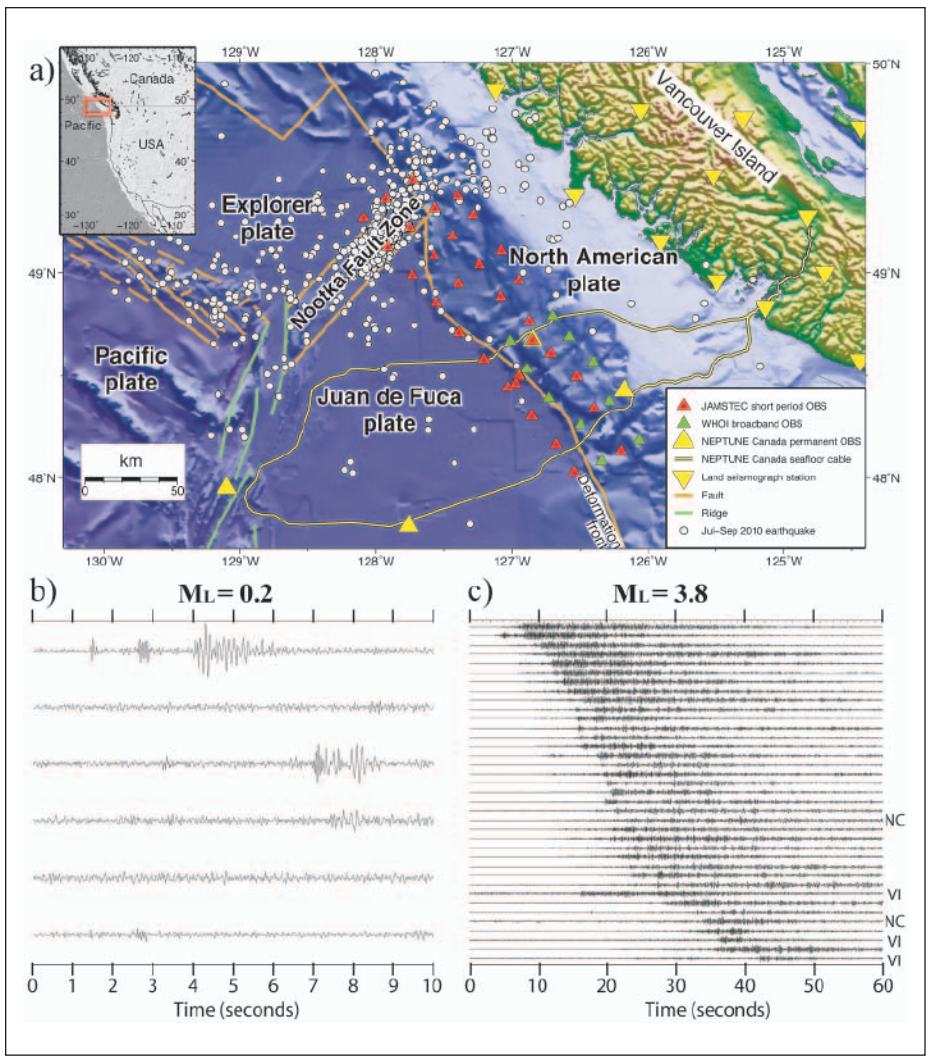

Fig. 1. (a) Map showing the Seafloor Earthquake Array–Japan-Canada Cascadia Experiment (SeaJade) monitoring area at the northern Cascadia margin, seismometer stations at the seafloor and on Vancouver Island, and preliminary earthquake epicenters from the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) short-period ocean bottom seismometer (OBS) array. (b) Example of a small earthquake (M_L = 0.2) shown on the six JAMSTEC OBSs nearest this earthquake. (c) Example of a larger earthquake (M_L = 3.8) shown on all 32 JAMSTEC OBSs, the two North-East Pacific Time-series Undersea Networked Experiments (NEPTUNE) Canada (NC) OBSs located on the continental slope, and the three seismometers on Vancouver Island (VI) closest to this earthquake.

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shortcut is "cloning," replicating oneself by hiring or, in this case, nominating and positively evaluating, someone with attributes or background similar to one's own. Another is "snap judgments," making decisions based on one or two lines of evidence rather than on the entire dossier, such as "he went to my alma mater, so he must be good" or "he worked with my advisor/colleague/coauthor," and then ignoring or downplaying the rest of the dossier (see J. Moody, "Rising above cognitive errors: Guidelines to improve faculty searches, evaluations, and decision-making," 2010, at http://www.diversityoncampus.com/id13.html).

The impact of such mental shortcuts is demonstrated in the literature on implicit bias. For example, in a recent study, both men and women evaluators were presented with identical curriculum vitae, except for the first name—one third had recognizably female names, one third had male names, and one third had initials instead of given names; most preferred the male candidates [*Steinpreis et al.,* 1999], suggesting that men subconsciously fit a typical snapshot mental image of the appropriate person for the job. Both men and women also tend to write letters of recommendation differently depending on the gender of the candidate: letters written for women tend to be shorter than men's and have more references to personal traits and fewer references to professional traits [e.g., *Trix and Psenka,* 2003]. The bias that makes us think of professional traits in male candidates and personal traits in female candidates makes letters for women weaker and women therefore less appealing as candidates.

AWARDS Recommendations

Webcasts summarizing research on implicit bias and strategies on how to minimize its impact are now available to AGU members, and members of awards selection committees are strongly encouraged to view them (see http://www.awis.org/displaycommon.cfm?an=1&subarticlenbr=424).

Strategies to reduce the impact of implicit bias or associations on candidate evaluation include the following:

- Provide checklists and structured evaluation forms for nominators (rubrics) instead of letters of nomination, which tend to be subjective and may be gender-biased. Criteria should focus on accomplishments.
- Create a clear set of criteria for the most worthy awardee before committees meet.
- Empower the Honors and Recognition Committee with broad oversight of award committees.
- Provide the committee members with a history of the award's nominees and winners broken down by gender and race (where possible).
- Recognize the impact of implicit bias and discuss it with all committee members before discussing applicants.
- Increase the number of women nominated for society awards. In 2010, women received 2 of 19 awards and medals. Of 163 nominees, 33 were women. Most of these nominations (23) were for service and education awards; only four were for senior-level awards and medals. The rest were for early-career awards.

Table 1. Recipients of AGU Medals and Awards in the Past 2 Decades[a]

	1991–2000		2001–2010	
	Number of Awardees	Percent Women	Number of Awardees	Percent Women
Scholarly awards (without medals)	41	7	43	12
Medals	67	0	74	11
AGU Fellows	143[b]	10[b]	462	11
Early career[c]	74	18	103	27
Service/education	9	22	18	22

[a]Data are grouped by decade to make more meaningful the small numbers of awards given annually.
[b]For 1997–2000 only (1991–1996 data not found).
[c]Includes section and focus group awards.

Ellen Druffel examined gender distribution among AGU Fellows in an article published in *Eos* about 2 decades ago [*Druffel,* 1994]. Her findings and recommendations ring true even now. She urged AGU members to nominate worthy women, use genderless language for the nomination process, have AGU prioritize gender equity in awards, and increase the numbers and visibility of women in AGU. Today, with enhanced understanding of the evaluation process and new data, it is hoped that the next decade will see substantive progress toward rewarding women for their accomplishments in Earth science research in accordance with their representation in different career stages.

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NEWS

Report Says Gulf of Mexico Oil Spill Assessment Should Include Ecosystem Services Approach

The oil spill in the Gulf of Mexico that resulted from the 20 April 2010 explosion of the Deepwater Horizon (DWH) platform drilling the Macondo well was so massive and affected such a large and deep region of the gulf that the process of determining environmental damage in the region should be more encompassing than a typical habitat and resource equivalency approach, according to a 9 November report by the U.S. National Research Council (NRC).

The congressionally requested report calls for an ecosystem services approach to complement ongoing approaches to the damage evaluation for the spill that is being conducted through the ongoing Natural Resources Damage Assessment (NRDA) process triggered by the U.S. Oil Pollution Act (OPA) of 1990.

Damage assessments historically have measured losses in ecological terms, such as the number of acres damaged or numbers of fish killed, with restoration often based on replacing a lost resource with a similar resource. However, according to the report, *Approaches for Ecosystem Services Valuation for the Gulf of Mexico After the Deepwater Horizon Oil Spill*, habitat and resource equivalency approaches "may not capture the whole value provided by large ecosystems such as the Gulf of Mexico because of the complex long-term interactions among ecosystem components."

The committee concluded that "an ecosystem services approach would complement the ongoing approaches to the NRDA process. The ecosystem services approach focuses not only on the restoration of damaged resources but also on establishing and maintaining the usefulness of those resources to the public."

The report also states, "The unprecedented depth, application of dispersants at the well head, and tremendous volume of oil in the DWH spill complicate the assessment of potential impacts on the deep water ecosystems of the Gulf, a relatively unstudied realm of abundant marine life including bottom-dwelling fish, deep water corals, and chemosynthetic communities. To fully quantify the impact of the oil spill thus requires a thorough understanding of the complex interactions and linkages between and among the various components and processes of these ecosystems. Modification of the [Gulf] ecosystem by a number of human activities makes it more difficult to isolate impacts associated with the DWH spill."

"We had an event that challenges the traditional approaches to damage assessment," committee chairman Larry Mayer, director of the Center for Coastal and Ocean Mapping at the University of New Hampshire, Durham, told *Eos* in an interview. "After the establishment of the Oil Pollution Act, there was a formulaic way of looking at damage assessment: this NRDA process defined by law. And the spills that took place were never of the magnitude or the depth or the time constant of the Deepwater Horizon. So this [spill] is challenging those traditional approaches, which were mostly these kinds of equivalency approaches: You replace a duck with a duck, or a loon with a loon, or an acre of marsh with an acre of marsh.

"When you have a small spill that impacts a small area, that's probably a very appropriate way of doing it," he continued. What [the National Oceanic and Atmospheric Administration (NOAA)] realized, what Congress realized—that's why they asked for this report—is this spill is going to challenge those approaches."

The NRC report also focuses on the depth of the spill. Unlike other major oil spills, such as the *Exxon Valdez* incident, the Deepwater Horizon went from the bottom up, and it occurred at much greater depth than what had been experienced previously. Mayer said a major question concerns the impact of the oil spill on the deep sea. "We have vastly different anecdotal reports, from one side saying there has been virtually no impact [to the deep sea] to other sides saying it has been catastrophic," he said. "The deep sea is the big unknown in terms of the ecosystem and the impact of the oil on the ecosystem."

Mayer added that some beneficial information could derive from the spill. "The silver lining is that we are going to see over the *n*th years a tremendous amount of research focused on the Gulf of Mexico, focused on trying to understand just these questions that we can't answer easily now," he told *Eos*.

During a news briefing about the report, committee member Stephan Polasky, professor of ecological and environmental economics at the University of Minnesota, St. Paul, said, "In a very ironic way, these crises—the Gulf spill and earlier the *Exxon Valdez*—really push the science forward." He said the *Exxon Valdez* spill occurred during the early days of what economists refer to as nonmarket valuations. "The court cases and the effort on the *Exxon Valdez* really pushed forward efforts of the ability to assess the impacts on things that people cared about: what we would call ecosystem services—back then, it was [called] benefits to the public from fisheries or marine mammals and the impacts on them: so, the costs associated from the spill."

Polasky explained, "In a way, the Gulf oil spill could serve as a similar catalyst to a better understanding not only in the Gulf but in general our understanding of these ecosystem services, of the benefit to people from ecosystems, and will improve our understanding of the near-coastal systems and marine systems and some of the interconnections to both better science and better economics about tying these impacts to benefits people care about."

NRC committee members said that NRDA trustees as well as NOAA, which provided funding for the report and also helped to prepare the study's statement of task, have responded favorably to the report. The report states that an ecosystem services approach "would complement" the NRDA process. Committee member Ralph Stahl, principal consultant with the Dupont Corporation Remediation Group, Wilmington, Del., said NOAA appears open to looking at other approaches in addition to traditional valuation approaches. Mayer added that although NOAA currently is following its standard approaches, it is interested in the report and is taking the recommendations seriously.

In a statement, Tony Penn, deputy division chief in the Assessment and Restoration Division of NOAA's Office of Response and Restoration, said the agency welcomes the report. "Due to the size and scale of this disaster, NOAA and its trustee partners have been challenged in the collection of vast amounts of data over an ecosystem that stretches for hundreds of miles," Penn noted, indicating that as of mid-October more than 70,000 samples have been collected and 42,000 laboratory contaminant analyses have been completed.

"We are now beginning to try to determine how the data collected are to be interpreted. We are evaluating through the traditional approaches (Habitat Equivalency Analysis and Resource Equivalency Analysis, as indicated in the report) but also through ecosystem-based approaches," he stated.

"We want to address all the potential injuries including ecosystem services and their associated human uses as part of this damage assessment. We also recognize that we will need to plan for longer-term impacts that may show themselves in the future. In assessing impacts at any point in this assessment, we must meet the [OPA] statutory requirements to show a causal effect between the spill and the natural resources and services," Penn continued. He said the agency's "ultimate goal is to implement restoration activities sooner rather than later in a way that is meaningful to the Gulf ecosystem, and we are committed to ensuring the American people are fully compensated for their losses."

The 9 November report is part of a broader study by the committee that will also examine additional concerns related to the gulf oil spill including long-term research activities and observational systems that are needed for understanding, monitoring, and valuing trends and variations in ecosystem services. For more information, see http://www.nap.edu/catalog.php?record_id=13141.

—RANDY SHOWSTACK, Staff Writer

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New Geoscience Teachers Division for 2-Year Colleges

The role of 2-year colleges (2YCs) in geoscience education is growing as the number of students enrolled in Earth and space science courses increases and as these institutions—which include community colleges and junior colleges—provide more students majoring in geoscience at public universities. In recognition of the increasing role of 2YCs in geoscience education, the National Association of Geoscience Teachers (NAGT) recently created a Geo2YC division for faculty, administrators, graduate students, and other geoscience professionals who share a professional interest in geoscience education at 2YCs.

The mission of the new division, which is NAGT's first national division, is to serve as a forum for exchanging curricular ideas, concerns, and resources; establish a network of geoscience educators at 2YCs and other institutions with shared interests; sponsor NAGT 2YC activities and make recommendations to the NAGT Council in support of 2YC geoscience education; support and coordinate research on 2YC geoscience education; and advocate for 2YC geoscience education within NAGT and with other organizations.

The Geo2YC division traces its origin to a June 2010 meeting entitled "The Role of Two-Year Colleges in Geoscience Education and in Broadening Participation in the Geosciences: A Planning Workshop," which was held at Northern Virginia Community College in Annandale. The workshop, sponsored by NAGT and the U.S. National Science Foundation, attracted 31 2YC faculty members and seven representatives from professional organizations. Workshop participants voiced a strong need for a national 2YC geoscience group and formed an ad hoc committee to approach NAGT to host such a group. In July 2011, NAGT adopted a resolution that formally recognized Geo2YC as a division of its organization.

For more information about Geo2YC, visit http://nagt.org/nagt/divisions/2yc/ or contact Geo2YC division president David Voorhees at dvoorhees@waubonsee.edu.

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FORUM

The Language of Science and Communication With Congress

"There are in fact two things, science and opinion; the former begets knowledge, the latter, ignorance." So stated Hippocrates back in 400 C.E. Today we find ourselves in a tug of war between science and opinion as we try to fashion a path forward on many important societal issues, including the use of science in addressing the water, energy, and climate change issues that are growing in importance. Our job in Congress is making sure we use the knowledge gained from asking questions and apply the responses properly in the decision- and policy-making processes. While that all sounds good in theory, the application is at best cumbersome, often leaving us with more questions than answers.

As an elected member of Congress in Washington, D. C., I find myself constantly in the midst of a continuous and often contentious debate over the use of science and its application in the public policy environment. Today we are in the middle of a serious challenge regarding the use and management of our nation's water resources, fossil and renewable energy, the nexus between water and energy, environmental water requirements, aging water infrastructure, and jobs. This is all overlain by severe budget constraints and an uncertain climate future. Have we entered a period of a "new normal" in how we address water and energy issues? Have the assumptions about water and energy that we used in the past changed? Has the complexity of the scientific and policy issues increased beyond our analytical capability? These are all questions that we need scientific support and cooperation in answering.

Lately, discussions in Congress are less related to the science and more associated with establishment of a specific perspective or political agenda and not always cognizant of reality. Scientists are often asked to testify at hearings to explain the relationship between their work and the issue being debated. Frequently, however, we find that a scientist's message gets lost in the dialogue of the moment and is constrained by the 5-minute testimony limit. It is not that scientific information is not important; it is more that the scientific language being used, while clear, is often muddled by the time it gets pushed and compressed through the testimony filter. Congress and scientists need to work together to develop a better way to present scientific information in a form that policy makers and legislators can use. I understand that scientists often get frustrated when they feel that their message is not being heard, that they are being forced to interpret their data beyond its boundaries, or that policy makers are not asking the right questions. All that may be true, but that is the nature of the beast and the process of taking science into the policy and legislative arena.

The climate, water, and energy nexus is a clear example. The majority of legislators in Congress understand that climate change is occurring. The issue becomes more focused on what we can do about it and what is realistic within the context of today's political climate and budget constraints. Collectively, we have to develop a dialogue in which science is communicated effectively in layperson's terms and the information presented directly relates to issues that affect people.

Let me put communication with Congress in context. We do not know what you are focusing on unless you tell us. You are plugged into the science world daily and discussing it continuously in your own terminology. We jump from issue to issue and are lucky if we get to focus on any particular issue for more than 30 minutes at a time. We depend on overloaded staff to keep us informed and to identify key elements. Equally important, scientists think and process information differently than public policy people do. Scientists are taught to develop hypotheses and then work to disprove them. In Congress we are typically trying to mesh your scientific knowledge into a broader policy or regulation issue or question.

Here are several suggestions on how to develop a better dialogue for science in Congress:

1. *Learn to tell a story.* Provide clear, real-life examples of the potential implications of your science. Explain to us the relevance of your science within a context to which an average person can relate. Is your science important for interpreting a policy issue? Are you supporting or debunking known facts? Talk to us in terms we can understand and can interpret easily. Otherwise, we get detoured by the acronyms and phrases and miss the bigger story you are trying to tell.

2. *Talk to and educate congressional staff.* Our personal and committee staffs do the majority of inquiry work for Congress. They explore the issues, gather the facts, talk to appropriate people, assemble the background documents, organize and develop the first cuts of the congressional statements, and assist the members in developing the questions asked at briefings and in follow-up discussions. An uneducated staff will lead to your specific information not being understood or utilized to its full potential. Keep the congressional staff informed via agency contacts (congressional liaisons), professional organizations (like AGU), and your academic institutions when they visit Washington. Finally, reach out through social media such as video conferences and webinars. In a world of reduced dollars for travel, our staff are not getting out to visit with you, so we have to find ways to improve the information flow.

3. *Talk in positive rather than negative language.* Instead of answering questions in the negative (e.g., saying "we cannot positively say that this is climate related"), reframe the discussion by saying that "a warming climate will allow more precipitation to be held in the atmosphere, leading to more extreme rainfall events and more variable water flows in our rivers and watersheds." The point here is that the first thing out of your mouth is what is heard, not the follow-up context. Put your most important point out first, and then provide the scientific context.

Hippocrates was right. Science begets knowledge while opinion begets ignorance. We want science and the scientific process, not opinion generated by national paid media consultants or the loudest pundit, to help guide us in Congress. The problem is that in today's world, science often gets overlooked or, more likely, overrun by the semi-trailer of rhetoric and opinion. If you want your science to have relevance in the public policy debates, you have to be willing to work with us to ensure that your knowledge gets transferred in a timely and appropriate manner. We look forward to working with you on this important issue of communicating science.

—Grace F. Napolitano, U.S. House of Representatives, California's 38th Congressional District; Ranking Member of the Subcommittee on Water and Power, Member of the Subcommittee on Water Resources and Environment; E-mail: david.wegner@mail.house.gov

MEETINGS

Explaining Unusual Winter Lightning in Japan

Third International Symposium on Winter Lightning;
Sapporo, Japan, 15–16 June 2011

Japan's meteorological setting in winter is unusual: It is an island in a relatively warm sea frequently overswept by colder air from Siberia. This sets up appreciable atmospheric instability in the fringe of the land adjacent to the Sea of Japan. Heavy snowstorms overlap the edge of the island and produce extraordinarily energetic lightning flashes that initiate from points on the ground (known as ground-to-cloud (GC) strokes) and wreak havoc on power lines and, more recently, wind turbines. These troublesome and costly conditions set the stage for the third in a series of conferences on winter lightning.

Improvements in the detection efficiency and location accuracy of anomalous winter lightning were reviewed at the symposium. Simultaneous observations of electric field waveforms and optical images of high-current upward lightning (GC strokes) in winter were reported. Verification of GC strokes by these methods was also reported.

Lightning strikes to wind turbines, increasingly numerous in Japan, drew considerable attention. In addition to reports on lightning surge characteristics, detailed observations of upward lightning striking wind turbines in winter were reported. Experiments on the energy absorption capability of distribution surge arresters was also described.

Lightning striking tall structures during winter storms is prevalent and of mixed electrical polarity. Information on current characteristics, the evolution of lightning, and other details on the CN Tower in Canada (height, 553 meters), the Gaisberg tower in Austria (height, 100 meters), a chimney of the Fukui Thermal Power Plant in Japan (height, 200 meters), and towers in Rapid

Meetings cont. on next page

Meetings

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City, Iowa (maximum height, 191 meters), were reported. A plan was outlined for lightning current observations to commence in 2012 at the Tokyo Sky Tree tower (height, 634 meters).

Regarding the long-standing questions about the electrical structure of Japanese winter storms, findings from a wide range of methods (electric field meters, field mill arrays, radar, high-speed video cameras, operational lightning location systems, radio frequency lightning mapping systems, radiosondes, and videosondes) were described. These methods are aimed at investigating the physical behavior of winter storms and the lightning within them.

The prototypical positive dipole structure, in which a negative charge builds up at the bottom of a cloud and positive charge builds up on the ground before a lightning discharge, is demonstrably common in summer storms. Beginning with observational studies in the 1970s, this positive dipole structure has frequently been offered as an explanation for winter observations. In winter, however, the entire "ice factory" of moist convection and its charge-separating capability lie adjacent to the Earth's surface, an important factor in the lightning threat. At the conference it was reported that seasonal variations in the prevalent polarity of ground flashes, observed in different locales in Japan showing rather abrupt transitions from negative dominance to positive dominance in winter months, are not entirely consistent with the prototype electrical structure. Conference participants suggested that exceptionally damaging flashes with positive polarity to the ground and negative leader extension into positive clouds and frequently characterized by ultrahigh current that continues after the initial continuing current of lighting may be better explained with positive clouds proximal to the ground in winter. Further coordinated measurements are needed.

Questions about the basic storm electrical structure that were outstanding at the end of the conference point to a need to pool all observational resources on individual snowstorms in Japan, in much the way that field campaigns on summer storms have been conducted. In this way, a more definitive picture may emerge for the next International Symposium on Winter Lightning.

—TAKATOSHI SHINDO, Central Research Institute of Electric Power Industry, Tokyo, Japan; MASARU ISHII, University of Tokyo, Tokyo, Japan; and EARLE WILLIAMS, Massachusetts Institute of Technology, Cambridge; E-mail: earlew@ll.mit.edu

Network-Based Approaches to Climate Knowledge Discovery

Climate Knowledge Discovery Workshop; Hamburg, Germany, 30 March to 1 April 2011

Do complex networks combined with semantic Web technologies offer the next generation of solutions in climate science? To address this question, a first Climate Knowledge Discovery (CKD) Workshop, hosted by the German Climate Computing Center (Deutsches Klimarechenzentrum (DKRZ)), brought together climate and computer scientists from major American and European laboratories, data centers, and universities, as well as representatives from industry, the broader academic community, and the semantic Web communities.

The participants, representing six countries, were concerned with large-scale Earth system modeling and computational data analysis. The motivation for the meeting was the growing problem that climate scientists generate data faster than it can be interpreted and the need to prepare for further exponential data increases. Current analysis approaches are focused primarily on traditional methods, which are best suited for large-scale phenomena and coarse-resolution data sets. The workshop focused on the open discussion of ideas and technologies to provide the next generation of solutions to cope with the increasing data volumes in climate science.

In the course of the workshop, it was agreed that a suite of new techniques is needed that interpret and link phenomena among different Earth system components and processes at multiple temporal and spatial scales. Tools that use a combination of high-performance analytics with algorithms motivated by network science, nonlinear dynamics, and statistics, as well as data mining and machine learning, could provide unique insights into challenging features of the Earth system, including extreme events and chaotic regimes.

Using complex networks was identified as one very promising solution. By representing the climate system as networks, scientists can improve their understanding of observed climate phenomena and complex relationships in the global climate system, as well as anticipation of the consequences of climate change. Networks constructed from climate data have been shown to detect natural changes in the climate system. There is also the potential to enhance regional climate predictions over land by exploiting atmospheric teleconnections. Such climate networks could be as large as millions or billions of nodes. Investigating data at this massive scale will require advanced parallel or multithreaded computing technologies and software.

The multidisciplinary and interdisciplinary nature of climate research, which requires extensive sharing of data and analysis results, further complicates studies of the Earth system. Workshop participants agreed on the need for a climate-specific ontology for annotating data sets, facilitating analysis workflows, reasoning, and providing a mechanism for data provenance. Ontologies, informally or formally, represent knowledge of a set of concepts and the relationships among those concepts often in specific problem domains. The semantic Web builds on semantic technologies, including ontologies in machine-readable form, to provide a framework that can allow data that may span application, organization, and domain boundaries, to be found, accessed, and used.

A broad initiative is needed both to educate climate researchers about the potential of using knowledge discovery tools and to conduct research into ways and means of applying graph-theoretic techniques to multidisciplinary climate model data. A number of areas for future work were identified at the workshop, including ontologies to describe the relationship between features and events, a CKD test bed based on community climate model data, and further examination of science topics that will allow the climate science and graph-analytic communities to interact on a set of concrete examples. Sample science areas include model intercomparison, climate teleconnections, and scale interaction.

More information on CKD activities is available at https://redmine.dkrz.de/collaboration/projects/ckd-workshop.

The following people contributed to this meeting report: Peter Fox, Rensselaer Polytechnic Institute; Auroop Ganguly, Northeastern University; Jim Kinter, Center for Ocean-Land-Atmosphere Studies; and Karsten Steinhaeuser, University of Minnesota, Twin Cities.

—REINHARD BUDICH, Max-Planck-Institut für Meteorologie, Hamburg, Germany; PER NYBERG, Cray, Inc., Seattle, Wash.; E-mail: nyberg@cray.com; and TOBIAS WEIGEL, DKRZ, Hamburg, Germany

ABOUT AGU

Fellows Celebrated at Fall Meeting

The 2011 AGU Fellows will be presented during the Fall Meeting Honors Tribute in San Francisco, Calif. The formal ceremony will be held on Wednesday, 14 December 2011, during which President-Elect Carol Finn will introduce each Fellow and read a brief statement of the achievements for which each has been selected.

Thomas P. Ackerman
For significant contributions to radiative transfer theory and its applications to the study of aerosols and clouds.

Sridhar Anandakrishnan
For fundamental discoveries on the behavior, history, and future of the great ice sheets of Antarctica and Greenland.

Ralph J. Archuleta
For his outstanding contributions to earthquake source physics and the origin of earthquake strong motion, from both fundamental and applied points of view.

Mary Jo Baedecker
For seminal contributions to the foundations of contaminant hydrogeology, particularly biogeochemistry of organic compounds in contaminated groundwater.

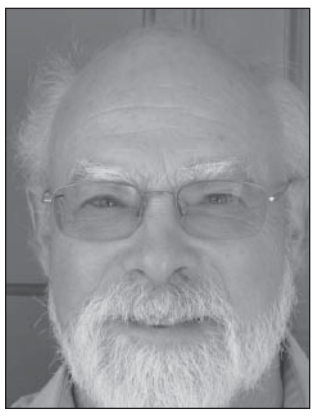
Robin E. Bell
For her breakthrough research that revealed the nature of Antarctic bedrock hidden beneath the ice surface and its influence on ice sheet dynamics.

Ronald H. Benner
For his innovative and seminal contributions to understanding the biogeochemistry of marine dissolved organic matter.

Yehuda Ben-Zion
For relating earthquake mechanics to fault zone structure using a unique blend of theoretical and observational seismology, damage mechanics, and field geology.

Mark L. Brusseau
For his pioneering contributions to the elucidation of coupled processes that control nonequilibrium mass transfer and reactive transport in the subsurface.

Donald E. Canfield
For his outstanding contributions to understanding the biogeochemical cycling of sulfur and the oxygenation of Earth's atmosphere.



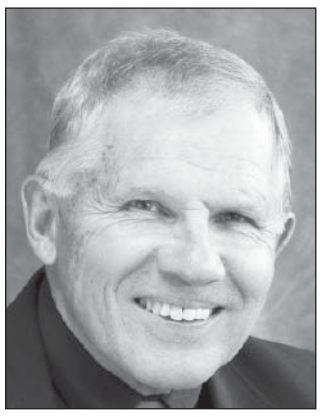
Oliver Chadwick
For his novel application of geographic and geochemical tools to advance understanding of how soils develop and interact with other parts of the Earth system.

Catherine Chauvel
For key contributions to understanding mantle evolution by isotope studies of oceanic basalts and linking subducted sediments to arc magmas.

Liu Chen
For his major contributions to space plasma physics.

Jonathan J. Cole
For his pioneering and comprehensive work on understanding the carbon cycle in rivers and lakes.

Edward R. Cook
For his outstanding analytical contributions to tree ring research and paleoclimate reconstruction, which have provided compelling insights into drought and climate change.



William R. Cotton
For advancing science with his seminal studies of cloud physics, cloud dynamics, and mesoscale meteorology.

Kenneth C. Creager
For significant contributions to the understanding of Earth's structure, intraslab earthquakes, and episodic tremor and slip.

Charles DeMets
For determination of global plate angular velocities, of motion across subduction zones and diffuse oceanic plate boundaries, and of Pacific–North American plate motion.

Eugene W. Domack
For his groundbreaking work and insight in deciphering Holocene climate change in Antarctica and its global connections.

Chris K. Folland
For his contributions to the construction of the global temperature record and to observing and predicting climate variability and change.

Timothy J. Fuller-Rowell
For his contributions to the science of the upper atmosphere and for his creative approach to the modeling and operational forecasting of space weather.

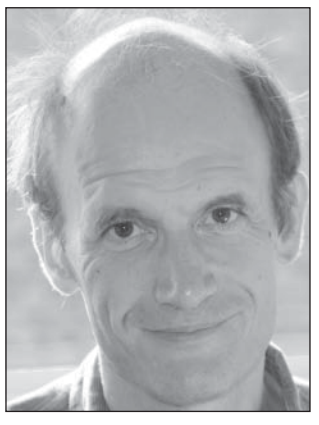
Giuseppe Gambolati
For his unique and seminal contributions to geomechanical aspects of subsurface fluid flow.

Allen H. Goldstein
For groundbreaking research on the chemistry and emissions of natural and anthropogenic trace gases and aerosols in the atmosphere.

Maura E. Hagan
For significant contributions to our understanding of how atmospheric waves determine the state of the atmosphere and ionosphere.

Marc M. Hirschmann
For his exceptional work on igneous phase equilibria, illuminating the simplicity underlying experimental results on complicated natural solutions.

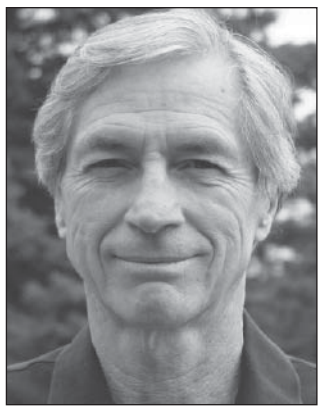
Richard Bertram Horne
For seminal studies of the excitation, propagation, and interaction of plasma waves with energetic particles in planetary magnetospheres.



Dominique Jault
For his seminal contributions to our understanding of the dynamics of the Earth's core and for insightful combining of observation and theory to advance our knowledge of the interaction between core and mantle.

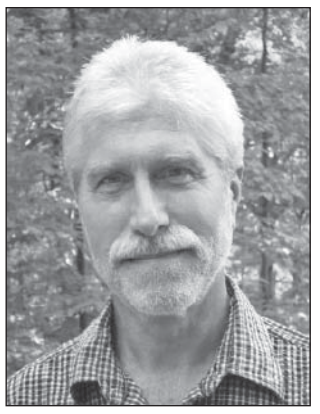
Kenneth S. Johnson
For his elegant contributions to in situ sensor development, which allow enhanced understanding of biogeochemical processes at unprecedented temporal and spatial scales.

Paul A. Johnson
For creativity and leadership in nonlinear elasticity of Earth materials, relating them to materials science in general, and for novel applications to earthquake triggering.



Thomas C. Johnson
For original contributions in limnology, providing new insights into sedimentary processes in the world's great lakes and into the climate history of tropical East Africa.

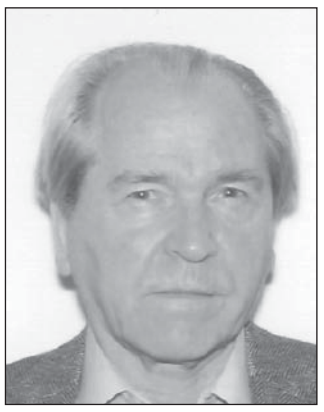
Suzanne Mahlburg Kay
For her contributions to understanding the growth and evolution of continental crust in subduction zones.



William C. Keene Jr.
For discoveries on the composition of precipitation at remote locations and for his leadership role in multiphase processes, organic acids, and halogens in tropospheric chemistry.

J. Michael Kendall
For important contributions to the study of the structure and dynamics of the Earth's interior using a combination of theoretical and numerical analyses of seismic data, with a particular focus on anisotropy.

Krishan K. Khurana
For his penetrating studies of the moons and magnetospheres of the outer planets.



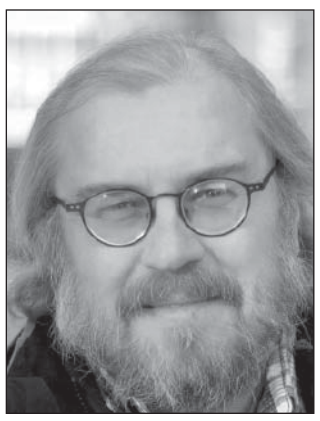
Andrew A. Lacis
For fundamental contributions in applied radiative transfer and remote sensing analysis that have greatly improved our understanding of and ability to forecast climate change.

Kristine M. Larson
For developing new and creative applications for the Global Positioning System and Earth sciences.

James R. Ledwell
For his seminal studies of turbulent ocean and air-sea exchange processes based on tracer release experiments.

Jack Lissauer
For advancing our understanding of planet formation, extrasolar planets, and planetary rings, using both theoretical and observational approaches.

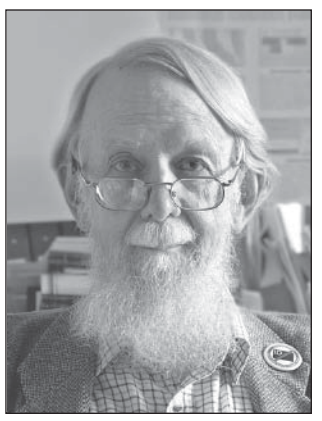
W. Timothy Liu
For his exceptional contributions to understanding air-sea interactions and to promoting the use of spaceborne scatterometry.



Robert L. Lysak
For his fundamental contributions to understanding the coupling between the Earth's magnetosphere and ionosphere and to magnetohydrodynamic wave physics.

Craig E. Manning
For his peerless experiments on the solubility of minerals in aqueous fluids at high temperature and pressure, a unique combination of rigor and realism, yielding timeless data and timely applications.

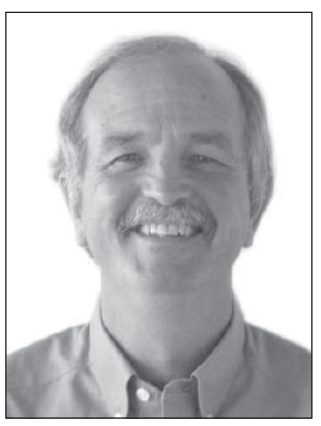
Willam F. McDonough
For his major contributions to our understanding of the geochemistry of Earth's interior.



Michael E. McIntyre
For his great body of work advancing the understanding of fluid dynamics in geophysics and astrophysics.

John M. Melack
For making seminal contributions to our understanding of the ecological functioning of inland waters and their importance in the Earth's carbon cycle.

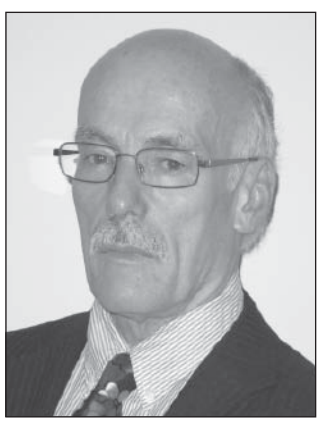
Charles A. Nittrouer
For his important contributions to understanding marine sedimentary systems and for his leadership in guiding international programs in marine sedimentary research.



Barry Parsons
For his quantifying and understanding of both the thermal structure of the upper mantle and active crustal deformation.

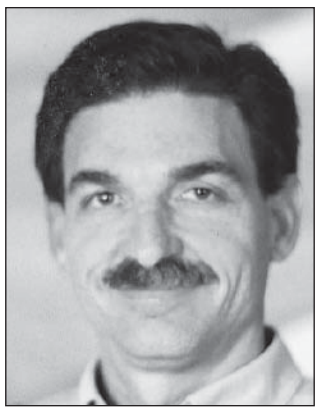
John Adrian Pyle
For his major contribution to the field of atmospheric science through modeling and interpretation of measurements and for his scientific leadership.

Maureen E. Raymo
For leading paleoceanography and paleoclimatology in numerous, comparably important directions.



Jeffrey E. Richey
For leading seminal studies of fluxes of carbon and processes controlling the biogeochemistry of carbon in the Amazon River system.

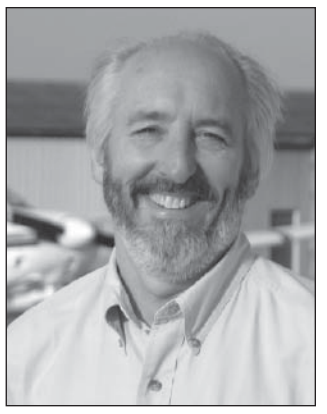
Alan Robock
For important contributions to understanding the global climate system, including the climate impacts of soil moisture, snow and ice, and stratospheric aerosols.



Eric S. Saltzman
For innovations in measuring the natural cycles of sulfur and halogen gases and for his insight into analyzing the interactions of air, ocean, and ice to discern the chemical history of the atmosphere.

Benjamin D. Santer
For his insightful and rigorous contributions to climate change detection and attribution research and for his tireless communication and public outreach.

William E. Seyfried Jr.
For making major contributions to our knowledge of the chemistry of aqueous fluids and the processes that take place near mid-ocean ridges.



Paul B. Shepson
For exceptional creativity in the study of the atmospheric chemistry of isoprene and of the role of snow and ice surfaces in the atmospheric chemistry of the Arctic.

Herman H. Shugart
For opening lines of inquiry into quantifying the structural and functional complexity of terrestrial ecosystems and for advancing the understanding of the influences of regional and global environmental change on ecosystem function.

Frank J. Wentz III
For his pioneering and sustained innovative contributions to microwave remote sensing of the ocean and atmosphere and for his definitive contributions to research on climate change and air-sea interaction.

Takehiko Yagi
For his pioneering work in the application of the diamond anvil cell and multianvil apparatus, combined with synchrotron experiments, to the mineralogy of the lower mantle and the core.

Kevin J. Zahnle
For advancing understanding in how planetary-scale physical and chemical processes affect the evolution of planets and life on them.

George Zandt
For fundamental contributions in developing and applying passive seismic techniques to imaging and understanding continental orogenic systems.

Gary P. Zank
For his many contributions to our understanding of the physics of the heliosphere and its interaction with the interstellar medium.

Rixiang Zhu
For wide-ranging and fundamental research in paleomagnetism and for his leadership in the geophysics community in China.

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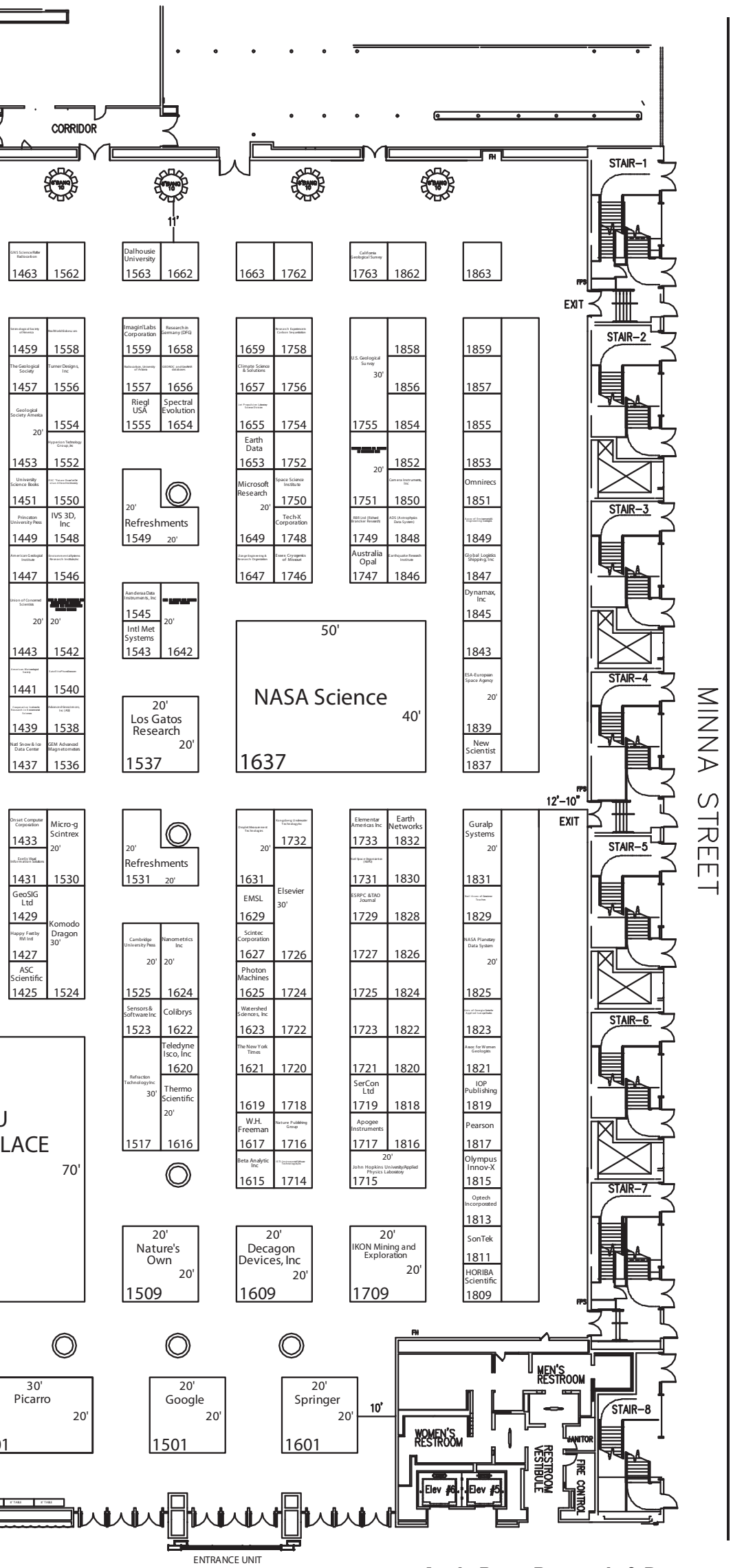

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Riegl USA
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Rigaku Americas Corp.
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Robertson Geologging (USA) Inc.
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Royal Society Publishing
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SatellitePhoneStore.com
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Savillex Corporation
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Scintec Corporation
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Scripps Institution of Oceanography
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Seismological Society of America
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Sensors & Software Inc.
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SerCon Ltd
Booth 1719

SERDP & ESTCP
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Society of Exploration Geophysicists
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SonTek
Booth 1811

Southern California Earthquake Center
Booth 1126

Space Science Institute
Booth 1750

Spectral Evolution
Booth 1654

Springer
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St. Anthony Falls Laboratory
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Taylor & Francis
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Tech-X Corporation
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Turner Designs, Inc.
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U.S. Department of Energy ARM Climate Research Facility
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U.S. Department of Energy Biological and Environmental Research Climate and Environmental Sciences Division
Booth 1542

U.S. Geological Survey
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UCAR Community Programs
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UCAR Education and Outreach
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UNAVCO
Booth 1130

UNEP/GRID-Sioux Falls
Booth 1830

Union of Concerned Scientists
Booth 1443

University of Alaska–Fairbanks Research Institutes
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University of Chicago Press
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University of Georgia Center for Applied Isotope Studies
Booth 1823

University of Houston
Booth 1228

University Science Books
Booth 1451

W. H. Freeman
Booth 1617

Watershed Sciences, Inc.
Booth 1623

Wiley-Blackwell
Booth 1208

Zonge Engineering & Research Organization
Booth 1647

Content in the Exhibitor Listing is current as of 6 November 2011

About AGU
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AGU's New Task Force on Scientific Ethics and Integrity Begins Work

In support of the new strategic plan, AGU has established a new task force to review, evaluate, and update the Union's policies on scientific misconduct and the process for investigating and responding to allegations of possible misconduct by AGU members. As noted by AGU president Michael McPhaden, "AGU can only realize its vision of 'collaboratively advancing and communicating science and its power to ensure a sustainable future' if we have the trust of the public and policy makers. That trust is earned by maintaining the highest standards of scientific integrity in all that we do. The work of the Task Force on Scientific Ethics is essential for defining norms of professional conduct that all our members can aspire to and that demonstrate AGU's unwavering commitment to excellence in Earth and space science."

The official charge for the task force is to:

- review the current state of scientific ethical standards in the geophysical sciences and how other professional/scholarly societies address ethical issues for their profession, their organization, and their membership;
- develop a set of ethical principles and a code of conduct for AGU scientific activities;
- review and update AGU's protocols and procedures for addressing violations of its ethical principles;
- propose sanctions for those who violate AGU's ethical principles; and
- recommend whether or not AGU should adopt a statement of ethical principles as a condition of membership and, if so, how the principles would be applied to AGU membership.

The task force has begun its work and is in the process of evaluating a wide range of policies, strategies, and approaches. As part of the effort to prepare new policies, the task force is holding an open town hall meeting at the AGU Fall Meeting in San Francisco. (For details, see the About AGU article by Kristan Uhlenbrock on p. 434.) All interested AGU members are invited to hear an update on the task force's efforts and to contribute feedback, input, and ideas.

We hope that all AGU members will come to the December town hall meeting and/or offer reviews, constructive feedback, and sound guidance to the task force as we prepare our new policies. The public has a high degree of trust in scientists. The task force believes that maintaining that trust requires that AGU and its members be guided by the highest ethical standards as we conduct and review science and when we communicate that science to the public and policy makers.

To further facilitate feedback with the ongoing efforts, information about the task force, current activities, links to draft documents for review, and details on how to provide feedback will be posted to http://www.agu.org/about/governance/committees_boards/scientific_ethics.shtml.

The task force's final recommendations to the AGU Council will be prepared by early spring 2012 for consideration and adoption.

The task force chair is Peter Gleick, Pacific Institute, Oakland, Calif. Task force members are David Chesney, Michigan Technological University, Houghton; Floyd DesChamps, Alliance to Save Energy, Washington, D. C.; Karen Fischer, Brown University, Providence, R. I.; Tim Grove, Massachusetts Institute of Technology, Cambridge; Linda Gundersen, U.S. Geological Survey, Reston, Va.; Noel Gurwick, Union of Concerned Scientists, Washington, D. C.; Dennis Moore, National Oceanic and Atmospheric Administration, Seattle, Wash.; Arthur Nowell, University of Washington, Seattle; Len Pietrafesa, Coastal Carolina University, Conway, S. C.; Jeff Plescia, Johns Hopkins University, Laurel, Md.; Peter Schuck, NASA, Greenbelt, Md.; Jagadish Shukla, George Mason University, Calverton, Md.; and Vivian Weil, Illinois Institute of Technology, Chicago.

Randy Townsend is the AGU staff liaison to the task force.

—Peter Gleick, Pacific Institute, Oakland, Calif.; E-mail: pgleick@pacinst.org; and Randy Townsend, AGU; E-mail: ethics@agu.org

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About AGU

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Learn About AGU's Scientific Integrity Policies During a Fall Meeting Listening Session

AGU members are invited to hear about the Union's new Scientific Integrity and Ethics Policy during a listening session at Fall Meeting. (See also the About AGU article by Peter Gleick and Randy Townsend on p. 433.) At this event, members of the Task Force on Scientific Ethics will discuss current efforts to update the Union's policies on scientific integrity. In addition, AGU members will have the opportunity to become involved in helping to shape the future of AGU by providing feedback, ideas, and insights.

The task force is responsible for reviewing and guiding the Union's standards, principles, and code of conduct on ethics and integrity in scientific activities. AGU is among many scientific organizations and U.S. federal agencies reviewing or drafting their scientific codes of conduct to ensure that the integrity of science is not compromised, through either political interference or conflicts of interest. AGU president Michael McPhaden recently stated that "core strengths of scientific integrity and commitment to excellence are the striking attributes of our organization."

Support the task force in fulfilling its charge and in determining a path forward by attending this listening session. All AGU members are invited to this evening session, on Monday, 5 December, from 6:00 to 7:30 P.M. in Moscone South, Room 300.

—Kristan Uhlenbrock, Public Affairs Coordinator, AGU; E-mail: kuhlenbrock@agu.org

CLASSIFIED

POSITIONS AVAILABLE

Atmospheric Sciences

The Department of Atmospheric Sciences at Texas A&M University is seeking applications for a tenure-track position at the assistant professor level in the field of weather analysis and forecasting. Candidates are sought with research expertise in one or more of the following areas: synoptic meteorology, mesoscale meteorology, and forecasting techniques. Candidates focusing on hurricanes or other forms of severe weather are of particular interest. A Ph. D. in atmospheric sciences or a related field is required at the time of appointment. Postdoctoral experience is desirable, but is not required. The successful candidate will be expected to maintain a prominent research program and to teach courses at the undergraduate and graduate levels.

The Department of Atmospheric Sciences is one of the largest such departments in the world, offering degree programs at all levels and research activities across the full spectrum of atmospheric sciences. Among the resources available for teaching and research are the ADRAD Doppler radar and access to the SMART-R mobile radar facility, as well as the TAMU Supercomputing Center.

Texas A&M University is an affirmative action/equal opportunity employer committed to diversity at all levels, and the University offers an extensive spousal accommodation program. It is the policy of Texas A&M University that in all aspects of its operations each person shall be considered solely on the basis of qualifications, without regard to race, color, sex, religion, national origin, age, disabilities, or veteran status. State law requires that you be informed that you are entitled to (1) request to be informed about the information collected about yourself (with a few exceptions as provided by law); (2) receive and review that information; and (3) have the information corrected at no charge.

To apply, please send a CV, statement of research and teaching interests, and names and contact information for at least three references to: R. Saravanan Chair, Faculty Search Committee Email: sarava@tamu.edu

The position will remain open until a suitable candidate is found. Initial review of applications will begin on December 1, 2011.

Biogeosciences

FACULTY POSITION IN EARTH MATERIALS AND NEAR-SURFACE PROCESSES. The Department of Earth and Planetary Science at the University of California, Berkeley invites applicants for an Assistant or Associate level faculty position. We seek outstanding candidates in earth and planetary science with priority in the fields broadly defined as earth materials and near-surface processes. Areas of research could include, but are not limited to: biogeochemical processes, earth resources, ore-generation processes, petrogenesis, environmental geophysics, subsurface fluids, geomorphology, and earth history. Applicants will be asked to provide curriculum vitae, statements of research and teaching interests, and 3 names for letters of reference. All applications must be submitted online through http://eps.berkeley.edu/positions and be received by January 9, 2012. The University of California, Berkeley is an Affirmative Action/Equal Opportunity Employer. The department is interested in candidates who will contribute to diversity and equal opportunity in higher education through their teaching, research, and service.

Postdoctoral Researcher in Tropical Rainforest Ecosystems. Princeton University invites applications for a Postdoctoral Research Associate position. The successful candidate will investigate the current and future status of tropical rainforest ecosystems as carbon sinks. The position will be based at Princeton University, is available immediately, and will bridge research ideas between the laboratories of Profs. David Medvigy and Lars Hedin. Applications are invited for research on how the tropical forest carbon sink is impacted by (i) constraints by nutrients or water; (ii) plant biodiversity; (iii) environmental sensitivity of decomposition. This work will involve use of state-of- the-art numerical models and empirical analyses. Candidates should have a Ph.D. within the last three years in biogeosciences or ecology, and should have some experience with numerical modeling. The initial appointment is available for one year, with a possibility of renewal for an additional year contingent upon satisfactory performance. Applicants should include a cover letter, a curriculum vitae with publications, brief statement of research interests and goals and contact information for three references by applying on the Princeton University jobsite at https://jobs.princeton.edu/ Requisition #0110697.

Princeton University is an equal opportunity-affirmative action employer and complies with applicable EEO and affirmative action regulations.

Hydrology

Assistant Professor of Hydrology. New Mexico Institute of Mining and Technology (NMT) invites applications for a tenure-track assistant professor level position to the Hydrology Program within the Department of Earth and Environmental Sciences.

Applicants should have a Ph.D. in Earth Science, Civil or Environmental Engineering, or a related field at the time of appointment. We seek candidates with interest in combining hydrological modeling and field studies. Areas of particular interest include karst hydrology, watershed hydrology, ecohydrology, and aqueous geochemistry. Potential for excellence in teaching and research are the most important qualifications.

Read more about this position on the AGU Career Center, search "Assistant Professor of Hydrology."

Ocean Sciences

Faculty Positions available at the Institute of Oceanography, National Taiwan University (IONTU). We invite applications for one to two faculty position(s) at the level of assistant professor or higher, starting on August 1, 2012. Applicants should hold a doctoral degree and specialize in research fields related to marine sciences, preferably in the fields of physical oceanography, marine informatics, chemical oceanography, marine chemistry or marine biogeochemistry. Applicants should send (1) curriculum vitae (including publication list), (2) reprints of up to three publications (published after June, 2007), (3) a proposal for future research and teaching preferences before January 31, 2012 to: Prof. Char-Shine Liu Chair, Faculty Search Committee Institute of Oceanography, National Taiwan University No. 1, Sec. 4, Roosevelt Road, Taipei, 106 Taiwan Tel: +886-2-3366-1387 Fax: +886-2-2363-6802 Email:csliu@ntu.edu.tw Please check http://www.oc.ntu.edu.tw for general information of IONTU. Both regular and electronic mails are acceptable. Please also arrange for three recommendation letters to be sent directly to the Chair of the Faculty Search Committee. Upon receipt of the application, an acknowledgement email will be sent to the applicant within a week. Applicants who do not receive the acknowledgement email please contact the Chair of the Faculty Search Committee via fax or telephone for confirmation.

Solid Earth Geophysics

Worcester State University, Department of Physical and Earth Sciences, invites applications for two tenure track positions in Physical Geography/Geomorphology/Geology at the Assistant Professor rank for Fall 2012. Minimum requirements include a Ph.D. in Physical Geography, Geology, or a related discipline and undergraduate teaching experience. Areas of teaching competence must include at least 3 of the following: physical geography, geomorphology, soils, introductory physical geology, introductory oceanography. Additional desired competencies include fluvial, coastal or glacial geomorphology, groundwater resources, earth history or planetary geology. Applicants should demonstrate: potential for excellence in teaching and mentoring undergraduates; active engagement in research and scholarship; a commitment to public higher education; enthusiasm for recruiting students into the geosciences. An interest in geoscience education, an ability to integrate GIScience and field experience into teaching and research, or an interest in developing field courses would strengthen an application. The successful candidates will help shape a small, dynamic department dedicated to offering a quality liberal arts education in a public institutional setting. Review of applications will begin December 1st, 2011. For more information, please refer to the posting at http://worcester.interviewexchange.com/joboffer details.jsp? JOBID=28133 Direct questions to Dr. Allison Dunn, Search Committee Chair at adunn@worcester.edu.

Postdoctoral Research Associate position at U Texas, Arlington.

A postdoctoral research associate position in the Department of Earth and Environmental Sciences (EES) at the University of Texas at Arlington is available starting January 2012. Funding for this position is provided in part by NSF and NASA, through the ongoing CALIPSO project on the actively erupting Soufriere Hills volcano on Montserrat, West Indies (http://www.uta.edu/faculty/mattioli/research/CALIPSO/Intro.html). The initial appointment will be for one year and may be renewed for at least an additional year, with a satisfactory annual review.

The CALIPSO project focuses on using data from the CALIPSO Facility (borehole strain, seismometers, and surface cGPS) to develop models for the evolution and dynamics of the active SHV magmatic system over a range of temporal and spatial scales. The successful candidate should have a demonstrated background in one or more of the following areas: 1) inversion of surface deformation data; 2) FEM modeling of dynamic magmatic

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systems or volcano edifice instability; 3) analysis of borehole strain and/or seismic data; or 4) analysis of high-rate GPS data.

A Ph.D. in Earth Sciences or a related field is required and demonstrated computer and modeling skills are a must. Some familiarity with operation of remote geophysical data acquisition systems is desirable. Ability to work as part of a team, which includes graduate students and other CALIPSO PIs is essential. Completed applications consist of: a curriculum vitae; statement of research experience and goals; and names and contact information of at least four individuals who would be willing to provide letters of recommendation.

Applications should be submitted by December 1, 2011, but will continue to be reviewed until the position is filled. If possible, interviews will be conducted at Fall AGU, or by phone. Applications in Adobe PDF format should be submitted electronically to gmattioli@uta.edu. Print applications may be mailed to: Dr. Glen S. Mattioli, Department of Earth and Environmental Sciences, University of Texas at Arlington, 500 Yates St., Arlington, Texas 76019.

UT Arlington is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and individuals with disabilities are encouraged to apply. A criminal background check will be conducted on finalists.

The Institut de Physique du Globe de Paris (IPGP) (www.ipgp.fr) and the University Paris Diderot have openings for two tenured positions in geophysics at the assistant professor level. IPGP has an internationally recognized stature with research teams in, among others, seismology, geodesy, marine geophysics, and numerical and analytical modelling of earth processes. While highly qualified candidates in any of these fields will be considered, applications in the following areas are particularly encouraged:

o Measurement and modelling of crustal deformation using modern geodesy techniques (e.g., GPS, InSar, optical correlation), development and application of innovative methods to analyze these data, and incorporation of other geophysical/geological data to solve fundamental earth process.
o High-resolution seismic imaging of sub-surface structure and its application to natural resources and earth processes, such as those associated with fault zones, subduction zones, continental margins, magma chambers, and volcanoes. o Seismology of the deep earth structure and its relationship to deep earth processes, mantle convection, chemical composition, and mineralogy.

The successful candidate will be expected to develop innovative techniques to analyze and interpret geophysical data and to actively develop their research program through external funding. As assistant professors, the successful candidates will be involved in teaching activities at undergraduate and graduate levels, and depending upon the ability of the candidate, classes can be taught in either French or English. Candidates should have a Ph.D. and at least a post-doctoral or equivalent experience, and will be expected to propose an ambitious research program in their area of expertise.

Interested candidates should send an extended CV, a 3 page statement describing their proposed research program to Dr. Yann Klinger (klinger@ipgp.fr) before January 2, 2012. For additional information, please contact Y. Klinger (klinger@ipgp.fr).

Space Physics

The Department of Physical and Environmental Sciences (DPES) at the University of Toronto Scarborough invites applications for a full-time, tenure- stream, position in Theoretical and Computational Planetary Physics. The position will be at the rank of Assistant Professor and will commence July 1, 2012.

As part of an expansion in the broad field of the evolution of solar and extrasolar planets, the Physics and Astrophysics Group within the Department especially welcomes applications from researchers working in the fields of Geodynamics and/or the Structure of the Earth and Planetary Interiors. Areas of interest include the early and subsequent evolution of rocky and/or icy planetary objects; including deep interior, lithosphere, and surface processes; planetary rotation dynamics; and planetary materials and deep interior structure.

Applicants working in analytical and modelling focused research areas are particularly sought. High performance computing will be supported through access to distributed and shared memory computer clusters accessed via SciNet (see www.scinet.utoronto.ca), and initiatives to construct a GPU-based computer cluster at UTSC.

Applicants should have a completed PhD. Demonstrated excellence in research and a commitment to excellence in teaching are essential. The

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UNIVERSITY OF ALBERTA — Université du Québec en Abitibi-Témiscamingue

Postdoctoral Fellow and 3 PhD positions in Mineral Exploration Geology and Geophysics

We seek highly qualified and motivated geophysicists and geologists to work on an NSERC–industry-funded collaborative research project that aims to improve the effectiveness of ZTEM surveys for porphyry copper exploration. The project is led by Professors Jeremy Richards and Martyn Unsworth at the University of Alberta (U of A), and Professor Li Zhen Cheng at the University of Québec in Abitibi-Témiscamingue (UQAT). ZTEM is an airborne electromagnetic technique that uses natural electromagnetic signals to image subsurface structures.

The Postdoctoral Fellow will have advanced skills in electromagnetic data acquisition and processing, and will lead and coordinate data gathering and integration. The PDF will work directly with Unsworth and Richards at the U of A, and will receive a 2-year contract at a competitive salary.

Two of the PhD students will be geophysicists who will focus on 2D and 3D inversion of ZTEM data. One student (supervised by Unsworth at the U of A) will focus on the EM data component, and the other (supervised by Cheng at UQAT) will focus on 3D inversion aeromagnetic data.

The third PhD student will be an economic geologist (supervised by Richards at the U of A), and will focus on geological characterization of known porphyry deposits in the study area, for which ZTEM and other geophysical data exist.

Interested candidates should send a CV, a statement of research experience and interest, and the names and addresses of three referees to:

Jeremy Richards (Jeremy.Richards@ualberta.ca)
Department of Earth and Atmospheric Sciences, University of Alberta
Edmonton, Alberta, Canada, T6G 2E3

Post-Doctoral Research Scientists Consortium for Climate Change Study

Would you like to be part of a team developing new approaches to climate modeling and delivering climate change information to society and researchers? We seek scientists:

To work on the following challenging scientific problems and the main themes of study by the Consortium for Climate Change Study (CCliCS) Project sponsored by National Science Council in Taiwan. More than 10 post-doctoral research fellows will be devoted to the different topics as follows: (1) Climate system modeling, including model development and implementation of new physical parameterizations (e.g. radiation, convection, boundary layer and land surface), (2) Global and regional ocean modeling, focused on air-sea interactions and coupling processes, (3) Regional atmosphere-ocean coupled modeling system over Northwestern Pacific, (4) Aerosol-cloud-climate interactions, including forcing estimates and feedback process analysis, (5) Climate control on the regional high-impact weather extremes, focused on tropical cyclone, (6) Detection and attribution of observed changes in the extreme weather events and climate indices using high-resolution regional and global model, (7) Climate diagnostics and validation of climate simulation using new performance metrics and new generation of observational data. The employment can be started immediately. Recruited scientists will work within the Consortium for Climate Change Study (CCliCS), which aims to develop a climate model for climate change projections and study the impact of climate change on the extreme weather and climate. Job details of each field mentioned above can be found at http://www.rcec.sinica.edu.tw/tw_index_en.html

Your profile
We seek persons with a PhD degree in meteorology/physics/atmospheric/ocean sciences or a similar discipline, with experience in numerical modeling, preferably related to weather and climate, and climate diagnostics. A good knowledge of the programming languages Fortran and Unix/Linux is a necessity. We seek persons who can work independently on complex problems but is also comfortable sharing larger tasks within a group. Good knowledge of spoken and written English is required, and a clear willingness to learn Chinese would be plus. Outstanding applicants with post-doctoral research experience may be hired as assistant researcher. The position is a full-time one-year term appointment that may be renewed annually up to 5 years.

Information & Application
More information is available from Dr. Huang-Hsiung Hsu, Research Fellow at Research Center for Environmental Changes, Academia Sinica by phone: +886-2-27871935 or by email at: hhhsu@gate.sinica.edu.tw.

Applicants should send their CV and the name of three professional references to Dr. Huang-Hsiung Hsu no later than December 31, 2011 via either email (hhhsu@gate.sinica.edu.tw) or postal mail (Research Center for Environmental Changes, Academia Sinica, 128, Academia Road, Section 2, Nankang, 115 Taipei, Taiwan).

Academia Sinica is an affirmative action/equal opportunity employer committed to the development of a diverse workforce.

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successful applicant will teach courses in physics and/or astrophysics at undergraduate level and physics, geophysics or astrophysics at graduate level. The successful candidate will also hold a graduate appointment in one or both of the University of Toronto's tri-campus graduate Department of Physics and Department of Astronomy and Astrophysics and will be expected to teach it its graduate programs and supervise graduate students. Salary will be commensurate with qualifications and experience. Information about DPES can be found at the departmental website (www.utsc.utoronto.ca/~physsci).

Applications will be accepted until February 15, 2012. Applicants are asked to send a letter of application including a full curriculum vitae, teaching dossier, concise descriptions of current research activity and graduate student supervision experience, and future research plans. We strongly encourage you to submit your application online. If you are unable to apply online (or alternately have large documents to send), please submit your application and other materials electronically as a Word document or a PDF file to dyer@astro.utoronto.ca. or send them directly to the Associate Chair at the following address:

Professor Charles Dyer Associate Chair, Physics and Astrophysics Department of Physical and Environmental Sciences University of Toronto Scarborough 1265 Military Trail Scarborough, Ontario CANADA M1C 1A4

Applicants should provide a list of three persons who can be contacted by the search committee for a letter of reference once the short list of candidates is established. All application materials must be received by the application deadline.

The University of Toronto is strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to the further

Interdisciplinary/Other

The Geosciences Department at Idaho State University seeks applications for a tenure-track Assistant Professor with teaching and research interests in earth sciences cyberinfrastructure (HPC, modeling, data mining, knowledge discovery, semantics, visualization, etc). To learn more and apply, see www.isujobs.net posting 2011191. Apply Here: http:// www.isujobs.net

The Department of Earth Sciences (DES) at the University of Memphis invites applications for an Earth Scientist with research emphasis in climate change or paleoclimate studies. Applicants should have a fundamental working knowledge of climatic, meteorologic or paleoclimatic data, conduct quantitative or modeling studies, have demonstrated background in spatial analysis, and complement and extend research programs in a multidisciplinary department. The successful applicant will develop an active research program, compete for external funding in research areas such as climate change, paleoclimate, water resources, or climate and landscape evolution, and teach undergraduate and graduate courses. Review of applications will begin on November 30, 2011, and may continue until the position is filled. Please submit a curriculum vitae, statement of research and teaching interests, copies of as many as three significant publications on which the applicant is an author or co-author, and contact information for at least three professional references. The Ph.D. is required at the time of appointment. The start date is August 15, 2012. Upload application materials at https://workforum.memphis.edu.

Assistant Professor in Planetary Sciences.

Purdue University is building a strong new effort in Planetary Sciences. Jay Melosh has joined the Purdue Faculty and, together with Andy Freed, Marc Caffee, and David Minton, has a mandate to expand Planetary Sciences by adding an additional faculty member this year. We seek a broadly based individual for a tenure-track position at the Assistant professor level. The successful candidate will be an outstanding researcher with potential for excellence in teaching at both the graduate and undergraduate levels. We seek someone who will complement our existing strengths in modeling, geodynamics, atmospheric science and isotopic cosmochemistry. In harmony with Purdue's traditional emphasis on science, mathematics and engineering, we seek a quantitatively focused researcher with an interest in planetary surface processes. The Department of Earth and Atmospheric Sciences presently has outstanding programs in geodynamics, isotope geochemistry, terrestrial climate and extreme weather systems.

Applicants must have a Ph.D. in a field related to Planetary Science. Salary and benefits are highly competitive. The appointment will begin in August 2012. Candidates are expected to develop a vigorous research program, obtain external funding, supervise graduate students, and teach undergraduate and graduate courses. Interested candidates should submit their curriculum vitae, publication list, and brief descriptions of their planned research program and teaching philosophy to planetaryseasearch@purdue.edu. Names and contact information for at least three referees must be included in the application. Information on the EAS department can be found at http://www.purdue.edu/eas/. Applications completed by January 15, 2012 will be given full consideration, although the search will continue until the position is filled. A background check will be required for employment in this position.

Purdue University is an Equal Opportunity/Equal Access/Affirmative Action employer fully committed to achieving a diverse workforce.

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清華大學 深圳研究生院
Graduate School at Shenzhen, Tsinghua University, China

Professor/Associate Professor/Assistant Professor
Division of Ocean Science and Technology

- Ranks: Tenure-track Assistant Professor, and tenured Associate - Full Professor.
- Salary: Annual salary is up to USD 65K, and is negotiable for candidates with exceptional quality.
- Financial supports: Funds from the "Kongque Scheme" of the Shenzhen government can be applied for settling and research.
- Closing date: Open until all positions are filled.

The Division of Ocean Science and Technology has been established in Tsinghua University as one of its initiatives to develop its excellence of education and research in ocean science and technology. The Division will take the advantage of existing excellences in mathematics, engineering and computer sciences in Tsinghua University, and advance the sciences and technologies in 1) observing, understanding and predicting physical, geological, chemical and biological environment and processes in shelf seas and oceans, and their interaction with the Earth system, 2) exploring and protecting marine nature resources, and 3) assisting regional and national sustainable economic development. A new 15,000 m^2 ocean science and technology building will be built in 2012 to host this new division in the Tsinghua University Graduate School at Shenzhen which includes state-of-art laboratories for physical, biogeochemical and biological experiments and analysis, and deep test tanks for ocean engineering and sensor development. (http://www.sz.tsinghua.edu.cn/).

The Division has identified the following 5 focused areas:

- Air-Sea Interaction
- Submeso–mesoscale physical processes
- Nearshore processes
- Biogeochemical and biological processes
- Marine technologies

The Division is recruiting faculty members at all ranks in these 5 focused areas to establish a strong sizable program. An individual with strong skills in field observations, sensor development, and field data-model integration will be highly desirable. The successful candidates are expected to develop internationally recognized, externally funded disciplinary or interdisciplinary research programs, and actively participate in graduate teaching and advising. It is highly encouraged to have cluster hiring for candidates to form small self-organized interdisciplinary research groups.

Qualifications:
A PhD (or equivalent professional experience) is required, and postdoctoral experience is preferred. The successful candidate must have a demonstrated capability or potential to carry on an active, independent, externally funded research program, to supervise graduate students, and to collaborate with others in research and education. These positions are available immediately. The level of an appointment will be commensurate with the qualification and experience of a successful candidate.

Applicants should send a statement of teaching and research interests and goals, curriculum vitae, 3-5 representative reprints, and contact information of three referees to xu.hui@sz.tsinghua.edu.cn. Applications are accepted any time, and will be reviewed in a timely manner till the positions are filled.

UNIVERSITY OF OXFORD

www.ox.ac.uk/jobs

Professorship of Geophysics

in association with St Cross College

Start date: 1 October 2012 or as soon as possible thereafter.

BRONZE Athena SWAN Charter for Women in Science

This is a newly established post in the Department of Earth Sciences and its purpose is to maintain and strengthen research and teaching in geophysics and to provide ongoing academic leadership in this core discipline. Geophysics is currently benefiting from a great expansion in global and regional data sets and from the advancement of computational modelling techniques. The department enjoys an internationally leading position in the field through research groups in seismology, geodesy, earthquake studies, marine geophysics and numerical modelling of earth processes. While applications in these areas are welcome, applications in all areas of geophysics, broadly defined, are encouraged.

Please see the further particulars at **http://www.ox.ac.uk/about_the_university/jobs/fp/** for more details about the post and for full instructions before making an application. Applications, including a covering letter and full CV, and naming three referees should be received no later than Monday 12 December 2011, by Dr Gwen Booth, Personnel Officer, Senior Appointments at professorships@admin.ox.ac.uk If you have a query about how to apply, please contact Mrs Elaine Eastgate at professorships@admin.ox.ac.uk or telephone:+44 (0) 1865 280189.

Applications are particularly welcome from women and black and minority ethnic candidates, who are under-represented in academic posts in Oxford.

Committed to equality and valuing diversity

LSU
LOUISIANA STATE UNIVERSITY

ANTICIPATED/TENURE-TRACK
ASSISTANT PROFESSOR
(BIOGEOSCIENTIST) DEPARTMENT OF GEOLOGY & GEOPHYSICS

The Department of Geology & Geophysics at LSU seeks to fill a tenure-track Assistant Professor position in the general area of biogeoscience. Researchers with strengths in geobiology, biogeochemistry, and paleoclimatology are encouraged to apply. We seek a colleague who will develop a strong, externally-funded research program and contribute to our teaching mission, particularly courses related to the history of Earth's biosphere. We encourage applicants to describe how their research and teaching interests would link to the department's focus areas in "Evolution of Sedimentary Systems" and/or "Earth Materials and Solid Earth Processes."

Advantages offered by LSU to applicants include its location on the Mississippi Delta and near the Gulf of Mexico, natural laboratories that can be used in both teaching and research activities, the LSU Synchrotron Light facility (Center for Advanced Microstructures and Devices) located a short distance from the main campus, and the LSU Center for Computation and Technology, where the high performance computing resources are housed. Additionally, the Department has a strong record in research and graduate training (MS and PhD degrees), ongoing federal and industry funded research and teaching programs, and a large and active alumni group. See **http://uiswcmsweb.prod.lsu.edu/geol/** for more information regarding these focus areas, faculty, facilities, and research programs.

Responsibilities include supervising graduate student research (MS and PhD), publishing research findings in highly ranked journals; teaching undergraduate and graduate courses in his or her area of specialization, and serving on committees in the departmental, college, and professional societies. **Required Qualifications:** Ph.D. or equivalent degree in geological sciences or other relevant disciplines; record of published research; ability to attract funding.

An offer of employment is contingent on a satisfactory pre-employment background check. The position is open until filled. We will begin screening applications on **January 9, 2012.** Inquiries should be directed to **Search Committee, at 225-578-3353 or geology@lsu.edu.** Apply online and view a more detailed ad at: **www.lsusystemcareers.lsu.edu. Position #002835.** You will need to provide a copy of your curriculum vitae (including e-mail address), a statement of your research and teaching interests, and the names, addresses, phone numbers, and e-mail addresses of at least three references.

LSU IS AN EQUAL OPPORTUNITY/EQUAL ACCESS EMPLOYER

Department of Geosciences
PRINCETON UNIVERSITY

The Department of Geosciences at Princeton University seeks a solid earth geoscientist, broadly defined, to be considered for a tenure-track assistant professor position. Possible fields of specialty include, but are not limited to, geodynamics, seismology, glaciology, mineral physics, and computational geophysics. We are particularly interested in scientists who will diversify and interact productively with current members of the department.

Applicants should submit a curriculum vitae, including a publication list, a statement of research and teaching interests, and contact information for three references to http://jobs.princeton.edu, requisition # 0110694. The start date is flexible. Evaluation of applications will begin immediately; interviews of candidates will begin in February 2012 and will continue until the position is filled.

Princeton University is an equal opportunity employer and complies with applicable EEO and affirmative action regulations.

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Assistant Research Professor/Stratigraphy/ Northern Arizona University. We invite applications from individuals with research experience and expertise in sequence stratigraphy. Minimum qualifications include an earned doctorate conferred by August 1, 2012 in the geosciences; teaching experience at the college level; and research experience using modern methods of sequence stratigraphy. Preferred qualifications include: experience with integrated field and subsurface research in sequence stratigraphy; demonstrated use of seismic reflection data in research; demonstrated use of state-of-the-art subsurface exploration and production software; demonstrated ability to teach (a) advanced undergraduate and graduate courses on sequence stratigraphy, and (b) specialized topics courses; experience or potential for multidisciplinary collaboration with individuals within and outside of academia including the oil and gas industry; experience or interest in advising and mentoring graduate students; demonstrated experience in effective science communication; and, demonstrated experience in, or commitment to, working with diverse communities. NAU is an AA/EEO/WMDV Employer. For a full position description and application instructions, visit the university website at http://hr.nau.edu/

Faculty Positions in Energy/Mineral Resources and Global Climate Change/Water Sustainability.

The Department of Earth and Environmental Sciences at the University of Michigan is searching for candidates in the areas of Energy/Mineral Resources and Climate Change/Water Sustainability, at the assistant, associate or full professor level, starting September 2012. This is a university-year appointment. We encourage applications from candidates with established records of research and teaching in either of these areas.

Energy/Mineral Resources: Candidates for this position should investigate processes key to the origin and development of fossil energy sources, alternative energy sources, or mineral resources. Research areas might include, but are not limited to: (i) formation of mineral or energy deposits using sedimentology, aqueous geochemistry, or high-temperature geochemistry; (ii) exploration for deposits using reflection seismology or exploration geochemistry; and (iii) research relevant to alternative energy development or carbon sequestration. Candidates may use field, and/or experimental studies, and/or modeling.

Global Climate Change/Water Sustainability: Candidates for this position should investigate water cycling and resource issues in relation to climate and paleoclimate change. Areas of expertise might include, but are not limited to: (i) hydrological cycling with emphasis on atmosphere and/or land surface processes; (ii) monitoring and modeling of surface and ground water, vapor, snow, and ice; and (iii) impacts of climate change on water availability and quality. Candidates may use field, monitoring, and/or experimental studies, geochemical or geophysical techniques including remote sensing, and/or modeling.

The successful candidate is expected to establish an independent research program and contribute to undergraduate and graduate teaching. Applicants should submit a CV, statement of current and future research plans, statement of teaching philosophy and experience, evidence of teaching excellence, and names of at least four persons who can provide letters of recommendation. Information about the Department can be found at: www.lsa.umich.edu/earth.

Applications should be submitted as a single PDF file by email to:

earth-search@umich.edu

Deadline is December 15, 2011 for full consideration, but applications will continue to be reviewed until the position is filled.

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LAMONT-DOHERTY EARTH OBSERVATORY
THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY

Faculty Position in Physical Oceanography in the Department of Earth & Environmental Sciences and the Lamont-Doherty Earth Observatory of Columbia University

The Department of Earth and Environmental Sciences of Columbia University invites applications for a tenure-track assistant professor position in Physical Oceanography, based at the Lamont-Doherty Earth Observatory (Palisades NY). The successful applicant will demonstrate a strong research program addressing problems of global significance and will have the ability to raise external research funds. The successful applicant's research will be focused on one or more of the following: theory and modeling of physical oceanographic processes; data assimilation and interpretation; field efforts to collect novel and critical data. It may include themes that are interdisciplinary in nature and that connect with the forefront of climate research, biological oceanography and/or coastal processes and it will be grounded in the physics of the oceans. The successful applicant will demonstrate strong teaching abilities at both the undergraduate and graduate level. Please apply for the position with a cover letter, CV, statements of teaching and of research, and a list of references at our online site:

https://academicjobs.columbia.edu/applicants/Central?quickFind=55575

Review of applications begins immediately and will continue until the position is filled.

Columbia University is an Equal Opportunity/Affirmative Action employer.

soest School of Ocean and Earth Science and Technology
AT THE UNIVERSITY OF HAWAI'I AT MANOA

2012 SOEST Young Investigator Program

The School of Ocean and Earth Science and Technology (SOEST) invites applications for multiple **Assistant Researcher** positions. These one-year, non-tenurable, faculty positions may be renewed for a second year, and will begin in 2012 or as mutually agreed. SOEST is seeking junior scientists and engineers with outstanding abilities in any of the following disciplines: ocean, earth, atmospheric, planetary and materials science; marine biology; marine biotechnology; renewable energy; or ocean and resources engineering. The number of positions is subject to availability of funds.

Minimum Qualifications: Applicants should have received their doctoral degrees no earlier than 2009 and no later than the appointment date.

Salary: SOEST salary of $60,000 at 75% FTE plus research support of $3,000 per year. This may be supplemented with extramural funding (for a total salary up to $80,000 at 100% FTE). Salary is subject to collective bargaining adjustments.

Applications for this position should include a current curriculum vitae; a two-to-four page statement of proposed research activity; and letters of recommendation from three references familiar with the candidate's qualifications, accomplishments and research potential. Letters of recommendation should be submitted by the referees before the closing date.

All correspondence should be addressed to

Dr. Alexander Shor, Associate Dean for Research
School of Ocean and Earth Science and Technology
University of Hawai'i
1680 East-West Road, POST 802, Honolulu, HI 96822
soestyip@hawaii.edu

For information about SOEST and the research carried out at the School, see our web site at **www.soest.hawaii.edu**

SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY
UNIVERSITY OF HAWAI'I AT MĀNOA

Closing date: 31 January 2012

The University of Hawai'i is an Equal Opportunity and Affirmative Action Employer.

LSU
LOUISIANA STATE UNIVERSITY

ANTICIPATED/TENURED/TENURE-TRACK ASSOCIATE/FULL PROFESSOR
(TWO ENDOWED CHAIR POSITIONS - JOHN FRANKS CHAIR OR AASP CHAIR IN PALEOPALYNOLOGY)
DEPARTMENT OF GEOLOGY & GEOPHYSICS

The Department of Geology & Geophysics at LSU announces a multiple year search to fill two endowed chair positions. For each position we seek an outstanding individual with an internationally recognized scientific reputation. We invite inquiries, nominations, and applications for:

John Franks Chair: We seek an individual with research interests in one or both of our two interrelated departmental focus areas: "Earth Materials and Solid Earth Processes," and "Evolution of Sedimentary Systems." The successful candidate will conduct research in fields integrating our departmental strengths (for details see http://uiswcmsweb.prod.lsu.edu/geol/). Existing interdisciplinary research clusters at LSU, including materials science, coastal sciences, petroleum science and engineering, and high performance computing offer immediate opportunities to establish links with other high-level programs on campus.

AASP Chair in Paleopalynology: We seek an individual that will develop a program in stratigraphic palynology, including chronostratigraphy, paleoecology, and/or paleoclimatology. The successful candidate will develop a strong research program in one or more of these fields and will also serve as Director of the American Association of Stratigraphic Palynologists (AASP) Center for Excellence in Palynology within the Department of Geology & Geophysics. Candidates with significant academic and/or petroleum industry experience are encouraged to apply.

Required Qualifications: Ph.D. or equivalent degree in geological sciences or other relevant disciplines; strong record of published research; demonstrated ability to attract funding. **Responsibilities:** The successful candidate will be expected to supervise graduate student research, publish in highly ranked journals, and teach undergraduate and graduate courses in his or her area of specialization. Chair appointments would normally be made at the rank of Full Professor. However, exceptional candidates at the Associate Professor level will be considered.

The Department of Geology and Geophysics offers B.S., M.S., and Ph.D. degrees in geology. The Department has a strong record in research and graduate training, ongoing federal and industry funded research and teaching programs, and a large and active alumni base. Our focus areas described above have been developed within the LSU Department of Geology and Geophysics to enhance existing strengths of the Department and allow the Department to interface synergistically with other academic units at LSU. See www.geol.lsu.edu for more information regarding these focus areas, faculty, facilities, and research programs.

An offer of employment is contingent on a satisfactory pre-employment background check. The review process will begin **January 9, 2012.** and continue until a candidate is selected. Salary and rank are commensurate with qualifications and experience. Nominations or inquiries should be directed to **Endowed Chair Search Committee, at 225-578-3353 or geology@lsu.edu.** Apply online and view a more detailed ad at: **www.lsusystemcareers.lsu.edu. Position #002395.** Applicants will need to provide a copy of your curriculum vitae (including e-mail address), a statement of your research and teaching interests, and the names, addresses, phone numbers, and email addresses of at least three references.

LSU IS AN EQUAL OPPORTUNITY/EQUAL ACCESS EMPLOYER

CIRES
COOPERATIVE INSTITUTE FOR RESEARCH IN ENVIRONMENTAL SCIENCES

Visiting Fellowship opportunities
10-15 awards made annually

■ **Post-doctoral Visiting Fellowships** ■ **3-12 month Visiting Scientist, including sabbatical and faculty leave**

Join the thriving research community in Boulder, Colorado, for unique opportunities to conduct challenging research with recognized leaders in Earth system science. Sponsored by the largest research institute within the University of Colorado Boulder, CIRES fellowships are awarded each year to stimulate interdisciplinary research on campus as well as in partnership with NOAA's Boulder laboratories. The CIRES Visiting Fellows Program has attracted more than 265 scientists from around the world since 1967.

Work with our CIRES Fellows conducting research in areas such as atmosphere and ocean processes, cryospheric processes, ecology and ecosystems, regional/global environmental variability and change, global water cycle, advanced observing systems, geophysics, geochemistry, geomorphology, environmental microbiology, environmental health, science and technology policy research, and space weather.

University of Colorado Boulder

Go to **cires.colorado.edu** *for more information about CIRES.*
Visit **cires.colorado.edu/collaboration/fellowships** *for information and application instructions for the Visiting Fellowship Program.*

Deadline for application is December 31, 2011

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Women and minorities are encouraged to apply. The University is supportive of the needs of dual career couples.

The University of Michigan is an equal opportunity/affirmative action employer.

The Department of Civil and Environmental Engineering at the University of Pittsburgh invites applications for one or more tenure-track faculty positions effective September 1, 2012. One position is intended for applicants with fundamental expertise and research interests at the interface between geotechnical, geoenvironmental and water resources areas and the other is for those interested in environmental engineering and science. Applicants will be considered at the Assistant or Associate Professor levels, commensurate with qualifications and experience.

We are seeking outstanding candidates to join our vibrant and growing department of more than 20 faculty members and 90 full-time graduate students (50 of which are PhD students). The successful applicant will be expected to develop and sustain a strong, externally funded research program within their area of expertise and contribute to the teaching mission of the graduate and undergraduate programs. Candidates interested in collaborative and interdisciplinary research within the Department and/or other faculty in related focus areas in the Swanson School of Engineering, such as the Mascaro Center for Sustainable Innovation (MCSI) (www.mascarocenter.pitt.edu) and the University of Pittsburgh Center for Energy (http://www.energy.pitt.edu), are encouraged to apply. Applicants should review the departmental website at www.engineering.pitt.edu/civil for additional information.

An earned doctorate in civil engineering, environmental engineering science, petroleum engineering, earth science, or a closely related field is required. Interested applicants should submit a cover letter, a detailed resume, statements describing teaching and research interests and future plans, copies of three representative publications, and the names and contact information for at least three references, all in a single PDF file, to CEEsearch2011@engr.pitt.edu.

Applications will be considered beginning December 15, 2011 and continue until the position is filled. The University of Pittsburgh is an Affirmative Action, Equal Opportunity Employer.

The Department of Geology at the University of Toronto invites applications for the Roger E. Deane Postdoctoral Fellowship, a highly competitive fellowship in any field of Earth Science. This fellowship, generously endowed by the late Mrs. Dorothy M Deane, is named in memory of her husband, a faculty member from 1956 to 1964 who died in a tragic, research related boating accident near Tobermory, Ontario. The Department is interested in supporting innovative research and outstanding young geoscientists to work in collaboration with one or more faculty members. Applicants are encouraged to contact prospective hosts in advance to discuss areas of common interest. The Deane Postdoctoral Fellowship has an annual salary of $50,000 and is awarded for a one-year period, with an anticipated extension for a second year.

A complete application includes: a curriculum vitae, a research proposal (2 pages maximum excluding references), and the names & addresses of at least three references.

Deadline: Applications are due January 15, 2012.

Submit applications to: Ampy Tolentino, geol_sec@geology.utoronto.ca (subject line: Deane Postdoctoral Fellowship) Or mail to: Deane Postdoctoral Committee University of Toronto Department of Geology Earth Science Centre 22 Russell Street, Toronto, ON, Canada M5S 3B1

The Department of Earth and Planetary Sciences at Washington University in Saint Louis invites applications for their new Steve Fossett Postdoctoral Fellowship. The Department seeks outstanding candidates who will strengthen and complement existing areas of study, including both terrestrial and planetary geology, geochemistry, and geophysics. Candidates will be encouraged to collaborate directly with Faculty and students within the Department, and will be invited to lead a seminar in their area of expertise. Ideal candidates will have trans-disciplinary interests, and will interact scientifically with a broad spectrum of the Department's members. This competitive postdoc is awarded for a one-year period, which may be extended to a second year. The annual salary is $55,000 with additional research funds of $5,000 per year. Applicants should contact a potential Faculty sponsor to discuss additional arrangements.

Please send resume, statement of research interests, and names and contact information for at least three references to:

Fossett Fellowship Committee Department of Earth and Planetary Sciences Washington University Campus Box 1169 One Brookings Drive St. Louis, MO 63130 or via e-mail: Fossett_Fellowship@levee.wustl.edu

Applications will be considered until the position is filled, but priority will be given to those received before January 15, 2012. Washington University is an equal opportunity/affirmative action employer.

STUDENT OPPORTUNITIES

PhD/MSc Graduate Research Assistanceship (1PhD positions, 1 MSc): Several research assistantships related to a range of projects are available for students starting spring and/or fall 2012 in the area of Environmental Geochemistry. Seeking motivated students interested in multidisciplinary research investigating contaminant behavior and toxicology related to degradation of petroleum byproducts in Alberta oil sands studying novel natural & anthropogenic disturbed ecosystems and wetlands. Projects are laboratory-based and/or contain field components and involve access to state-of-the-art analytical instrumentation. Synchrotron-based X-ray techniques, electron microscopy (FE-ESEM, HTEM, MC-ICPMS, etc) will be used in conjunction with genetic techniques (TRFLP, QPCR) for the characterization of samples. These positions are fully funded however exceptional candidates will also be nominated for NSERC industrial and MITAC scholarships. Please Contact: Dr. Christopher G. Weisener, weisener@uwindsor.ca; University of Windsor. Spring/Fall 2012.

New Mexico Highlands University Graduate Assistantships. Located in the foothills of the Sangre de Cristo Mountains, the Environmental Geology program offers a field- intensive curriculum in petrology, geophysics, and collaborations with the Forest/Watershed Restoration Institute. The new Paleomagnetism, Geochemistry, & Water Chemistry labs support wide-ranging analytical research. Graduate assistantships include a stipend & full tuition waiver. Contact Dr. Mike Petronis 505-454- 3513/mspetro@nmhu.edu for additional information. For disabled TDD# 5054543003. AA/EOE Employer.

The Department of Earth & Environmental Systems at ISU has graduate assistantships available for students wishing to pursue an MS in Earth & Quaternary Sciences or Ph.D. in Spatial & Earth Sciences. Specialties include biogeochemistry, geoarchaeology, dendrochronology, GIS/remote sensing, paleoceanography/marine geology, and climatology/paleoclimatology. Preference given to applications received before Feb 1, 2012. Visit www.indstate.edu/ees for application information or contact Dr. Anthony Rathburn, Tony.Rathburn@indstate.edu, for more information.

Applications are invited from students to pursue graduate studies (PhD) in urban hydrology at UMBC working with a multidisciplinary research team. Funding is provided by NSF. Students with background in environmental engineering, environmental science, hydrology, geology, or related disciplines with skills and interest in numerical modeling are encouraged to apply. Work is being carried out in collaboration with

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FACULTY POSITION IN PETROLEUM GEOLOGY

ConocoPhillips SCHOOL OF GEOLOGY & GEOPHYSICS
The University of Oklahoma

The world's first School of Petroleum Geology was founded at the University of Oklahoma more than a century ago and the legacy continues with the Mewbourne College of Earth and Energy. Now the ConocoPhillips School of Geology and Geophysics at the University of Oklahoma invites applications for the position of Associate Professor/Professor in petroleum geology. Depending on experience and qualifications, the successful candidate may be appointed as a tenured Associate or Full Professor in an endowed Professorship or Chair in the ConocoPhillips School of Geology and Geophysics, and is expected to add significantly to the University's petroleum geology/geophysics education and research programs. Applications are being solicited from both academia and industry.

The successful candidate must have a demonstrated research record and the vision to establish and lead a strong multidisciplinary research program in petroleum geology. The position includes the opportunity to work with the Mewbourne School of Petroleum and Geological Engineering and the Oklahoma Geological Survey. The ConocoPhillips School of Geology and Geophysics possesses both state-of-the-art field and laboratory based geological and geophysical facilities and equipment, including a new field camp. A qualified applicant should have demonstrated expertise in a range of geological technologies to define and better understand geological features, concepts, and technologies related to oil and gas exploration and production, and should be an excellent educator with commitment to both undergraduate and graduate (M.S. and Ph.D.) education. A Ph.D. in geology or related field is required. Salary and benefits will be competitive and commensurate with experience and anticipated potential.

Review of candidates will begin February 1, 2012, and continue until the position is filled. The anticipated starting date is August 15, 2012. Applicants are requested to submit a vita/resume, statement of research and teaching interests, and a list of five references who can be contacted, including names, phone numbers, email, and complete mailing addresses. Applications and nominations should be addressed to Petroleum Geology Search Committee, ConocoPhillips School of Geology and Geophysics, University of Oklahoma, 100 E. Boyd Street, Rm. 710, Norman, OK, 73019-1009.

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

JOHNS HOPKINS UNIVERSITY

POSTDOCTORAL POSITION IN ORIGIN OF LIFE STUDIES

The Geophysical Laboratory and Johns Hopkins University seek a highly qualified, creative, and motivated applicant to participate in an interdisciplinary study of the role of mineral-biomolecule interactions in the origin of life. Working closely with astrobiologists, geochemists, and mineralogists at the Carnegie Institution and Johns Hopkins University, the successful candidate will pursue independent research on topics that may include the molecular-scale aspects of how organic molecules adsorb to mineral surfaces as a function of environmental conditions, the nature and extent of competitive and cooperative adsorption, and the possible roles of rock-forming mineral surfaces in prebiotic molecular stabilization, molecular degradation, and polymerization reactions.

Candidates should have a Ph.D. in a relevant discipline such as experimental and analytical geochemistry or chemistry; experience in data collection, database management, and data analysis; and excellent communication and interpersonal skills. Expertise in mineralogy, experimental aqueous geochemistry, and the experimental chemistry of the mineral-water interface are desirable. The postdoctoral position will be full-time, 2-years, and based at the Carnegie Institution's Broad Branch Road campus in Washington, DC. Applications will be evaluated as part of the Geophysical Laboratory's annual fellowship competition. For further information about how to apply, please see www.gl.ciw.edu/employment/Postdoctoral_Fellowships.

Completed applications should be submitted by December 31, 2011, to Robert M. Hazen, Senior Staff Scientist, Geophysical Laboratory, 5251 Broad Branch Road, NW, Washington, DC 20015-1305, USA (rhazen@ciw.edu). Email is preferred. The Geophysical Laboratory is an equal opportunity employer.

ESRL-CIRES FELLOWSHIP OPPORTUNITIES

NOAA's Earth System Research Laboratory (ESRL), Chemical Sciences Division and the University of Colorado at Boulder Cooperative Institute for Research in Environmental Sciences (CIRES)

Doctoral Fellowships

A competitive, educational award designed to foster interactive research within a professional research laboratory (ESRL) and academic excellence at the largest research institute within the University of Colorado at Boulder (CIRES).

Deadline
January 15, 2012

Apply online at
http://cires.colorado.edu/ESRL-CIRES

Personnel in the Chemical Sciences Division of ESRL are internationally recognized research leaders in a variety of fields, including **atmospheric chemistry, climate change, air quality and stratospheric ozone**. The research is done in close collaboration with CIRES-affiliated faculty at the University of Colorado at Boulder, who specialize in areas such as **environmental chemistry, observations and modeling, and in climate dynamics**.

Open to exceptional prospective graduate students in Chemistry, Atmospheric Sciences and in Engineering, the fellowships offer up to four years of financial support. For more information, see *http://cires.colorado.edu*.

Visit our website at *http://cires.colorado.edu/ESRL-CIRES* for information and application instructions or contact suzanne.vandrunick@colorado.edu.

The deadline for application is **January 15, 2012.**

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the Baltimore Ecosystem Study LTER. For information contact Prof. Claire Welty at weltyc@umbc.edu or for information visit http:// userpages.umbc.edu/~weltyc/.

Predicting future climate requires an improved understanding of future atmospheric greenhouse gas concentrations. Cornell, the Cary Institute of Ecosystem Studies, and the National Center for Atmospheric Research are partners in a new NSF-IGERT program designed to train graduate students in microbial, ecosystem, and global-scale approaches for advancing understanding of biogeochemical controls on greenhouse gas concentrations and global climate. Students will apply to work with individual faculty, but will participate in cross-disciplinary, cross-scale research in a collaborative environment across multiple departments and institutions. Minority and female students are especially encouraged to apply. Positions are available across many departments at Cornell, conducting innovative lab, field and modeling work. See www.biogeo.cornell.edu or email biogeo@cornell.edu for more details.

NASA Student Research Opportunity

The NASA Airborne Science Program invites highly motivated junior and senior undergraduate and early graduate students to apply for participation in the NASA Student Airborne Research Program (SARP 2012). The purpose of the Student Airborne Research Program is to provide students with hands-on research experience in all aspects of a major scientific campaign, from detailed planning on how to achieve mission objectives to formal presentation of results and conclusions to peers and others. Students will work in four multi-disciplinary teams to study surface, atmospheric, and oceanographic processes. Participants will assist in the operation of instruments onboard the P-3B aircraft to sample and measure atmospheric gases and to image land and water surfaces in multiple spectral bands. Along with airborne data collection, students will participate in taking measurements at field sites.

Outstanding faculty and staff for this program will be drawn from several universities and NASA centers, as well as from NASA flight operations and engineering personnel. The eight-week program begins June 17, 2012 and concludes August 10, 2012. Preparatory information will be presented at the University of California Irvine, where post-flight data analysis and interpretation will also take place. Instrument and flight preparations, and the research flights themselves, will occur at NASA's Dryden Aircraft Operations Facility, in Palmdale, CA.

Successful applicants will be awarded a $3,000 stipend for the 8-week program. Full travel and living expenses and a $2,500 food allowance will also be provided. Selection criteria will include:

· Academic performance
· Potential for contributing to US's future workforce as judged from career plans
· Evidence of interest in Earth system science and hands-on research
· Geographic, gender, and ethnic diversity
· Ability to perform in teams

Applications can be found at the SARP 2012 website www.nserc.und.edu/learning/SARP2012.html

Applications received by January 20, 2012 will be considered for early acceptance.

Deadline for all applications is February 10, 2012.

Specific questions about the program can be emailed to: SARP2012@nserc.und.edu

SARP representatives also will be present at the NASA booth at the 2011 AGU Fall Meeting in San Francisco.

SERVICES, SUPPLIES, COURSES, & ANNOUNCEMENTS

United States Polar Rock Repository. Rock samples are available as no-cost loans for research, teaching & museum use. http://bprc.osu.edu/emuwebusprr.

RESEARCH SPOTLIGHT

Highlighting exciting new research from AGU journals

Fractures on curved surfaces: A classic problem solved

Sheeting joints—large fractures parallel to a curved rock surface—are common in many locations on Earth, such as the iconic Half Dome in Yosemite National Park in California. Explaining how these fractures form has been a classic unsolved problem in geology. *Martel* solved the problem by reformulating the static equilibrium equations in a curvilinear reference frame. His analysis shows that compression along a curved surface can induce tension perpendicular to the surface, which can cause subsurface cracks to open. He found that the curvature of a rock surface plays a key role in the formation of fractures.

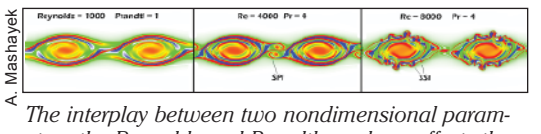
Greg Stock

Sheeting joints near the summit of Half Dome, Yosemite National Park. A new theory explains how sheeting joints form.

The author tested his theoretical findings and showed that his analysis accurately predicted where sheeting joints would be abundant and where they would be scarce in Yosemite National Park. Sheeting joints weaken a rock mass, so knowing where a rock mass is vulnerable to such cracks is valuable information. Furthermore, the method of analysis applies not only to rock surfaces but also to any curved surface and thus should be useful in a broad variety of engineering and scientific applications, especially those addressing failure mechanisms. (*Geophysical Research Letters*, doi:10.1029/2011GL049354, 2011) —EB

Putting bounds on the drivers of turbulence

When fluids with different or continuously varying properties flow next to one another, turbulent flow can emerge. At its most basic, turbulence takes the form of swirling vortices that occur along the flow direction; these vortices are known as a Kelvin-Helmholtz (K-H) instability. Superimposed on this two-dimensional K-H foundation are a variety of secondary instabilities that extend the mixing into three dimensions and endow it with a more complicated structure. How these secondary instabilities form and the role they play in pulling smoothly flowing fluid into the chaos of turbulence remain an area of active investigation.



A. Mashayek

The interplay between two nondimensional parameters, the Reynolds and Prandtl numbers, affects the occurrence and importance of different forms of turbulence-inducing secondary instabilities, such as the stagnation point instability (SPI) and the secondary shear instability (SSI).

Building on their previous research, *Mashayek and Peltier* use numerical simulations to determine the environmental conditions that give rise to the different types of secondary instabilities and the regions over which each is the dominant driver of turbulence. The authors varied the Reynolds and Prandtl parameters in a simulated fluid and determined the influence they would have on the amplitude of the turbulence. Reynolds numbers reflect the ratio of the stabilizing influence of viscous forces to the destabilizing power of inertial forces. Prandtl numbers represent the ratio of the diffusivity due to momentum to the diffusivity because of heat, thereby measuring the relative propensity of a fluid flow to become mechanically, rather than thermally, turbulent. The authors found that all secondary instabilities are more likely at higher Reynolds numbers, but they differ in their response to elevated Prandtl numbers. The secondary convective instability (SCI) and the recently hypothesized stagnation point instability (SPI) increase with rising Prandtl numbers, with SCI being the dominant driver of turbulence in fluids with high Prandtl numbers. The secondary shear instability (SSI) decreases with rising Prandtl numbers and the occurrence of SSIs impinges on the development of SPI turbulence, suggesting that there is a threshold set of Reynolds and Prandtl conditions where SPI and SSI trade off in importance. (*Geophysical Research Letters*, doi:10.1029/2011GL048542, 2011)—CS

Origin of a tidal structure in the thermospheric O/N_2 ratio

One recently recognized way of studying the ionospheric and thermospheric structure is through measurements of the column number density ratio of atomic oxygen to molecular nitrogen (O/N_2). Data from the Global Ultraviolet Imager on board the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) satellite show that this ratio exhibits a tidal structure. *Kil and Paxton* found that the 135.6-nanometer emission produced by the radiative recombination of the oxygen ion contributes to the retrieved O/N_2 ratio, and therefore the tidal structure in the O/N_2 ratio originates in the ionosphere, not the thermosphere. (*Geophysical Research Letters*, doi:10.1029/2011GL049432, 2011) —EB

—Ernie Balcerak and Colin Schultz, Staff Writers