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EOS

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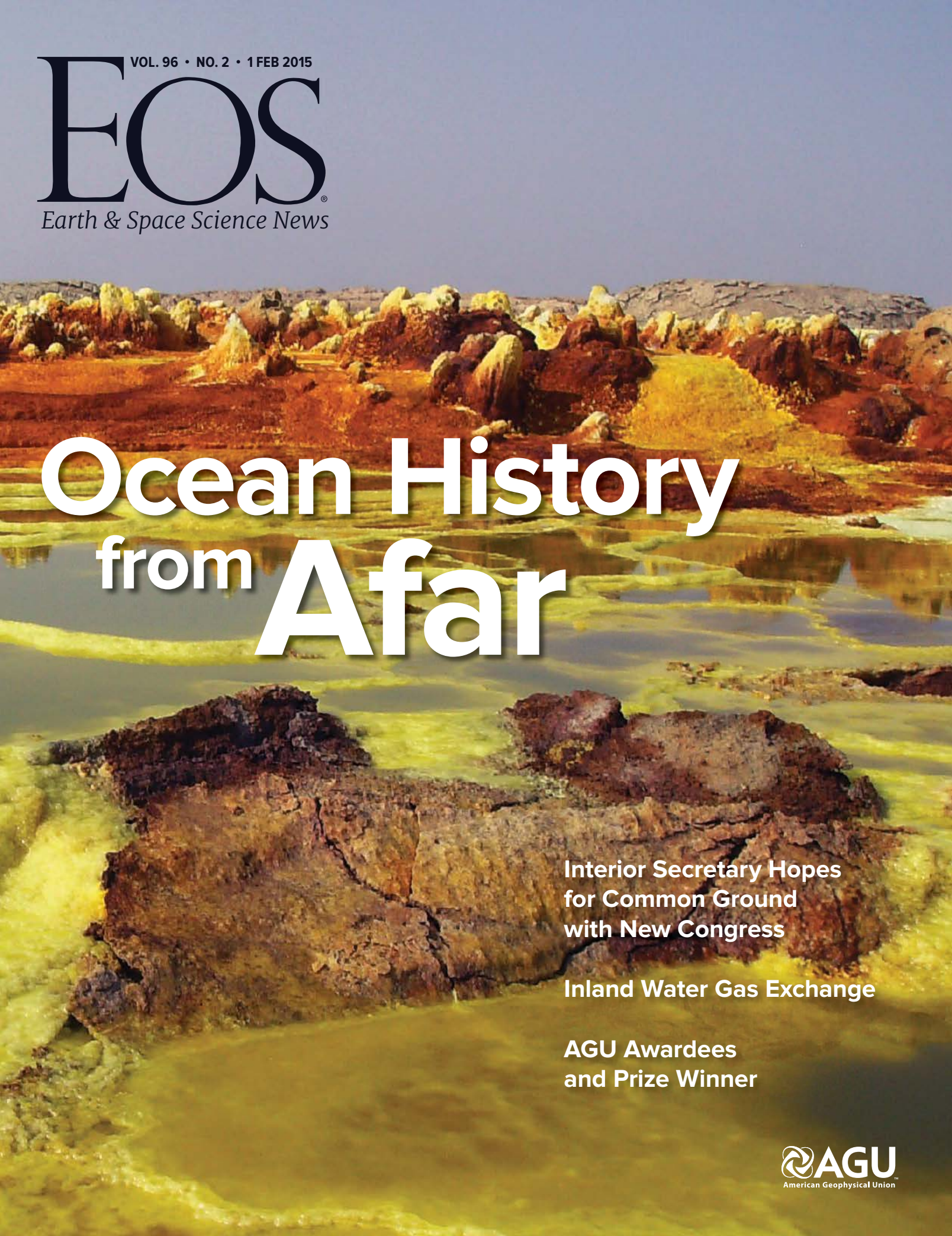

Ocean History from Afar

Interior Secretary Hopes for Common Ground with New Congress

Inland Water Gas Exchange

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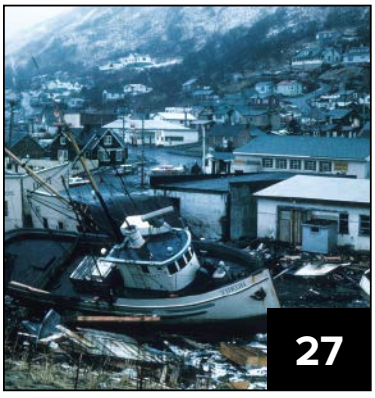

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The otherworldly landscape of Ethiopia's Dallol Basin, a volcanic caldera in the Afar Triangle, shows sulfur mounding on brine pools. What did this landscape look like tens of thousands of years ago? Analysis of sediments yields clues. See page 12. Photo by Achilli Family, CC BY 2.0, http://bit.ly/Dallolbrine.

EOS.

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Christine W. McEntee, Executive Director/CEO

AGU American Geophysical Union

Common Ground with New Congress Sought by Interior Secretary

Gary Wagner

U.S. Secretary of the Interior Sally Jewell delivers the Union Agency Lecture at the 2014 AGU Fall Meeting.

Republican control of both houses of Congress could lead to constructive measures moving forward in the best interests of the American people, according to Sally Jewell, secretary of the U.S. Department of the Interior (DOI).

Elected officials in the previous Congress spent a lot of effort "shooting down those things that are put on the table," Jewell said at a news briefing at the 2014 AGU Fall Meeting in San Francisco. "You are going to see in this coming Congress more responsibility to see that things actually get accomplished that are in the best interest of peoples' constituencies." DOI focuses on a wide variety of concerns related to the management of natural resources.

During Jewell's briefing, the Union Agency Lecture, and a student forum on 18 December, she called for working constructively with Congress and even with those who hold strong ideological views. Jewell emphasized the need to move forward creatively on climate change and other issues at a time when there are fiscal challenges. She also noted the fundamental importance of scientific integrity to the agency and DOI's recently revised scientific integrity policy.

At the briefing, Jewell said that she has reached out proactively to members of the House and Senate to find out their goals and what they are trying to accomplish. "Those meetings are enormously helpful. If you are sitting here shooting bombs at each other from different parts of the ideological spectrum, you don't have the awkwardness of a personal relationship," she noted. With the Interior Department having "an equity" in most congressional districts, she said "there is that common ground we can find [that] I think will move productive things forward."

> Jewell called for working constructively with Congress and even with those who hold strong ideological views.

Dealing with Ideological Opposition

Jewell underscored the need to find common ground and work with those who hold strong ideological opinions about climate change. She said that although some people may not agree on the origins of climate change, there could be agreement on how to deal with threats such as drought, wildfires, sea level rise, and the encroachment of salinity into freshwater supplies. Those concerns "are things that everybody can relate to because they are facts that are not refutable," Jewell said. She added that building resilience to climate change could be one area of mutual interest.

She noted the importance of "finding that common ground and not really duking it out over things where you're probably never going to move their ideology."

She also emphasized the need to expose ideologically driven scientists whom she said leverage media to cast doubt on sound scientific data about climate change and other matters. She referenced *Merchants of Doubt,* a book and movie about this topic. "'Merchants of doubt' scientists [who] make a profession out of creating doubt need to be exposed for what they are doing because it impacts all people," she said.

A New Moonshot

Jewell, 58, recollected in her keynote speech the significance of the space race during her childhood. "The moonshot we need to take now is on climate change." She said it is "the defining issue of our time" and something to which younger generations are paying tremendous attention.

She pointed to recent administration efforts, including the recently released White House National Climate Assessment and the U.S.–China joint announcement about reducing greenhouse gas emissions. "Just as [President] Kennedy did [in focusing on the Moon], presidential leadership is now driving action again," she said.

The Value of "Thoughtful Regulations"

In the Union Agency Lecture, Jewell stressed that sound science and data need to be transparent and readily available "so that [they] can be used in decisions that impact people and the environment without regard to political boundaries."

She also argued forcefully for the value of key environmental regulations, including the Clean Air Act, federal automobile emissions standards, and proposed regulations on methane emissions from industrial sources. She said these and other actions not only are good for the environment but also can help to create jobs and opportunities for industry.

Sally Jewell (center) spent 1.5 hours talking with students in a special forum at the AGU Fall Meeting. U.S. Geological Survey acting director Suzette Kimball is at left.

"There is thoughtful regulation that has changed the face of this world, and certainly this country, particularly for environmental protection," she noted.

Challenges for the Scientific Community

Jewell called on the scientific community to leverage scarce financial resources by working together to expand public and private partnerships. "None of us have the money we would like to have. We're not back in the space race where the federal government is going to pay for everything," she said.

In addition, Jewell urged scientists to take credit for their work and to share the importance of their work with friends, neighbors, and elected officials. She added that scientists need to "take responsibility for engaging the next generation" so that they have similar opportunities.

The Next Generation

During Jewell's 1.5-hour forum with 13 students, she talked about the importance of science within DOI, science communication, how to get members of Congress concerned about science issues, scientific ethics and integrity, and other issues raised by the students.

Annie Tamalavage, a graduate student at Texas A&M University, was one participant. Tamalavage, formerly a geochemistry research assistant with ConocoPhillips, is a student representative on the AGU Council. She asked Jewell how scientists can best apply their skills, which may be useful both for the exploitation of natural resources and for understanding ecosystems and potential environmental impacts.

Jewell, who was trained as a petroleum engineer, said that scientists have the ability to know that there can sometimes be ethical dilemmas and to think about them. "Being a scientist enables you to think through those things and not be a purist," she said, noting that DOI is responsible for the health of ecosystems, wildlife, and natural resources as well as leases for areas such as the outer continental shelf for oil and gas activities.

"How to reconcile those things? I think the answer is, you use science to understand them, and you use the most current information you can to understand what's going on," she said. She added that the use of "thoughtful regulations" is "a way to begin to reconcile those things."

By **Randy Showstack,** Staff Writer

Measurements, Modeling, and Scaling of Inland Water Gas Exchange

Advancing the Science of Gas Exchange Between Fresh Waters and the Atmosphere
Hyytiälä Forestry Field Station, Korkeakoski, Finland, 16–19 September 2014

Terrestrial inputs of carbon and nutrients, as well as within-water physical and biological processes, conspire to produce significant but highly variable emissions of greenhouse gases to the atmosphere from inland waters.

Inland waters generate significant emissions of carbon dioxide, methane, and other greenhouse gases (GHGs). Recent papers have estimated that these emissions could offset a large fraction of the terrestrial carbon sink. However, published estimates rely nearly exclusively on extrapolation of point-in-time observations made over limited regions.

To foster improvement of GHG aquatic emissions quantification and incorporation of new measurement technologies and approaches in aquatic ecology, more than 60 ecologists, limnologists, and micrometeorologists, including early-career scientists, attended an inaugural freshwater gas exchange workshop. The workshop brought together researchers studying the cutting edge of measurements and modeling of processes relevant to aquatic fluxes at research sites from the tropics to the poles. Expertise included flux measurements in lakes, streams, and wetlands; hydrodynamics; biogeochemistry, including microbial processes; and modeling.

> Greenhouse gas emissions from inland waters could offset a large fraction of the terrestrial carbon sink.

The workshop was timely because its goals tied closely to the need to define specifications for inland water GHG observations in the Global Lake Ecosystem Observatory Network (GLEON), the International Research Staff Exchange Scheme (IRSES) Greenhouse Gas Lake Project, and the Integrated Carbon Observation System (ICOS). The group agreed that networks similar to ICOS are needed in multiple regions.

Over 4 days, participants focused on the current understanding of GHG emissions, measurement and model limitations, and needs for database and synthesis development. Keynote and research talks reviewed the importance of inland systems to landscape carbon cycling; the role of stream transport of organic, inorganic, and gaseous carbon; the complexity of modeling methane mixing across sediment, in water, and in atmospheric interfaces; and the difficulties in scaling chamber and eddy covariance flux measurements from point to lake to landscape. Regional synthesis and upscaling of aquatic emissions found significant spatial and temporal variability in all components of the carbon budget, with advances made in understanding key biological and physical processes that drive this variation.

Poster presentations emphasized the importance of next-generation flux measurement and modeling techniques, including the use of over-water eddy covariance and automated flux chambers, high-resolution in-water profiling including turbulence, and improvements to one- and three-dimensional models of aquatic systems and their atmospheric exchanges. Two-day breakout sessions discussed in-water biogeochemical, physical, and microbial observations; direct flux measurement approaches, including incorporation of the dynamic atmospheric boundary layer in flux calculations; and required improvements for coupled hydrodynamic-biogeochemical models.

Two additional discussions motivated new syntheses. In one, an inland water GHG flux forum was initiated to facilitate communications and support collection of comparable data. In the other, a synthesis manuscript on eddy covariance flux tower observations of lake carbon and energy exchanges was begun. Other outcomes included identifying minimum and ideal required measurements for sites conducting over-lake flux measurement, initiating a review paper on observational and modeling needs to improve numerical models incorporating methane biogeochemistry, and synthesizing gas transfer coefficients.

Researchers interested in contributing observations or approaches to the evolving eddy covariance synthesis and the GHG flux forum should contact Malgorzata Golub (mgolub@wisc.edu) and David Bastviken (david.bastviken@liu.se).

A photo of the participants and a list of workshop organizers can be found at http://bit.ly/inlandH2Oghg.

By **Ankur Rashmikant Desai,** Department of Atmospheric and Oceanic Sciences, University of Wisconsin–Madison; email: desai@aos.wisc.edu; **Timo Vessala,** Department of Physical Sciences, University of Helsinki, Finland; and **Miitta Rantakari,** Finnish Environment Institute, Helsinki

Two- and Four-Year Colleges

Team Up to Support Science Students

By Janet Hodder, R. Heather Macdonald, and Jude K. Apple

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Much has been written about how the United States faces a shortage of science, technology, engineering, and mathematics (STEM) professionals despite the national goal to provide 1 million additional STEM degrees by 2022 [e.g., *President's Council of Advisors on Science and Technology,* 2012]. What is not immediately clear, however, are the steps educators need to take to overcome the shortage and meet that goal.

The success of several new projects suggests that 2-year colleges, community colleges, technical colleges, and junior colleges (collectively 2YCs)—a group new to the STEM reform movement—can help lead students into career pathways involving science and math [*Boggs,* 2010; *National Academy of Engineering and National Research Council*, 2012]. In turn, these projects have increased awareness among professional societies and staff at 4-year colleges and universities (4YCUs) about the importance of 2YCs in the preparation of students for STEM careers.

Some 4YCU faculty, particularly those who did not attend a 2YC as part of their education, may be unfamiliar with the culture, needs, and realities of the 2YC faculty and their students. Here we provide insights into the community colleges' missions, students, faculty, and curriculum and present specific strategies to promote successful partnerships between 2YC and 4YCU faculty and institutions. In doing so, we hope to assist the growing number of 4YCU faculty who desire to partner with 2YC faculty to improve STEM education and achieve a broader impact for their disciplinary research.

Profile of Community Colleges

1132 public and private community colleges in the United States play a crucial role in undergraduate STEM education. They enroll 12.8 million students annually, approximately 45% of all U.S. undergraduates [*American Association of Community Colleges,* 2014]. (See box on page 10.)

Nearly one half of Americans who receive bachelor's degrees in science and engineering and one third of recipients of science or engineering master's degrees attended a community college at some point in their education [*Tsapogas,* 2004]. Community colleges are also important for teacher preparation, with 40% of the nation's teachers—including those in STEM fields—completing some of their mathematics or science courses at community colleges [*Shkodriani,* 2004].

Community colleges are diverse in size and location, ranging from multicampus districts in large urban settings to small, rural colleges in remote areas. Their departmental and governance structures vary within and among states.

Teaching at a Community College

Teaching is the primary responsibility for 2YC faculty (see box on page 11), and thus their reward structure is often different from those at many 4YCUs. Generally, research in their discipline is not expected; it may even be discouraged because it could interfere with time dedicated to

teaching. Teaching loads are heavy, and 2YC faculty commonly teach four to five courses per term.

In many programs, faculty are expected to teach courses beyond the primary discipline of their academic degrees. For example, a solid Earth geophysicist may be assigned to teach introductory oceanography.

Some faculty teach during the summer, others teach night classes, and some instruct online courses, which are increasingly being taught at 2YCs. The heavy teaching load means that 2YC faculty may find it difficult to engage in activities beyond their instructional duties and to take time away from their courses to participate in professional development. Teaching assistants are almost nonexistent, and laboratory preparatory staff are uncommon; 2YC faculty are generally responsible for teaching all parts of a course.

Many community college faculty have chosen careers focused on teaching and are committed to improving learning opportunities for students. Many have considerable experience with student-centered learning, developing teaching materials, and employing pedagogical innovations. Others participate in educational research such as that associated with student assessment or effective learning strategies.

Many community college faculty may become isolated from their academic discipline and thus may not be involved in disciplinary professional societies. When available, professional development opportunities provided by 2YC institutions focus primarily on teaching and supporting student success, with less emphasis on advances in disciplinary knowledge.

The curriculum at 2YCs focuses on lower-division courses. Some 2YC STEM courses fulfill general education requirements, whereas others meet general education requirements as well as specific degree requirements of 4-year STEM programs. Other courses are specifically designed for the STEM workforce as part of a certificate or applied associate's degree.

State regulations, institutional governance, and curricular demands at individual 2YCs can restrict or limit curricular reforms and new initiatives, creating a barrier to curricular change [*Macdonald et al.,* 2011]. In many cases, the curriculum at 2YCs is constrained because of articulation agreements with 4YCUs.

Partnerships Between 2YCs and 4YCUs

Recognizing that many 2YC students later enroll at 4YCUs, faculty from both 2YCs and 4YCs are working together to instill student interest in science and math. A few joint efforts stand out.

One is the Centers for Ocean Science Education Excellence (COSEE)–Pacific Partnerships program (http://www.coseepacificpartnerships.org). COSEE has provided opportunities for 2YC faculty and students to work with ocean scientists through a series of workshops and research internships. The goals of this project are to increase the quality of ocean science instruction at 2YCs, to improve ocean literacy of both faculty and students, and to develop an increased awareness of potential STEM career pathways (see Figure 1).

In particular, the COSEE–Pacific Partnerships project seeks to move professional development for 2YC faculty beyond learning new teaching methods to updating disciplinary knowledge. Through the program, 2YC faculty work closely with geoscientists to translate current geoscience research and knowledge into course content and other approaches to engaging 2YC students in the practices of science.

Another joint effort is the Supporting and Advancing Geoscience Education in 2YCs (SAGE 2YC) project (http://serc.carleton.edu/sage2yc/index.html). SAGE 2YC has provided 2YC faculty with resources to improve their teaching and support students in their career development through geotechnician preparation programs or by preparing students for college transfer.

Several other projects bring 2YC students to 4YCUs. For example, the Community College at Sea project (http://cascadia.uoregon.edu/ccsea) at the University of Oregon provides 2YC students opportunities to participate in oceanographic research cruises [*Livelybrooks,* 2013]. Chapman University provides summer undergraduate research fellowships for selected 2YC students in Orange County, Calif., who are studying Earth and environmental sciences, with support from the U.S. National Science Foundation's Research Experiences for Undergraduates program.

How to Develop 2YC-4YCU Partnerships

From our experiences as 4YCU faculty working with 2YC STEM faculty on COSEE–Pacific Partnerships and SAGE 2YC, we have developed a broader understanding of issues to consider when developing a 2YC–4YCU partnership for education, research, or faculty professional development. Through our collective projects, we have identified five factors to consider in establishing partnerships.

Include the 2YC faculty in the initial planning of a project.

Successful partnerships include a common understanding of relationships and roles. Performance expectations should be clear, and everyone should benefit from participation. Including 2YC faculty at the beginning of a project makes them more invested in the project's success and

Heavy teaching loads mean that 2-year college faculty may find it difficult to engage in activities beyond their instructional duties

Fig. 1. Community college faculty testing underwater microphones (hydrophones) that they constructed during a Centers for Ocean Science Education Excellence (COSEE) sponsored workshop held at the Oregon Institute of Marine Biology. Credit: Janet Hodder

allows them to contribute to project planning. One perception, based on the experience of many 2YC faculty with whom we have worked, is that they are included in many projects as a token, as an afterthought, or only as a way to boost the possibility of obtaining funding.

Understand the institutional mission, policies, and the true capacity of the partner 2YC.

Some 2YCs do not have a grants office and may have limited support for administrative functions related to external funding. Timing of activities related to the proposed project may need to fit the often more constrained 2YC schedule. Some 2YC faculty will have difficulty leaving their institution during the academic year and may need to provide replacement instruction, sometimes from their own resources, because they cannot cancel classes.

Be aware of the target student's profile and the 2YC's profile.

Projects that involve students need to take into account student needs and constraints (e.g., families; jobs; barriers to moving that prevent, say, participation in off-campus internships), the assets they bring (e.g., life experiences, strong community ties), and the culture of a 2YC.

For example, in developing the COSEE Promoting Research Investigations in the Marine Environment (PRIME) internship program (http://www.coseepacificpartnerships.org/programs/CC/students/), which provides 2YC students with a summer research opportunity at a marine laboratory, we had to work with 2YC faculty to identify students who would benefit from this early-career research internship. Without faculty intervention, 2YC students rarely consider applying for summer research experiences because they do not see themselves as being qualified for these opportunities.

The more diverse nature of the 2YC student body makes it necessary for program developers to think beyond the needs of the 18- to 22-year-old student cohort. For example, projects involving, say, fieldwork may need to provide accommodations for accompanying family members or may need to connect participants with child-care options. Projects could also follow the example of AGU's Unique Research Experiences for

Two-Year College Faculty and Students (URECAS) project, which has instituted virtual poster sessions as a low-cost way for 2YC and other students to present their research at national meetings.

Collaborative projects need to reflect faculty members' individual needs.

In the SAGE 2YC project, which has both 2YC and 4YCU faculty as principal investigators (PIs), buyout from teaching for one of the 2YC PIs enabled full participation in the project during the academic year. However, not all 2YCs allow teaching buyout.

In some instances, faculty will need stipends—for transportation, registration fees, and subsistence—to attend project activities and meetings. For some adjunct faculty, the phrase "free is too expensive" resonates, highlighting the need for additional funding to support hidden costs of participation.

Projects should reflect the realities of 2YC-4YCU course articulation.

For curricular projects to work, they need to mesh with goals of 2YCs and 4YCUs. For example, the COSEE–Pacific Partnerships project completed a comprehensive assessment of curricular needs with STEM faculty from several 2YCs before planning faculty professional development activities.

The Need for More Partnerships

Four-year institutions and faculty have only just started to play a significant role in partnering with community colleges to increase the capacity of both types of institution to support undergraduate engagement in STEM. In the geosciences, we have only just begun to see if these efforts will pay off.

Qualitatively, 2YC faculty who have participated in partnership projects reported increased student learning gains and engagement in their geoscience courses, although very few studies have measured whether interest in STEM persists through the students' lives. Nonetheless, an evaluation of 2YC students who participated in the COSEE internship program supports the idea that undergraduate research attracts and retains talented students to careers in science [*Lopatto,* 2007]: Compared with the "average" community college student who transferred to a 4-year institution, the interns

Who Are Community College Students and Faculty?

Developing successful partnerships between 2-year colleges (2YCs) and 4-year colleges and universities (4YCUs) to promote science, technology, engineering, and math (STEM) requires that 4YCU faculty have a working knowledge of the 2YC students and faculty whom they hope to serve. Below are general profiles of these groups.

Students

Thirty-six percent of 2YC students are first-generation college students [*American Association of Community Colleges,* 2014], many of whom have limited knowledge of what is required for success in higher education. Open admission policies mean that some students need developmental courses to prepare for college-level work. Many 2YC students have constraints on participation in extracurricular activities because they may be place bound or juggling employment and childcare.

The open admission policy at most 2YCs results in a student body that is generally more diverse, in many measures, than that of a 4YCU. A higher percentage of minorities underrepresented in the STEM fields attend 2YCs than 4YCUs. Nationally, 59% of Native American, 56% of Hispanic, and 48% of black undergraduates are enrolled in 2YCs.

The average 2YC student is a 28-year-old woman in a class that is 57% female; she is attending college part time, along with 60% of her classmates, and is working full or part time, along with 68% of her fellow students. Her tuition is considerably lower than that at most 4-year institutions, and she, along with 58% of her classmates, is receiving some type of financial aid [*American Association of Community Colleges,* 2014].

The average 2YC student, along with many of her classmates, is unlikely to be thinking of a career in the geosciences. In 2010, only 20% of all U.S. bachelor's degrees were awarded to underrepresented minorities, and fewer than 7% of bachelor's degrees in geoscience were awarded to underrepresented minorities (see raw National Center for Education Statistics data, https://webcaspar.nsf.gov/). Of all of the STEM fields, the geosciences remains some of the least diverse.

demonstrated a high persistence and success in STEM postsecondary education.

The most transformative projects will likely be those that specifically offer professional development for 2YC faculty, improve STEM education of 2YC students, provide research opportunities for 2YC faculty and students, and increase 2YC student transfer success rates to 4YCUs. More projects that focus on 2YC faculty and students should provide us with information on successful strategies for broadening the diversity of the geoscience workforce and recruiting more students into STEM careers.

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Faculty

One distinctive feature of 2YCs is the makeup of the faculty. Nationally, 68% of faculty members in the 976 public community colleges in the United States are part time [*Knapp et al.,* 2012].

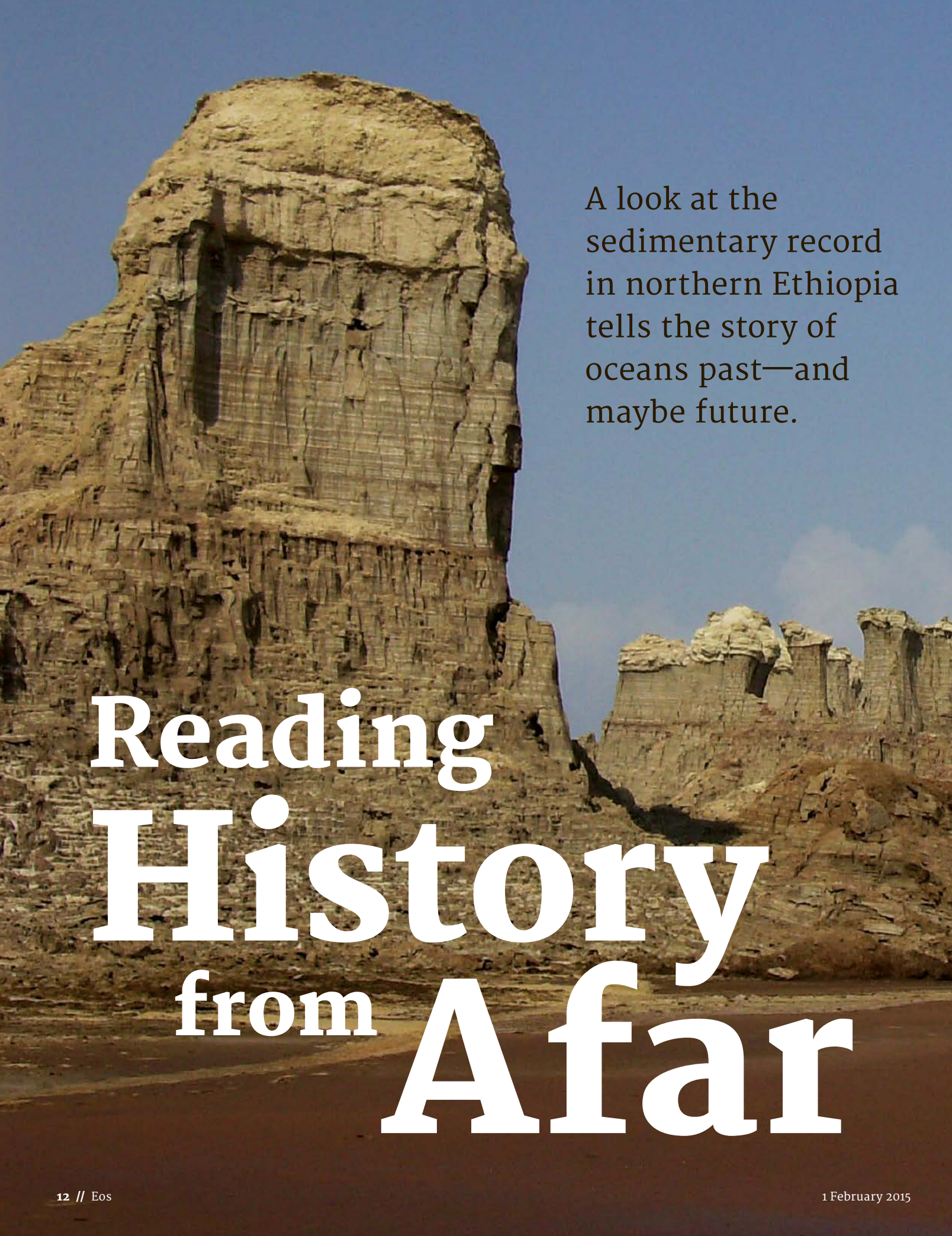
From 2003 to 2009, the number of part-time faculty increased by about 10%, whereas the number of full-time faculty grew by only 2% [*Knapp et al.,* 2010]. The number of permanent full-time faculty who teach STEM subjects at 2YCs varies by institution. Some are tenured or tenure eligible; however, some states (e.g., Texas) have no tenure system, and permanent, full-time faculty are employed on multiyear contracts.

Faculty titles at 2YCs are not always consistent with those at 4YCUs. Although some systems have assistant, associate, and full professors, others use terms such as "lecturer" for full-time permanent faculty. In STEM fields, 22% of full-time 2YC faculty have doctorates and 62% have master's degrees, compared with 12% and 51% of part-time faculty, respectively [*American Association of Community Colleges,* 2014].

Some faculty members at 2YCs are nonacademic professionals who teach specialized courses associated with certificate or applied associate degree programs. At many institutions, adjunct or contingent faculty who are commonly employed on a year-to-year or term-to-term basis do the majority of the teaching.

These full-time or part-time adjunct faculty members are diverse and include graduate students who want to gain teaching experience, people attempting to secure permanent positions in academia who may teach several courses each term at multiple institutions, and people with specific technical knowledge who teach a single course at one institution. Some 2YC faculty members, whether by choice or circumstances, spend their entire career in adjunct positions.

One notable feature of having regular and adjunct faculty is the disparity in pay and benefits between the two. Many adjuncts are paid by the course. The median pay for a three-credit course taught by a 2YC adjunct faculty member in fall 2010 was US$2235 [*Coalition on the Academic Workforce,* 2012]. In addition, adjuncts do not typically have access to professional development opportunities or discretionary funds, rarely participate in institutional governance, and may not even be listed on the college website.



A look at the sedimentary record in northern Ethiopia tells the story of oceans past—and maybe future.

Reading History from Afar

The Afar Triangle in northern Ethiopia is one of the harshest, most remote environments on Earth. This tectonically active area contains a record of continents breaking apart; episodes of seas flooding the continent; and the remains of coral reefs, microbial mats, and other saltwater deposits as seas periodically desiccated into brine pools and dry land.

Past investigations have uncovered evidence that this region might become the youngest ocean on Earth. Understanding the sedimentary records in this region may hold clues to the future floodingand carbonate formation in extreme environments.

In October 2013, scientists from Addis Ababa University (Ethiopia), the University of Fribourg (Switzerland), and Ghent University (Belgium) teamed up to learn more about the history of the Danakil Depression in the northern part of the Afar Triangle. Specifically, the team examined sediments, including ancient fringing coral reef terraces and fossilized microbial mats that were covered by brine deposits (evaporites) formed from evaporating oceans and lakes. Since then, the team has worked to examine and understand this sequence of sedimentary rocks and the past environments that formed them.

To the team's knowledge, this is the first revisiting of northern Afar's carbonate deposits in almost half a century. As a result of this expedition, the Afar Carbonate Research Consortium was formed as a platform for further research on the sediments in the region. An important follow-on field expedition began in late January 2015.

Afar: A Geological Laboratory

The Danakil Depression is bordered to the west by the Ethiopian Plateau and to the east by the Danakil Horst, a raised block of land bounded by normal faults. In the depression's southern part lies the famous Erta Ale range, which contains one of the only lava lakes in the world.

The depression features the remote Dallol Basin—one of the lowest land elevations on Earth,

By Balemwal Atnafu, Tesfaye Kidane, Anneleen Foubert, David Jaramillo-Vogel, Jean-Charles Schaegis, and Jean-Pierre Henriet

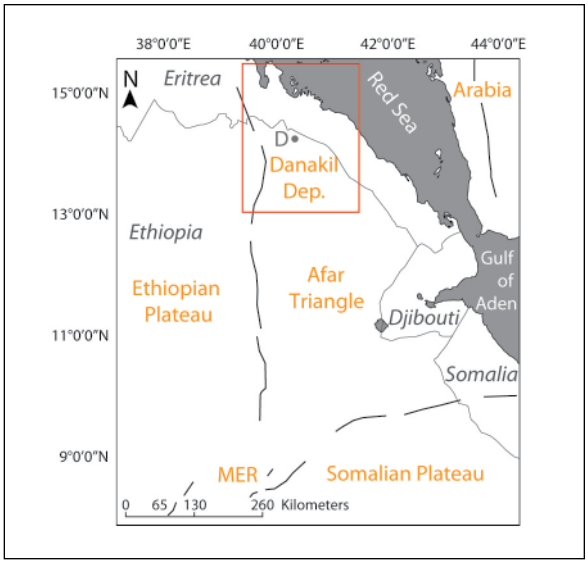


*Fig. 1. Location of the study area. MER, Main Ethiopian Rift; D, Dallol region. Black lines represent escarpment bouaries [*Keir et al., *2013].*

130 meters below sea level (see Figure 1). The basin also has year-round temperatures that are among the hottest on the planet. The remnants of a volcanic caldera, Dallol is dotted with hot springs that bubble with brine, as well as geysers, mounds of sulfur, salt pillars, and acid pools.

In the 1960s and 1970s, potash mining operations and coordinated studies of France's Centre National de la Recherche Scientifique and Italy's Consiglio Nazionale delle Ricerche preliminarily mapped the sedimentary characteristics of the Danakil Depression [*Holwerda and Hutchinson*, 1968; *Bannert et al.*, 1971; *Barberi et al.*, 1972]. Since then, geoscience research has largely focused on tectonics, volcanology, and geophysics rather than analytical studies of the basin that integrate tectonics and sedimentation.

This focus on earthquakes and volcanoes is not surprising: Afar is one of the only locations on Earth where rifting at the bottom of an early ocean is creeping up onto land. Ever since the early days of the continental drift theory, geologists have used the Afar Triangle as a field laboratory where the onset of continental and, potentially, oceanic rifting could be studied in detail.

Previous research has pieced together a rough history of this rifting. About 30 million years ago, lava oozed out of cracks in the Earth, blanketing the land and heralding the breakup between Arabia and Africa [e.g., *Baker et al.*, 1972]. After an initial breakup phase, continued rifting in the triangle formed several basins that later closed up and became filled with sediments.

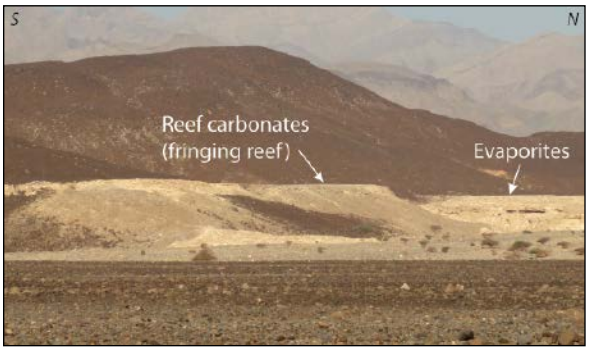
The faults, volcanoes, and magma dikes in the northern part of the triangle run parallel to the regional tectonic trend of the Red Sea [*Varet and Gasse,* 1978; *Wright et al.*, 2006; *Ayele et al.*, 2007]. They also contain a record of magnetic anomalies similar to those observed along oceanic spreading ridges [*Bridges et al.*, 2012]. Geoscientists project that the region is on its way to becoming the youngest ocean on Earth.

Records of Early and Episodic Marine Flooding

Analysis of sedimentary samples collected during the 2013 field study suggests that the Dallol area was covered by the Red Sea during some time in the past few hundreds of thousands of years. As seawater repeatedly flooded the region, diverse carbonate-rich units were deposited along the edges of the Danakil Depression, covering volcanic rocks below. In the center of the basin are 1000-meter-thick successive evaporite sequences, testimony to the constant evaporation and desiccation of brine pools.

Specifically, the team studied intergrowths of coral and algae called coralgal reefs, relics of the periods when the region was covered by the open Red Sea. Other layers rich in evaporites, microbial reef deposits, and hot spring carbonates show that the same region was covered by hypersaline lakes (brine pools) at different time periods (see Figure 2). Between the coralgal and microbial reefs, shell deposits of only one species of bivalve and one species of gastropod were found, signs that this region alternated between periods of restricted and open marine conditions.

The marine deposits studied by the team consist of at least four superimposed coralgal units. The team found evidence of periods when fringing reefs formed (see Figure 3), separated by eroded layers, suggesting long episodes when no new deposition occurred and possible exposure to the air. Extensive evaporate deposits interspersed between reef carbonates provide further evidence that the oceans periodically dried up in this region.



Fribourg University

Fig. 2. Fringing coralgal reef deposits overlain by evaporites.

Preceding page: Pillars made of alternating layers of salt and thin films of clay represent deposition of salt from brine pools. Individual salt layers likely represent an annual cycle of evaporation. Samples from these and other sediments help scientists understand the history of the Dallol Basin. Photo by Achilli Family, CC BY 2.0, http://bit.ly/DallolSalt

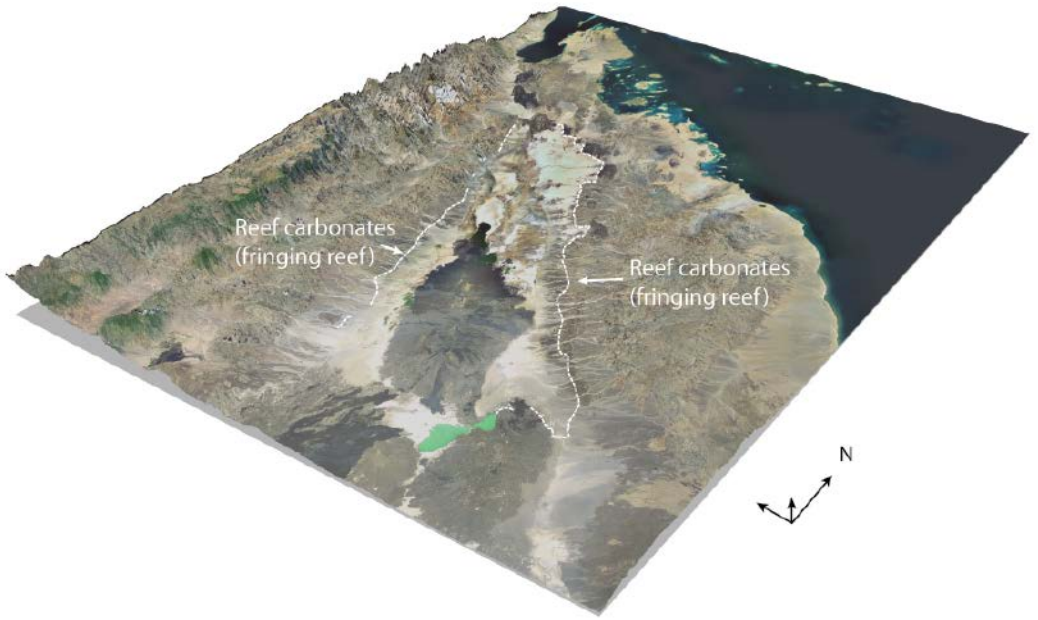


Fig. 3. Satellite image of the Danakil Depression superimposed on a digital elevation model. Credit: ASTER GDEM ©METI and NASA Landsat 7 & Landsat ETM+.

Future Studies

Previous dating studies based on carbon-14 ($\delta^{14}C$) and isotopic ratios of uranium and thorium ($^{230}Th/^{234}U$) of corals and bivalves from the study area suggested that these fossils are between 230,000 and 24,000 years old [*Lalou et al.*, 1970; *Bonatti et al.*, 1971; *Bannert et al.*, 1971]. New radioisotopic age determination results will help constrain the timing of the alternation between restricted and open marine conditions at higher resolutions and will link this record to relative sea level changes.

In addition, microbial mat deposits—small stromatolites and thrombolites—have been found not only in reef slope environments and in coralgal reef cavities but also at the margins of ancient and more recent hypersaline lakes. Hot spring carbonates rimming the lake and brine pool deposits suggest that hydrothermal activity influenced the region during the closure of the depression. Studying these well-exposed microbial deposits will allow the team to better understand how microbial processes mediated carbonate precipitation in both open marine and hypersaline settings.

Integration of field data with geophysical observations will provide a basin-wide understanding of how environmental fluctuations influenced the deposition of sediments and how these sediments were influenced by tectonic and magmatic events.

Acknowledgments

We thank the University of Fribourg, Ghent University, and the European Science Foundation's Coldwater Carbonate Reservoir Systems in Deep Environments–European Research Network (COCARDE-ERN; http://www.cocarde.eu) for their support. We also thank Addis Ababa University's School of Earth Sciences for facilitating the fieldwork.

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Awardees and Prize Winner Honored at 2014 AGU Fall Meeting

Katharine Hayhoe Receives 2014 Climate Communication Prize

Katharine Hayhoe was awarded the 2014 Climate Communication Prize at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The Climate Communication Prize is funded by Nature's Own, a purveyor of fossils, minerals, and handcrafted jewelry in Boulder, Colo. The prize honors an AGU member-scientist for highlighting the importance of promoting science literacy, clarity of message, and efforts to foster respect and understanding of science-based values as they relate to the implications of climate change.

Katharine Hayhoe

Citation

Katharine Hayhoe is unique among her generation of scientists. She combines incredible scientific productivity with an ability to connect with the people who most benefit from a better understanding of climate science, whether they be fellow scientists, public office holders, or members of the public.

Katharine has worked with scientists outside the climate community to deliver and translate model data they could use to draw meaningful conclusions about local climate change impacts. She has pioneered methods for downscaling climate models and has found ways to apply them to climate assessments. She has demonstrated leadership in conducting widely cited climate assessments and changing, for the better, the way such assessments are done. For example, in 2008 she and Don Wuebbles took leadership roles in assessments for the city of Chicago and the Great Lakes; she has also been a leader in assessments for the Northeast, California, and the Southeast. Her leadership carried through to the U.S. National Climate Assessment, where she has served as a highly motivated member of the author teams of the 2009 and 2014 national assessments. In recognition of her contributions, she was asked by the U.S. Department of the Interior to prepare a primer on climate downscaling for use by the department's Climate Science Centers and related interests.

Katharine has also volunteered her services as a "scientist on call" for AGU's question-and-answer service and is a member of the organization's Publicity Committee. She has demonstrated leadership in public outreach at local town halls, at churches, at universities, and at corporations, plus she has given her time to countless newspaper, radio, and television interviews.

She is a communicator who intuitively understands how to connect with audiences on the basis of their perspectives and who accurately conveys her expertise to them. She has done incredible outreach to fellow evangelicals and helped convey climate science through shared community values. Her book *A Climate for Change: Global Warming Facts for Faith-Based Decisions* has had a large impact on the Christian community. Her widely viewed interview on *NOVA* for PBS provided powerful insights into the life of a scientist who also is an inspirational woman of faith.

Her willingness to experiment and innovate in science and in communicating science, her commitment to making science relevant to decision makers and the public, and her infectious positivity and passion make Katharine Hayhoe a most deserving recipient of the AGU Climate Communication Prize.

—John E. Walsh, *University of Alaska Fairbanks, Fairbanks*

—Donald J. Wuebbles, *University of Illinois at Urbana-Champaign, Urbana*

Response

I am honored to receive the AGU Climate Communication Prize and, even more, to have the opportunity to walk in the footsteps of the outstanding scientists and communicators who have preceded me. Thank you to AGU, to my colleagues who nominated me, and to Nature's Own for this recognition.

Scientists are on the forefront of documenting global change. We are the ones who measure the impacts human activities are having on our planet. We analyze the data, we run the models, and we draw the conclusions. As such, I believe we have a responsibility: to tell people about what we find.

The sad reality of our world, however, is that climate change is now the most politically polarizing issue in the United States. Credible sources—scientists who understand the problem and can connect climate change to our values and the things we care about—present a real and dangerous threat to those who would maintain the status quo and deny the reality of climate change. Because of that, any outreach or communication we choose to do may come with a hefty price tag. If we are going to stick our heads out of our ivory towers, we have to be willing to give up our rights to be judged fairly and not misunderstood. We can't control what others say of us; we can only be true to who we are, and to the truth we have been given.

That's why it encourages me and fills me with pride when I see how we, as a community, are stepping up to this challenge. Everywhere I go, I hear colleagues discussing effective outreach strategies. New efforts such as University Corporation for Atmospheric Research (UCAR) Climate Voices science speakers network are flourishing. Workshops and webinars offering communication training fill up and overflow. Scientists understand, better than anyone, the magnitude of the problem that confronts us, and we are taking seriously our responsibility to share this information with all affected.

So on behalf of every scientist who has ever visited the grade school down the road, sat down for a long chat with a local news reporter, or given a series of talks at the senior citizen's home, thank you, AGU and Nature's Own, for recognizing and appreciating what we do.

—Katharine Hayhoe, *Texas Tech University, Lubbock*

Asrar, Hsieh, Mandia, Overland, and Wysession Receive 2014 Ambassador Awards

Ghassem R. Asrar, Paul A. Hsieh, Scott Mandia, James E. Overland, and Michael E. Wysession were awarded the 2014 Ambassador Awards at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award is in recognition of "outstanding contributions to the following area(s): societal impact, service to the Earth and space community, scientific leadership, and promotion of talent/career pool."

Ghassem R. Asrar

Citation for Ghassem R. Asrar

For more than 20 years, Ghassem Asrar has been a distinguished public servant to the Earth and space community of the highest degree. As chief scientist for the Earth Observing System (EOS) at NASA from 1992 to 1998, Ghassem developed a communication and outreach strategy promoting the EOS program to the public, the U.S. Congress, and international scientific organizations that still exists today. From 1998 to 2004, he served as associate administrator for NASA's Office of Earth Science. In this capacity he had overall scientific, technical, programmatic, and organization management responsibility for Earth science, with an annual budget greater than $1.5 billion. During this period, the program developed and successfully launched 15 Earth observing satellites and developed a comprehensive, multidisciplinary data and information system (EOSDIS) that enabled the use of data from these satellites by more than two million users. Ghassem's last tour of government service was as deputy administrator for the Agricultural Research Service of the U.S. Department of Agriculture from 2006 to 2008, where he was responsible for management and oversight of a $250 million portfolio of environment and natural resources research projects located at numerous laboratories throughout the United States.

One of the hallmarks of Ghassem Asrar's scientific leadership has been his commitment to interdisciplinary and international science. During his time as director of the World Climate Research Programme (WCRP), the number of nations participating in the program and their financial and in-kind contributions for WCRP activities increased. For example, for the first time in the 30-year history of the WCRP, an Open Science Conference was held in October 2011 in Denver, Colo., and attracted 2000 scientists from around the world, including 530 early career-scientists, more than 300 of whom were from developing nations and regions. Another attribute of Ghassem's impact on many fields has been his devotion to the next generation of Earth scientists. While at NASA, he established the NASA Earth System Science Graduate Student Fellowship program to attract students with strong math, physics, and basic sciences backgrounds to focus their Ph.D. research and training on the emerging interdisciplinary field of Earth system

science. NASA has awarded a total of 150 fellowships each year, the legacy of which has been the successful graduation of several thousands of Ph.D. and postdoctoral students who are now serving as the advisors and mentors of future generations of applicants and recipients.

In summary, Ghassem Asrar's leadership and service to the present and future generations of Earth scientists truly embody the spirit of the AGU Ambassador Award.

—Antonio J. Busalacchi, *University of Maryland, College Park*

Response

I am honored to be among the first recipients of the newly established AGU Ambassador Award.

I consider myself very fortunate to have had great opportunities to contribute to the field of Earth system science as a researcher, educator, science manager, and senior administrator. These opportunities allowed me to contribute in a variety of ways during the past 30 years. Reflecting on those years, I can confess that none of it had been planned the way they came along, not on my part! Even my first postdoctoral appointment in 1985 came about through a surprise invitation letter when I was completing and defending my Ph.D. dissertation. It was this opportunity that shaped my professional career during ensuing decade(s). One major common contributor was NASA, which sponsored my postdoctoral appointment, hosted me as a visiting senior scientist through the California Institute of Technology/Jet Propulsion Laboratory, and ultimately accepted me as one of its own. Combined together, these posts shaped more than 2 decades of my career. As such, I will always have a soft spot for NASA and its mission in my heart.

I can think of many fond memories and proud moments, such as being a part of the international science teams promoting interdisciplinary and coordinated field experiments in the 1980s and 1990s, a member of the international team formulating the international Earth observing system program with NASA's Earth Observing System as a major component, and a member of the U.S. national science teams for developing the U.S. Space Exploration and Energy Independence initiatives. The one role that I cherish most is my contribution to the NASA education programs such as the Earth system science fellowship, New Investigators program, and National Earth System Science curriculum and education standards. They have enabled training and development of current and future generations of Earth system scientists, globally. Without intellectual leaders sponsored by these programs, we could neither utilize effectively the current Earth observing system nor dream of the future generation of such systems.

I thank AGU for bestowing on me the Ambassador Award for my modest contribution to the field of Earth system science. I share this recognition and my gratitude with those who helped shape my career. I could succeed because of their support for me, and it is my great pleasure to accept this prestigious award. Thank you.

—Ghassem R. Asrar, *Joint Global Change Research Institute, Pacific Northwest National Laboratory, College Park, Md.*

Paul A. Hsieh

Citation for Paul A. Hsieh

Paul Hsieh famously played a key role in resolving the disastrous 2010 blowout of the Macondo well in the Gulf of Mexico. Many news accounts of Paul's role in capping the well can be found simply by an internet search on the phrase "Paul Hsieh hero."

Paul's success during the Macondo incident is no surprise. Rather, it is part of a career-long pattern of developing and applying fundamental scientific principles to resolve important societal issues.

Paul is a world leader in two complementary research areas: (1) the hydrology of fractured rocks and (2) the coupling between fluid flow, stress, and deformation. Perhaps more significant in the context of this award is how Paul has parlayed that expertise in terms of societal impact and service to the Earth science community.

The U.S. Geological Survey has a large program of cooperative studies in which state and local government entities help fund hydrologic investigations. Paul is part of the relatively small cadre of research scientists who assist this operational program on important and intractable problems. For instance, Paul led the successful completion of a sole-source aquifer model spanning the Washington-Idaho border. The responsible state agencies were initially wary of each other, but Paul quickly developed working relationships, and under his leadership the team produced timely and well-received results. This and many similar examples highlight Paul's ability to formulate solutions to hydrologic problems and bring all parties to the table. To facilitate such efforts, Paul has created open-source software for visualization of model results—tools that have considerably advanced the degree to which modelers can gain insight from simulations and effectively communicate results.

Paul's stature in the field of fractured-rock hydrogeology led to service on three National Research Council committees, including the Panel on Conceptual Models of Flow and Transport in the Fractured Vadose Zone. This committee, which Paul chaired, was particularly important. Water collected at Yucca Mountain showed that bomb blast isotopes had penetrated deep into the unsaturated zone. This unexpected observation required leading scientists to critique existing theory and explore alternatives. At the time the site was approved, the future of Yucca Mountain as a viable nuclear waste repository depended on understanding this phenomenon.

This background illustrates Paul A. Hsieh's career-long pattern of developing and applying fundamental science to resolve important societal issues. Paul is a zealous and unselfish collaborator, motivated entirely by the goal of achieving high-quality science, and an exemplary recipient for the inaugural Ambassador Award.

—Steve Ingebritsen, *U.S. Geological Survey, Menlo Park, Calif.*

Response

Thank you, Steve, for nominating me, and thank you to my colleagues who wrote letters to support the nomination. I am deeply grateful to AGU for selecting me as one of the five recipients of the Ambassador Award. In today's world in which human impacts are manifested on a global scale, it is highly fitting for AGU to emphasize the role of science in addressing societal issues, not only for today but also for future generations.

As an undergraduate at Princeton in the 1970s, I was drawn to hydrologic science through the classes taught by George Pinder and William Gray. Their pioneering work on computer modeling in hydrology instantly captured my fascination. Shortly thereafter, I had the good fortune of being hired by John Bredehoeft to work at the U.S. Geological Survey (USGS). Under John's guidance, I learned how to transform difficult questions into tractable problems—a process elegantly demonstrated in many of John's papers. During graduate school at the University of Arizona, I learned from my advisor, Shlomo Neuman, the importance of understanding fundamental theory and not simply learning methods and procedures. It is through such fundamental understanding that one is able to expand beyond one's own area of study to collaborate with others in related fields. To my mentors who invested time and energy in my education and growth, I am truly grateful.

I consider USGS my professional family. It is a joy to be among peers who are totally dedicated to their work. During my career, I have been allowed the opportunity to pursue different areas of work, from groundwater contamination to induced seismicity. Such diversity of work has greatly contributed to my career growth. I am thankful to be part of an organization that recognizes its employees as its most valuable assets.

My participation in the response to the Deepwater Horizon oil spill was a career highlight. It was a privilege to serve on the government science team, led by then secretary of energy Steven Chu. In my opinion, it was Dr. Chu's deep understanding of science and his wisdom in balancing risks and benefits that led us through the environmental crisis. It was a great example of the importance of science in decision making. Yet even the best scientists today must suffer the slings and arrows of a politicized society, a situation to which climate scientists, for example, are no strangers. And so we must continue to strive for rigor and openness in our work.

—Paul A. Hsieh, *U.S. Geological Survey, Menlo Park, Calif.*

Scott Mandia

Citation for Scott Mandia

Scott Mandia is helping the Earth science community deal with problems we never expected.

In 2009, scientists at leading research institutions had their emails stolen, mischaracterized, and plastered across the global media. Scientists were shocked that misinformation about their research could spread so rapidly.

Scott Mandia, along with two other researchers, decided to help. They formed the Climate Science Rapid Response Team to proactively address misinformation about climate research and assist scientists in accurately communicating their research to the public and the media. Their volunteer effort now includes more than 200 climate researchers who regularly communicate with journalists and provide assistance to nongovernmental organizations that are active on climate issues.

Mandia's work has helped many early- and mid-career scientists take on more ambitious public outreach opportunities, and many members of the rapid response team have grown as communicators in the past several years.

Of course, attacks on climate scientists didn't stop. In many ways, they got worse. In several cases, advocacy groups and politicians sued scientists in court and falsely accused them of faking their climate research. At the time, the Earth science community was not prepared to respond to these unprecedented legal assaults. Mandia stepped into the breach again and worked with documentary film maker Joshua Wolfe and Public Employees for Environmental Responsibility to create the Climate Science Legal Defense Fund (CSLDF), which now provides regular legal assistance to researchers.

The group has been a saving grace to the many scientists who have faced invasive document requests and other burdensome legal attacks. At the same time, the group's assistance has had a positive ripple effect in the scientific community. Other researchers can publicly communicate about their work secure in the knowledge that if they are attacked by advocacy groups or politicians, they can get the help they need.

Mandia's drive and enthusiasm are infectious. He approaches his work with the Earth science community seriously and with good cheer. His willingness to step up and provide valuable, necessary services to Earth scientists makes him an excellent inaugural recipient of AGU's Ambassador Award.

—Michael E. Mann, *Pennsylvania State University, University Park*

Response

I am honored to have been chosen to receive one of AGU's inaugural Ambassador Awards. I accept on behalf of the many people who helped make this possible. Deepest thanks to Dr. Michael Mann for coordinating the nomination process and to the others who wrote supporting letters. Thank you to the AGU awards committee members for considering my nomination worthy of this award. Your time is greatly appreciated.

Thank you to Drs. John Abraham and Ray Weymann for founding the Climate Science Rapid Response Team with me in 2010 and to Drs. Michael Ashley and Jan Dash for helping to manage the team over the past few years. Thank you to the climate scientists who joined the team. Your willingness to be "on call" for journalists and policy makers has provided them with critical, rapid, and cutting edge science information. Deepest thanks to Aaron Huertas (Union of Concerned Scientists) and to Susan Joy Hassol and Dr. Richard Somerville (climatecommunication.org) for providing science communication workshops for our team members. Because of the work of these two groups, many of our team members have become superb science communicators. The combination of our experts' willingness to reach out coupled with their advanced communication skills has moved forward the public dial of understanding of climate science.

Unfortunately, some groups and individuals have found climate science research inconvenient to their worldview and have used Freedom of Information Act (FOIA) laws to harass our experts and thus stifle the scientific endeavor. In January 2012, I cofounded the Climate Science Legal Defense Fund along with Joshua Wolfe to respond to this unfortunate reality. The Climate Science Legal Defense Fund serves to assist scientists when they face legal attacks as well as to educate them about their rights and best practices to avoid such attacks. I wish to thank Jeff Ruch and his staff at PEER for agreeing to become our fiscal sponsor and for always being there when scientists contacted our service in need of legal advice. Many thanks to Joshua Wolfe for being a huge part of the growth and success of the Climate Science Legal Defense Fund, even though you prefer to remain behind the scenes.

Finally, I wish to thank my wonderful wife, Kelly, who has steadfastly supported all of my climate science–related activities. You understand how important these activities are to me and to others, and for that, I am truly grateful.

—Scott Mandia, *Suffolk County Community College, Selden, N.Y.*

James E. Overland

Citation for James E. Overland

It is my great pleasure and honor to give the citation for the 2014 AGU Ambassador awardee Dr. James E. Overland. Jim's contributions to raising public awareness and fostering collaborative, interdisciplinary research on Arctic change and ecosystem responses are tremendous.

Jim's tireless work includes publishing more than 200 peer-reviewed scientific papers, book chapters, and reports; giving presentations at scientific meetings and local community gatherings; convening meeting sessions; organizing workshops; and forming working groups to address important issues related to Arctic climate change and its impact on fisheries and components of ecosystems. He communicates the significance of scientific findings to policy makers, fisheries managers, environmental agencies, biologists, and the public. Jim is a leading force to push Arctic research to the forefront. He shows great foresight in Arctic research and supports young scientists by serving as a Ph.D. committee member around the world.

Jim has brought communities of scientists from different disciplines together to work as a cohesive unit. Because changes in the Arctic environment are multivariate and data sources are scattered, Jim envisioned a single interdisciplinary portal of information to contain key indicators of the Arctic environmental system. His goal was to make the information easily accessible to scientists, teachers, students, decision makers, and the general public. Jim founded the State of the Arctic Report in 2006, which later became the Arctic Report Card, a yearly assessment of the Arctic's physical, chemical, and biological systems and how they are changing. He continues to serves as an editor of the Arctic Report Card, which in 2013 featured 18 essays authored by a team of 147 researchers from 14 countries.

In 2008, Jim organized scientists to create a Web-based forum/summary called the Sea Ice Outlook (SIO) with the purpose of providing the scientific community, stakeholders, and the public the best available information on the evolution of Arctic sea ice. In 2013, 23 groups of experts provided their predictions on the basis of model and/or empirical analyses.

Because of his profound knowledge of Arctic climate change and his insight into studies of climate change–related issues, Jim was chosen to represent the United States as a lead author of chapter 10 in the Intergovernmental Panel on Climate Change's Fifth Assessment Report. Jim has responded to requests to provide climate projections for evaluating endangered species and has contributed to U.S. and international Arctic change assessments.

Jim is a true ambassador in the Arctic research community.

—Muyin Wang, *University of Washington, Seattle*

Response

I am honored to be considered for the AGU Ambassador Award as a larger recognition of how the Arctic science community has cooperated and communicated the importance of ongoing rapid changes in the Arctic over the last decades. For me, it starts with the professional values promoted by National Oceanic and Atmospheric Administration leaders to provide credible scientific information backed by peer review publications. It has included working with other editors on the Arctic Report Card, a yearly update of multiple changes that now includes more than 100 contributors, and Sea Ice Outlook, a website to discuss the causes of rapid summer sea ice loss that has matured to a larger activity in the last 2 years. A challenge was working with biological scientist colleagues on Endangered Species Act listings for polar bears and various ice seals; here one compared climate change projections with potential impacts based on different life histories. With Arctic temperatures rising 2–3 times faster than the global value and many Arctic "surprises," it has been necessary for the community to come together during symposia and workshops to understand the mechanisms for this "Arctic amplification" as an indicator of global change and local impacts. Such efforts are seen by the many Arctic-related sessions at the current AGU meeting. International support for integration activities is through the International Arctic Science Committee (IASC), Arctic Monitoring and Assessment Program (AMAP), and various World Meteorological Organization activities. Achieving synthesis and consensus is not always easy or possible, as with any rapidly evolving science activity. The Intergovernmental Panel on Climate Change report dealt with differences between data and models on future timing of sea ice loss, and the community is currently debating the extent of larger hemispheric impacts of Arctic change. I appreciate the many colleagues whom I have had the pleasure to collaborate with over the years.

—James E. Overland, *Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration, Seattle, Wash.*

Michael E. Wysession

Citation for Michael E. Wysession

Michael Wysession is one of the world's leading geoscience educators. Most notably, he chaired the writing of national standards requiring, for the first time, that high school and middle school students complete a year of modern, quantitative, data-based Earth and space science.

Wysession is an excellent researcher, who has made and continues to make important contributions using seismology to study deep Earth structure. He has done even more as an educator, showing that it is not "those who can't, teach" but "those who understand, teach." Rather than avoid or dumb down complicated concepts, he thoughtfully and clearly explains them.

His interest was already apparent in grad school. While doing a fine thesis, he asked to coauthor the seismology text I was writing. I declined, feeling that he should focus on research until getting tenure. After he had gained tenure, we agreed that the book was largely com-

pleted, so he should get 10% of the royalties. Because many figures in texts are schematic, a key goal was to ensure that ray paths and travel times were computed to be correct. Michael produced superb figures explaining the complicated paths and travel times for core phases and clearly discussed their use. He also produced the beautiful cover comparing ray paths and wave fronts in the Earth, which explains their relation, which baffles most students. Michael put much of the book online (a new concept in 2002!) via a widely used website. When all was done, we agreed that Michael deserved 30% of the royalties since he did 3 times more than expected!

Wysession made an equal contribution by developing sophisticated animations showing how seismic waves propagate that give enormously more insight than the ray paths alone. When he presented these at an AGU Fall Meeting as a video, the poster session was crowded with students and senior scientists, who watched the animations repeatedly, gaining new insights into topics such as core-diffracted waves. Michael enthusiastically disseminated the animations on video and on the Web. They are now such a fixture of classes ranging from introductory to advanced worldwide that I cannot imagine teaching seismology without them.

He went on to become a leader in geoscience education, coauthoring more than 20 textbooks at elementary, middle school, and high school levels and authoring video courses on *How the Earth Works* (35,000 copies sold) and *The World's Greatest Geologic Wonders* (15,000 copies sold). He has also taken leading roles in the Incorporated Research Institutions for Seismology and other community activities.

—Seth Stein, *Northwestern University, Evanston, Ill.*

Response

I am honored to be one of the first recipients of the AGU Ambassador Award. Science education, literacy, and outreach are extremely important, and I am very pleased that AGU has decided to recognize these kinds of efforts with a new award. I was also greatly honored to be primarily responsible for the construction of the Earth and space science component of the new national K–12 Next Generation Science Standards, both at the National Academy (for the writing of *Framework for K–12 Science Education*) and at Achieve (for the writing of the actual standards). We are at a momentous point in the history of American education. Geoscience finally broke through the 120-year-old barrier and joined biology, chemistry, and physics as a science worthy of every student's high school education. The university presidents who wrote the influential 1893 Committee of Ten report [where (1) 3 years of high school science were codified as being biology, chemistry, and physics; (2) "physical geography" was delegated to middle school; and (3) space science was omitted from secondary education altogether] could scarcely have foreseen the catastrophic impacts of their document in creating an American public ignorant of the critical geoscience-related issues of energy and mineral resources, water availability, natural hazards, climate change and its consequences, and the increasing environmental impacts of human activities. No more. The 2013 Next Generation Science Standards (NGSS), already adopted by more than a dozen states and countless other school districts (with many more in process), recommend that high school science education consist of a year of life science, a year of physical science (a semester each of chemistry and physics), and a year of geoscience. The same would hold for middle school. NGSS are revolutionary in other ways as well: teaching science and assessing student understanding from a practice-based approach and seamlessly incorporating engineering and technology into the science curriculum. But it is the presentation to American K–12 students of geoscience as a set of modern, complex, fascinating, systems-oriented, transdisciplinary, quantitative, data-oriented, and (most importantly) extremely human-relevant sciences that will prove to be the greatest impact of NGSS. National K–12 science textbooks and curricula are frantically being rewritten to respond to these changes. We at AGU, as a community, need to respond and do whatever we can to help this transition to an eventual geoscience-literate public. Our future funding and work force will depend upon it.

—Michael E. Wysession, *Washington University, Saint Louis, Mo.*

Daniel J. Fornari Receives 2014 Edward A. Flinn III Award

Daniel J. Fornari received the 2014 Edward A. Flinn III Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors "individuals who personify the Union's motto 'unselfish cooperation in research' through their facilitating, coordinating, and implementing activities."

Daniel J. Fornari

Citation

Anyone familiar with Daniel J. Fornari will attest to his energy, creativity, and dedication to advancing the field of marine geology. His tireless and unselfish commitment to leading and facilitating deep-sea research and the development of instrumentation for the oceanographic community makes him an ideal recipient of the Edward A. Flinn III Award. Dan is one of a rare breed of geoscientists who is capable of successfully managing people, mentoring young scientists, implementing development of new tools, facilitating expeditions, interpreting data, and generating significant and thought-provoking publications. He is energetic, imaginative, organized, and exceedingly generous in providing his time and expertise to advance oceanographic research and technology development.

Without a doubt, Dan's leadership and contributions to the ocean sciences community over the past 40 years have been exceptional. Few researchers have freely given as much time and effort for the betterment of our field. He has been a driving force behind many successful and important collaborative field programs that led to groundbreaking results in understanding seafloor volcanic and hydrothermal processes. Dan has led many of these programs and acted as a facilitator for numerous others, especially helping inexperienced and young investigators be successful with their research. Dan has a unique and highly valuable combination of skills, energy, and dedication that makes it possible for others to succeed.

Some of Dan's greatest contributions have come through leadership roles he played as a chair of the Ridge 2000 Program, as director of the Ocean Exploration Institute at the Woods Hole Oceanographic Institution (WHOI), and as the chief scientist for Deep Submergence at WHOI. The innovations he has fostered have profoundly improved the investigative capabilities of all scientists who have used University-National Oceanographic Laboratory System (UNOLS) deep submergence assets in the National Deep Submergence Facility. Much of the progress that our community has made over the past 2 decades would not have been possible without Dan's determination and efforts.

In summary, I know of few other geoscientists who have been as capable and willing to help others accomplish their research as Dan. He has exemplified a spirit of leadership and cooperation in his scientific career through fostering scientific inquiry into important problems, development of instrumentation, tireless advocacy for advancing deep submergence technology, and his mentorship of young investigators. He epitomizes the AGU motto of "unselfish cooperation in research," making him a superb recipient of this award.

—Michael R. Perfit, *University of Florida, Gainesville*

Response

I am humbled to accept this prestigious honor. My sincere thanks to AGU and to Mike Perfit, Susan Humphris, Mark Kurz, and Ken Macdonald for our scientific partnerships over the past 30-plus years, their generous citation, and nominations for the 2014 Edward A. Flinn III award.

When I began my career in 1970, on the maiden voyage of Scripps Institution of Oceanography's R/V *Melville*, I quickly realized that successful oceanographic research requires selfless cooperation and numerous and varied collaborations. The dedication and experience of ship captains and crews permit us to spend long periods at sea collecting vital data. The expertise of engineering and technical personnel at operating institutions leads to development of innovative vehicles and sensors that help resolve and record oceanographic processes. Close intellectual connections between peers and students, which often reach across disciplinary boundaries, answer research questions and instigate new lines of inquiry.

It truly takes a community to carry out successful oceanographic research. This award helps to commemorate the dedication and significant progress made by the oceanographic community that accepted me as a young student 44 years ago and that I have helped to guide over the past 3 decades.

The study of a vast array of oceanographic problems and a greater understanding of the Earth-ocean system, holistically, can significantly contribute to better stewardship of our planet. This requires an elevated national priority for funding basic research and nurturing scientific education and public outreach. Of equal importance is continued support of technical innovation to study the oceans.

It has been my privilege to work with mentors and program managers who believed not only in these ideals but [in] my contributions toward those goals. I've been blessed with colleagues who shared their love of and dedication to exploring and studying volcanic and hydrothermal processes throughout the global ocean and students who contributed to my career by stimulating new ideas or approaches to solving problems.

I could not have accomplished all I have without the loving support and patience of my family. My wife, CL, has been my guiding light and love for 45 years. My sons, Sasha and Simon, supported my work, tolerated my absences, and thought their dad was both weird and cool because he got to dive in *Alvin* and play with deep-diving robots. I thank my parents and my brother Jim for their love and support, always. My colleagues have my deepest gratitude for their trust and collaboration and my hope that their research continues to push at the frontiers of ocean science knowledge.

—Daniel J. Fornari, *Woods Hole Oceanographic Institution, Woods Hole, Mass.*

Meinrat O. Andreae Receives 2014 Waldo E. Smith Award

Meinrat O. Andreae received the 2014 Waldo E. Smith Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors an individual for "extraordinary service to geophysics."

Meinrat O. Andreae

Citation

It is a great pleasure and an honor to give the citation for the 2014 Waldo E. Smith Award to Meinrat "Andi" Andreae. Andi is director of the Max Planck Institute for Biogeochemistry in Mainz. Professor Andreae stands out because of his ability to see the big picture, to identify the major questions in science, and to propose a path to solve these key questions. This has put him in leading roles in many international scientific projects and programs and international assessment studies (Intergovernmental Panel on Climate Change, World Meteorological Organization, and many others) as a member of scoping and planning teams that have developed international scientific programs, e.g., the International Geosphere-Biosphere Programme (IGBP) core projects on atmospheric chemistry (IGAC) and on land-atmosphere interaction (iLEAPS).

His early studies showed the importance of marine biogenic sulfur emissions, in which he proposed a feedback loop between marine biota and climate, mediated through the effect of aerosols on clouds. This work structured the critical links with feedbacks between climate and natural biogeochemistry cycles in marine ecosystems and, more recently, also in terrestrial ecosystems. He has also done extensive work on global biomass burning, coordinating the Biomass Burning Experiment (BIBEX) under the International Global Atmospheric Chemistry (IGAC) project.

His investigations on the interactions of atmospheric composition with climate, land use, and the water cycle influenced IGBP to do a higher level of science integration, initiating the Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS). Under Andreae's leadership, the studies on aerosol-cloud interactions led to the iLEAPS–IGAC–Global Energy and Water Cycle Experiment (GEWEX) project on aerosol-cloud-precipitation-climate interactions, a critical issue today.

Andreae was instrumental in setting up collaborations between scientists from developed countries and colleagues in developing countries in Africa, South America, and Asia. His extensive long-term collaboration with Brazil, where he was one of the initiators of the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), was honored by his becoming a member of the Brazilian Academy of Sciences. Andreae is also the central scientist in the Amazon Tall Tower Observatory project, the first tall tower laboratory in any tropical region.

Andreae has been and still is an extremely productive scientist, with more than 430 published papers and more than 28,000 citations, giving him an h index of 81. Furthermore, Andi's personal character is also important; he is always ready to help and to guide undergraduate students, technicians, and colleagues from around the world. In Amazonia, he helped build up a full generation of young scientists during his participation in LBA over the last 15 years.

Andi Andreae's achievements in geoscience communication are truly outstanding, and I congratulate him on this well-deserved AGU honor.

—Paulo Artaxo, *University of São Paulo, Sao Paulo, Brazil*

Response

Thank you very much, Paulo, for those kind words. I'd also like to thank AGU's Award Committee, the reviewers and nominators, and all the friends and colleagues who invested their time and effort to support my nomination. Thank you, my friends and colleagues, for this unexpected honor!

When asked to respond to so much praise, I discovered that—at least for me—it is far more difficult to respond to praise than it is to praise others. So let me take this opportunity to give credit to two people who had profound impacts on my thinking and my scientific career. The first one is Ed Goldberg, my Ph.D. thesis advisor. By giving me a thesis topic that involved microbiology as well as chemistry, that spanned from sedimentary pore waters to atmospheric aerosols, he made me aware of the importance and power of interdisciplinary research and of the complex interactions between all components of the Earth system. Ed also taught me the importance of serendipity, to always keep my eyes open for the unexpected and unintended outcome of an experiment. Such serendipitous results may yield more important and novel insights than the original objective of the experiment. For example, my work on dimethylsulfide (DMS) and climate began with the observation of extra peaks in gas chromatograms during my thesis work on arsenic. Paulo mentioned my preference for looking at the "big picture," something that I also owe thanks to Ed Goldberg for. He always emphasized the importance of looking at whether our questions and conclusions made sense in the big picture and of not getting bogged down in minutiae.

The other person I'd like to acknowledge is my friend and colleague at Max Planck, Paul Crutzen. Paul gave me the opportunity to work with him in the early stages of the design of the International Geosphere-Biosphere Programme (IGBP), setting an agenda based on interdisciplinary research—especially in bringing together the biological and atmospheric sciences—and a global, Earth system perspective. Paul was also instrumental in bringing me into the Max Planck Society, the institution that gave me the freedom and resources to develop an international research program, out of which grew interactions with scientists from around the world, who have become cherished colleagues and friends.

Finally, I would like to say thanks to my wife, Tracey, and my daughter, Claire, for patiently enduring the absences and distraction that come with a busy international scientist's life.

—Meinrat O. Andreae, *Max Planck Institute for Chemistry, Mainz, Germany*

Curt Tilmes Receives 2014 Charles S. Falkenberg Award

Curt Tilmes received the 2014 Charles S. Falkenberg Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors a "scientist under 45 years of age who has contributed to the quality of life, economic opportunities, and stewardship of the planet through the use of Earth science information and to the public awareness of the importance of understanding our planet."

Curt Tilmes

Citation

Dr. Curt Tilmes is a worthy recipient of the Falkenberg Award because of his excellent contributions to the discipline of data stewardship, which is fundamental for ensuring long-term access to and usability of Earth science data and for ensuring the credibility of scientific research using such data. This nomination is in recognition of his sustained accomplishments in Earth science informatics over a period of more than 15 years, especially in ensuring the credibility of data-derived science.

Dr. Tilmes just completed a 2-year detail from NASA to the U.S. Global Change Research Program, where he was the technical lead for the nascent Global Change Information System (GCIS). Initially considered an almost impossible task, given the number and variety of organizations that hold the relevant data sets, the first deployment of GCIS has occurred, focusing on data sets used in the National Climate Assessment, which is a major congressionally mandated report. This system provides a unified Web-based source of authoritative, accessible, usable, and timely information about climate and global change for use by scientists, decision makers, and the public. It helps provide a solid foundation for answering Earth science questions of global interest regarding climate change by facilitating access to data and associated documentation that support conclusions in scientific literature. Such access is essential to ensure the credibility of scientific conclusions. The breadth of Dr. Tilmes's work goes across 13 U.S. agencies that hold data relevant to global change, and the impact of his work is global.

Dr. Tilmes has extensive and well-recognized experience in developing, operating, and managing data and information systems, as well as leading committees with a focus on data stewardship. Examples of this experience include his work at the Goddard Space Flight Center since 1994 on satellite data-processing systems for the Earth Observing System missions and the Suomi National Polar Partnership mission and his chairmanship of the Data Stewardship Committee of the U.S. Federation of Earth Science Information Partners.

In summary, Dr. Curt Tilmes has made very significant contributions to science through his work in data systems development and Earth science informatics. His system development activities have provided access to a large body of Earth science data from NASA's missions. His research in Earth science informatics, especially provenance, and leadership in data stewardship are expected to increase the credibility of conclusions and policies derived from Earth science data products.

—Ruth Duerr, *Cooperative Institute for Research in Environmental Science, University of Colorado Boulder*

—Hampapuram K. Ramapriyan, *NASA Goddard Space Flight Center, Greenbelt, Md.*

Response

I'm humbled to join such a tremendous group of scientists who have received this award since it was established and awarded posthumously to Charles Falkenberg in 2002. Charles was in my office at Goddard Space Flight Center discussing the Moderate Resolution Imaging Spectroradiometer (MODIS) data

processing system with me not long before the tragic events that took his life and those of his family. He was passionate about Earth science and its benefits for society, and he also valued the contributions from the data management and computer science side of the house.

I thank AGU, the Earth Science Information Partners (ESIP) Federation, and the Falkenberg Award review committee for their consideration, and especially Rama and Ruth for nominating me.

I would like to think this award gives some recognition of the importance of traceability of science and some validation of our efforts to present the formal provenance and relationships that support the knowledge derived from Earth observation data. I consider such an effort critical to understanding the source and ultimately providing credibility for that knowledge.

I'm grateful for my time at the U.S. Global Change Research Program working with the Global Change Information System and National Climate Assessment teams. I look forward to continuing to interact with those tremendous teams in the future.

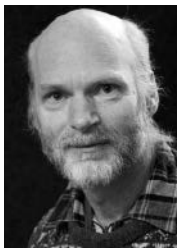
I could not have accomplished this work without the considerable contributions and keen advice from dozens of colleagues from NASA, other federal agencies, and interagency committees and working groups, as well as wonderful organizations like AGU and the ESIP Federation. Building on the work of many others and existing data systems at NASA, I consider Global Change Information System (GCIS) the fruition of much research and discussion over many years.

I would also like to take a moment to acknowledge the hardship my work and schedule often causes to my family and thank them for their solid support and willingness to put up with me.

—Curt Tilmes, *NASA, Washington, D. C.*

Simon Lamb Receives 2014 Athelstan Spilhaus Award

Simon Lamb received the 2014 Athelstan Spilhaus Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors an individual "for their enhancement of the public engagement in the Earth and space science," through devoting portions of their career conveying to the general public the excitement, significance, and beauty of the Earth and space sciences.



Simon Lamb

Citation

The pathways of Simon Lamb and Athelstan Spilhaus share much in common. Both developed stellar careers in their respective area of Earth sciences, but both had a passion for science communication. Moreover, both recognized the power of pictures to convey science to the community. In the case of Spilhaus, the medium was his famous comic strips, which prompted John F. Kennedy to confide during a meeting with him in 1962, "The only science I ever learned was via your comic strip in the *Boston Globe*." By the 1990s comic strips had been replaced by film and video. And it is this medium that Simon Lamb adopted to convey his considerable knowledge on Earth science to the public. Simon provided much of the intellectual direction for the eight-part series *Earth Story,* which was aired to an audience of millions in the United Kingdom on the BBC 2 channel. What is remarkable about this series is that the science issues are tackled head-on, and there is no dumbing down or oversimplifying.

Simon has published two books, including the successful popular science book *Devil in the Mountain: A Search for the Origin of the Andes.* This book was listed by the *New York Times* as one of the 100 notable books of 2004. However, his latest venture has been with the film *Thin Ice,* which was a 6-year project that began in 2007 and focused on scientists and their work on understanding climate change. The film was codirected and coproduced with David Sington and was made in Antarctica, Europe, the Arctic, New Zealand, and the Southern Ocean. Unlike *Earth Story,* where Simon was in the background with production and direction, *Thin Ice* was filmed, narrated, and presented by Simon. The film won awards at several film festivals. Simon's goal now is to launch a major new film and Web initiative to explore technological solutions to climate change.

As someone who works closely with Simon in tectonics research, I see all the qualities that make him a fine science communicator. He writes beautifully clear prose, and his verbal communication skills are the best, but perhaps his greatest asset is his rare ability to cut through the fog and see the inherent simplicity of how our planet works.

Dr. Simon Lamb is a very deserving recipient of AGU's 2014 Athelstan Spilhaus Award for science communication.

—Tim A. Stern, *Victoria University of Wellington, Wellington, New Zealand*

Response

I am thrilled to receive the Athelstan Spilhaus Award for 2014. Many things have contributed to my efforts to communicate the Earth sciences to a wide audience. When I was at school, I was made to write an essay every week on a topic chosen by my teacher—I must have written hundreds of these, and they taught me the basic craft of writing and how to communicate succinctly and clearly on a huge range of subjects. I drew heavily on this experience much later in my life when I came to write popular science books. At university, I became fascinated by filmmaking and ended up as president of the student filmmaking club. Here I learned how to use the power of the visual media to convey ideas. Many of my student friends went on to careers in the media, whereas I became a geologist. But over the years, I have managed to maintain a long-standing collaboration with my old friend from student days, David Sington—who today is a distinguished British filmmaker—and this has allowed me to make films about the Earth sciences at a professional level. And of course, I owe a huge amount to my academic colleagues—in particular, Philip England and Peter Barrett—for supporting me in my efforts through TV/film and book writing to take the Earth sciences to a wide audience. However, I am very much aware that in a profession where one is judged mainly by one's original research output, there is a risk in devoting time to the public understanding of science. I suspect that Athelstan Spilhaus was very much aware of this himself, and—I am only guessing here—he had to cope with unwelcome comments from some of his colleagues about his science strip cartoons. It is easy to underestimate the importance of this type of science communication, yet it is quite possible that President Kennedy's enthusiasm for putting man on the moon stemmed directly from reading them—Kennedy claimed that all the science he ever learned came from Athelstan Spilhaus! But whatever the risks, I think it is vital that all scientists communicate in whatever way they can to the rest of society, because humanity faces huge problems in the future—be they global warming, energy supply, health, or sustainability—and we will need to rely evermore on science to solve them.

—Simon Lamb, *School of Geography, Environment and Earth Sciences, Institute of Geophysics, University of Wellington, Wellington, New Zealand*

Mioara Mandea Receives 2014 International Award

Mioara Mandea received the 2014 International Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors "an individual scientist or a small team for making an outstanding contribution to furthering the Earth and space sciences and using science for the benefit of society in less favored nations."

Mioara Mandea

Citation

Mioara Mandea, program manager for the Solid Earth Directorate for Strategy and Programmes at Centre National d'Etudes Spatiales since 2011, started her scientific career during the very strict communist regime in Romania and obtained her Ph.D. at Bucharest University in 1993 under difficult conditions. This early experience and her persistent effort to overcome the difficulties also characterized her subsequent work. Be it in Vietnam or in Namibia, in Egypt or in India, to name just a few of the many places where she has been involved with the global geomagnetic ground-based network, she brought her knowledge, her field experience, and her determined approach to find solutions.

Mioara's career in the western European research community started with a number of research fellowships at the Institut de Physique du Globe de Paris. But it very soon took a more international direction when, in 1994, she became the head of the French National Magnetic Observatory, which included the responsibility for observatories outside France in less developed countries. When she was appointed the head of the geomagnetic section at the Helmholtz-Zentrum Potsdam in 2005, she forcefully initiated the expansion of the global networks of high-quality geomagnetic observatories.

In both France and Germany she highly prioritized building up student education and supervising Ph.D. students from less favored countries.

Mioara has devoted much effort to projects involving the international community. In particular, her contribution to the World Digital Magnetic Anomaly Map should be mentioned. Such maps are crucial to combining the various local surveys into a coherent

global representation. Mioara was a key person in this initiative, as illustrated by her appointment as president of the Geophysical Maps Commission of the Commission for the Geological Map of the World.

Within the International Association of Geomagnetism and Aeronomy (IAGA), she became a member of the executive committee in 2007 and secretary general in 2009. In this capacity she was instrumental in organizing the 2013 Scientific Assembly of IAGA in Mexico. In the European Geosciences Union (EGU), Mioara became president of the Earth Magnetism and Rock Physics Division in 2007 and had a considerable impact on the structure of the division. In 2012 she was appointed general secretary of the EGU.

Her interest in preparing young scientists to exploit the challenging opportunities in the scientific fields of geophysics is illustrated by her membership in the Excellence in Geophysical Education Award Committee of AGU in 2008 and her role as chair of that committee in 2010.

Congratulations to Mioara for her valuable contributions to the science of Earth's magnetic field and her deep commitment to working for greater participation of scientists from less developed countries.

—Eigil Friis-Christensen, *Technical University of Denmark, Lyngby, Denmark*

Response

It is a great pleasure, a privilege, and an immense honor to be the recipient of the AGU 2014 International Award, especially considering the international reputation of AGU, fostering scientific excellence and promoting research in Earth and space sciences worldwide. I would not be standing here today were it not for Eigil Friis-Christensen and his generous citation and for my colleagues who have supported my nomination.

Receiving this award has a special significance for me, as I have myself been the subject of a broad international education and career in institutions and universities of Romania, France, and Germany. Here I would like to briefly address my two reasons for feeling so privileged: the object of my studies and the people I have shared my work with. My research has focused on the measurement, observation, modeling, and theory of understanding the multitude of magnetic fields encountered in the Earth's and Earth-like planets' space. Recently, my interest has shifted to a wider range of topics, mostly related to the solid Earth's observation from space, a great challenge but also an enriching experience that has familiarized me with a highly qualified team. My current position in Centre National d'Etudes Spatiales (CNES) has also opened new perspectives for international projects and collaborations.

I have always considered that doing science is a hobby worth sharing with others, colleagues, or students. I firmly believe that it is our responsibility to invest resources in the community's well-being, so I have been involved in many activities with AGU, the European Geosciences Union (EGU), and the International Association of Geomagnetism and Aeronomy/International Union of Geodesy and Geophysics (IAGA/IUGG). The dynamics of human relationships is a fundamental aspect of scientific research, especially nowadays when research is understood as a collaborative practice: I have been very lucky from this point of view. A list of all collaborators I am indebted to includes more names than I could possibly evoke here and now....

Nevertheless, on this special occasion, I would like to thank Jean-Louis Le Mouël, without whom my career in geosciences would have never been realized. It is rightfully customary to take a moment and thank the family: my parents; my daughters, Anamaria and Raluca; and my sister, Daniela, along with their relatives and families. To finish, let me address my final thanks to my students, my colleagues, my friends, who have played such an important role during these years, and again share with them this wonderful recognition. Thank you.

—Mioara Mandea, *Centre National d'Etudes Spatiales, Paris, France*

Heather Macdonald Receives 2014 Excellence in Geophysical Education Award

Heather Macdonald received the 2014 Excellence in Geophysical Education Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award honors "a sustained commitment to excellence in geophysical education by a team, individual, or group."

Heather Macdonald

Citation

It is my pleasure to cite Dr. R. Heather Macdonald for her sustained leadership in the transformation of geoscience education during the past 2 decades. Heather's blend of steadfast vision and selfless dedication to advance geoscience education through supporting faculty is illustrated by three programs: On the Cutting Edge, a national professional development program for geoscience faculty; the Supporting and Advancing Geoscience Education in Two-Year Colleges (SAGE 2YC) project; and the Building Strong Geoscience Departments initiative. Notable characteristics imparted to each of these by Heather are that they incorporate ideas from facilitators and participants collaboratively, build through a continuous cycle of improvement to create a sustained program that evolves with participant needs, and develop a leadership cohort eager to carry the successful initiative into the future.

Heather developed the annual On the Cutting Edge Workshop for Early Career Geoscience Faculty, which focuses on teaching, research, and career management. Review comments indicate that it transforms many participants' approach to teaching. Another measure of success is that past participants recommend it to their peers and their students and welcome the opportunity to become a facilitator. More than 600 early-career faculty from all types of academic institutions (undergraduate and graduate, 2 year and 4 year, public and private) have participated in the workshop since its inception. The impact is multiplied through its reach to additional faculty through materials on the Cutting Edge website. Heather developed a parallel workshop titled Preparing for an Academic Career in the Geosciences for graduate students and postdocs.

More than a decade ago, Heather identified 2-year colleges, which currently enroll nearly half of undergraduate students, as institutions critical to the education of future geoscientists. Her efforts have contributed to programs to build leadership in the 2-year college geoscience education community through the SAGE 2YC project. She contributed to creating the Building Strong Geoscience Departments program that supports the sharing of best practices, lessons learned, and expertise for faculty and department chairs. The latter program is now a part of the National Association of Geoscience Teachers (NAGT) portfolio, with an associated website and listserv.

Heather has led development of 11 collaborative National Science Foundation grants to garner the support necessary to achieve the vision. She has served the community tirelessly through membership in significant committees for AGU, the American Geosciences Institute, and the National Research Council and as a past NAGT president. There is no one more deserving of the Excellence in Geophysical Education Award than Heather Macdonald.

—Richelle M. Allen-King, *University at Buffalo, State University of New York, Buffalo*

Response

I am honored to be the recipient of the 2014 AGU Excellence in Geophysical Education Award. My involvement with AGU began in 1994 with a talk at the first education session at an AGU meeting. In the following 2 decades, geoscience education has grown dramatically, and I'm proud to be part of a vibrant geoscience education community.

Collaboration has been a key element in my career. Many creative and inspiring colleagues have helped shape my work in geoscience education. I thank my colleagues at the College of William and Mary, in the geology department and across campus—from marine science to education, from biology to modern languages and linguistics and writing. You have taught me much about teaching in and beyond the classroom, working effectively with research students, and building departments and programs to be places of opportunities for students and faculty alike. I thank my geoscience education colleagues across the country, including the leaders of On the Cutting Edge and Building Strong Geoscience Departments, all of the workshop leaders and participants from those programs, the Smithsonian Environmental Research Center (SERC) Web team and staff, and so many more. We have helped establish a culture of information and resource sharing that supports continuous improvement in geoscience education.

Some highlights. It is a pleasure to reflect on the Early Career Geoscience Faculty workshop, its evolution through time, and its positive impact on successive generations of participants. The leaders of each workshop have contributed to the success of this series. I am particularly grateful to Richelle Allen-King, Rachel Beane, Randy Richardson, and Richard Yuretich for their innovative ideas, attention to detail, and wise counsel over many years. Another highlight has been participating in the emergence of the 2-year college geoscience community. I've learned much from my Supporting and Advancing Geoscience Education in Two-Year Colleges (SAGE 2YC) colleagues Eric Baer, Bob Blodgett, and Jan Hodder and from Katryn Wiese and so

many other 2YC colleagues. I thank David McConnell for sharing his geoscience education research expertise with me and my students. I especially thank my long-time colleagues Cathy Manduca, David Mogk, and Barb Tewksbury for their creativity, generosity, collaboration, and friendship.

As our community continues to grow, I am excited to see the new collaborations that will form and the resulting advances in geoscience education research and practice. Thanks to all of my colleagues and to the geoscience education community for their many contributions and to AGU for this honor.

—Heather Macdonald, *College of William and Mary, Williamsburg, Va.*

Chigomezyo Mudala Ngwira Receives 2014 Science for Solutions Award

Chigomezyo Mudala Ngwira was awarded the 2014 Science for Solutions Award at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. The award is for "significant contributions in the application and use of Earth and space sciences to solve societal problems."

Chigomezyo Mudala Ngwira

Citation

Within heliophysics, space weather is the newest field and also the field most pertinent to life and technology. The most explosive space weather originates as solar eruptions, producing myriad secondary effects as they propagate through the heliosphere. When these events approach Earth's magnetosphere, inducing geomagnetic storms (GSs), they can wreak havoc on humans, spacecraft, and instruments. Determining how and when these adverse effects occur, and ultimately mitigating them, is a key goal of heliophysics today. Much is at stake: Society depends increasingly on vulnerable satellite-based technologies (e.g., GPS and cell phones), and electric power grids can be severely damaged by ground-level magnetic changes. Chigomezyo Ngwira is combining theory, modeling, and data analysis in novel ways to make progress on this urgent problem.

Chigo's work has been focused on the critical ground-level effects of solar eruptions: geomagnetically induced currents (GICs). As the magnetosphere is reconfigured by an eruption, the current system from the ionosphere to the surface is altered, inducing large currents in wires and associated power grid equipment. At worst, portions of the grid could be disabled, straining the resources of hospitals, data farms, and other critical facilities. The scientific foundation required for comprehensive understanding of GICs became available only recently, thanks largely to Chigo and his colleagues.

Chigo has made great strides on two crucial fronts: (1) GICs at middle and southern latitudes, locations earlier thought not to be threatened by GSs, and (2) impacts of extreme GSs and GICs based on historical events and state-of-the-art simulations of the near-Earth response to extreme solar eruptions. In "Improved Modeling of Geomagnetically Induced Currents in the South African Power Network," Chigo and colleagues showed, for the first time, that significant GICs could occur in the South African grid during major GSs. This pioneering work launched major GIC activities in South Africa.

In "Simulation of the 23 July 2012 Extreme Space Weather Event: What if This Extremely Rare CME Was Earth Directed?," Chigo and colleagues used advanced models to study, for the first time, the GIC activity that such a well-observed extreme event would cause if aimed at Earth. In "Modeling Extreme 'Carrington-Type' Space Weather Events Using Three-Dimensional Global MHD Simulations," he and his coauthors predicted maximum possible GIC amplitudes and revealed impacts at latitudes much farther south than expected.

Chigomezyo Ngwira's research is a prime example of how science directly benefits society worldwide, through better understanding of natural hazards and improved preparedness for extreme events. His results not only guide U.S. policy decisions now but also manifest enormous potential for guiding energy policy in the developing world.

—Judith T. Karpen, *NASA Goddard Space Flight Center, Greenbelt, Md.*

Response

I am greatly humbled and honored to receive this prestigious award. I would like to offer my sincerest gratitude to AGU for this honor established by Peter Schlosser. In accepting this award, I want to say thank you to Judith Karpen for the nomination and to Antti Pulkkinen, my postdoc advisor, for believing in me.

The research on extreme space weather, particularly geomagnetically induced currents, is an important topic for our technologically dependent society given the potentially catastrophic consequences on high-voltage power transmission grids. I am excited that "the application and use of the Earth and space sciences to solve societal problems" is recognized as a novel way to advance our understanding of the world we live in.

Growing up, I learned at an early stage that education was the key to a successful future. However, I did not make the journey here alone. Numerous people have supported me along the way. I would like to thank Lee-Anne McKinnell and Pierre Cilliers—my graduate school advisors—and many other people who have supported me during this journey. I am also blessed with an amazing and loving family, especially my wife, Chomba, who has been very supportive of my work. I would not be here today without all of that love, support, and encouragement.

In conclusion, I want to again say how grateful I am to receive this award, especially knowing that I work every day among other brilliant postdoc scientists who are equally deserving. I count it a blessing to work alongside many eminent scientists at NASA Goddard Space Flight Center. I've also had wonderful support from my employers at The Catholic University of America.

—Chigomezyo Mudala Ngwira, *The Catholic University of America, Washington, D. C.*

Elizabeth Kolbert Receives 2014 Walter Sullivan Award for Excellence in Science Journalism—Features

Journalist and author Elizabeth Kolbert received the 2014 Walter Sullivan Award for Excellence in Science Journalism—Features at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. Kolbert was honored for the article "Annals of Extinction: The Lost World: Part Two," published in the 23&30 December issue of The New Yorker *magazine. Kolbert's powerful, yet whimsical article examines growing environmental havoc in our world through the lens of the massive, end-Ordovician extinction some 440 million years ago and the fossils of graptolites, a species almost eliminated by that devastating event. Kolbert shows that just as nuclear fallout is a contemporary human signature in Earth's geological strata, so are our impacts on our planet's living creatures and the fossil record they are leaving behind. Her story considers whether such signals indicate a new geologic epoch dominated by human activity and contemplates what future scientists might learn from the strata being laid down today. The Sullivan Award is for work published with a deadline of more than 1 week.*

Elizabeth Kolbert

Citation

Writing about extinction is an inherently depressing endeavor, and one would think that writing about the sixth extinction, which is unfolding now and which could result in the greatest loss of diversity since the asteroid impact that ended the reign of the dinosaurs, would be even grimmer. But Elizabeth Kolbert has the incredible talent to make stories of environmental catastrophe vivid, gripping, fascinating—and accessible. In her *New Yorker* article "The Lost World," which was excerpted from her *New York Times* best-selling book, *The Sixth Extinction,* she begins with what might seem like an obscure footnote in the long narrative of geological change—the extinction of the graptolites at the end of the Ordovician period—and then opens the story into a larger investigation into mass extinctions and their remnants.

Always an intrepid reporter who grounds her stories in field reporting, Kolbert takes us to Dob's Linn in Scotland to collect graptolites with stratigrapher and "scientific hooligan" Jan Zalasicwicz, who is on a campaign to convince his colleagues that we have entered a new geologic era, the Anthropocene. In the article's most brilliant turn, she moves to the question of how future geologists (or their equivalent) will be able to discern evidence of the Anthropocene era, assuming, of course, it too will come to an end. Perhaps it will be our subways or even our soda cans—as Kolbert writes, a "Dr. Pepper spike." In his *New York Times Book Review* of *The Sixth Extinction*, Al Gore wrote, "Elizabeth Kolbert has established herself as one of our very best science writers. She has developed a distinctive and

eloquent voice of consciousness on issues arising from the extraordinary assault on the ecosphere." And the *San Francisco Chronicle* wrote, "It is not possible to overstate the importance of Kolbert's book. Her prose is lucid, accessible and even entertaining as she reveals the dark theater playing out on our globe." A serious, painstakingly thorough journalist, a keen and informed observer of the world around us, Elizabeth Kolbert translates the technical into the playful and poetic even as she forces us to contemplate some of the most dire issues of our time—who else could describe a graptolite fossil as resembling a set of false eyelashes for a Barbie doll?

—Gillian Blake, *Henry Holt, New York, N. Y.*

Response

I am extremely honored to have received this year's Walter Sullivan Award. Walter Sullivan set a very high bar for science journalists, and many of the previous winners have served as models to me, including such brilliant writers as John McPhee, Jon Krakauer, and Tim Folger.

The stories that formed "The Lost World," which appeared in *The New Yorker*, were written as part of a book, *The Sixth Extinction*, published by Henry Holt and Co. That book took much longer to complete than it was supposed to—nearly 5 years. I was very fortunate during that time to have the support and counsel of Gillian Blake, Holt's editor in chief. I can't thank Gillian enough for all of her help and her advice. I also want to thank Holt's president, Steve Rubin, and its deputy publisher, Maggie Richards. I was lucky, too, to have such wonderful and sympathetic editors at *The New Yorker*, including John Bennet, Dorothy Wickenden, and David Remnick.

Science journalists might be described as the barnacles of the scientific world; we're entirely dependent on the scientists we adhere to. I owe a tremendous debt to the many scientists who assisted me in writing "The Lost World," particularly to Jan Zalasiewicz, of the University of Leicester; Ian Millar and Dan Condon, of the British Geological Survey; and Pascal Tassy, of Paris's Museum of Natural History.

—Elizabeth Kolbert, The New Yorker, *New York, N. Y.*

Andrew Grant Receives 2014 David Perlman Award for Excellence in Science Journalism—News

Andrew Grant, physics reporter for Science News*, received the 2014 David Perlman Award for Excellence in Science Journalism—News at the AGU Fall Meeting Honors Ceremony, held on 17 December 2014 in San Francisco, Calif. Grant was honored for the article "At Last, Voyager 1 Slips into Interstellar Space," published 12 September 2013 by* Science News*. Grant's compelling story reports evidence that the spacecraft Voyager 1 entered interstellar space. The article also explores the scientific debate about the whether the interstellar threshold was truly crossed, without lessening the significance of the new findings. The Perlman Award is for work published under deadline pressure of 1 week or less.*

Andrew Grant

Citation

When scientists announced that Voyager 1 had exited the solar system, Andrew Grant didn't just report that news. He asked a basic question: What do we mean by "solar system"?

It is a great day when an editor's most difficult challenge is containing a writer's enthusiasm for his topic. That was the task at hand last September when Andrew Grant reported and wrote "At Last, Voyager 1 Slips into Interstellar Space."

Starting in the fall of 2012 and continuing into the following summer, there were tantalizing hints that Voyager 1 was on the cusp of exiting the solar system. But Andrew thought there was a flaw in how reporters—and scientists—were spinning the story: Scientists don't agree on the definition of the solar system, so how can we say that Voyager is leaving it? "There is no highway sign that says 'Now Leaving the Solar System,' and if even if there were, it's unclear where it would be," Grant wrote in a proposal for an infographic outlining the Sun's influence on the planets, the Kuiper belt, and objects well beyond the solar system but still within the Sun's clutch.

Shortly after Andrew submitted that proposal, Voyager 1 scientists announced that the probe had traveled beyond the mist of solar particles and into the dense fog of interstellar space. At the time, Andrew had been at *Science News* for about 8 months. I had the pleasure of editing several of his stories, and among our running conversations was how much background and context to include in news stories and where. When Andrew turned in the Voyager article, he had basically disregarded every bit of restraint I had encouraged in previous stories. And that was a great instinct. The resulting story captured the magnitude of the discovery, couched within a full discussion of what Voyager observed when and what those observations may mean, all wrapped up in the enthusiasm of space exploration.

We published the story online in its entirety, and the news peg of it got folded into the introductory text of the solar system map Andrew had earlier proposed—an illustration that served as the centerpiece of the issue that launched *Science News*'s redesign last October.

Debate continues on whether Voyager 1 has entered the space between stars, a conversation that's not surprising to those of us who have closely followed Andrew's careful interpretation of Voyager's journey. Andrew puts the same amount of consideration into everything he reports, so I am confident that, like Voyager, Andrew will continue to amaze and inspire.

—Kate Travis, Science News, *Washington, D. C.*

Response

Thank you to AGU and the judging panel for this award. As thrilled as I was upon learning I had won, I think I was giddier when I received an email from David Perlman, whose work I've admired since before my career began. It's an honor to receive an award named after him.

It's hard for a physics writer not to be captivated by the story of Voyager 1 entering interstellar space. Here's a 37-year-old spacecraft, with less computing power than the IBM 286 I played on as a kid, still kicking 34 years after the end of its primary mission. At first I wondered what the equivalent of a single ocean buoy 18 billion kilometers away could inform about the vast uncharted waters of interstellar space. It turns out the answer is quite a lot, especially when you add in a well-timed solar storm and some brilliant scientific detective work.

I had a blast covering this story, and I appreciate the guidance from my editors Kate Travis and Lila Guterman in striking the right balance between news and background. (Kate informs me that this article makes up for all the backstory I didn't get to tell "in every other story ever.") Most excitingly, the story of Voyager 1 isn't over yet. At the time I'm writing this, scientists still can't explain the magnetic field surrounding the probe, and one dissenting member of the team fully expects to give me a call one day with evidence that Voyager actually never left.

That's the way science works, and that's the kind of story I love covering.

—Andrew Grant, Science News, *Washington, D. C.*

Murat Aydin

A drill tower is raised at the West Antarctic Ice Sheet Divide drill site in 2005.

Atmospheric Carbonyl Sulfide Hit a Minimum 5000 Years Ago

Carbonyl sulfide is the most abundant sulfur gas in the lower atmosphere. It's a greenhouse gas, and it contributes to the formation of stratospheric aerosols. Most carbonyl sulfide stems from sulfur gas emissions from the ocean, with smaller emissions from biomass burning, wetlands, and volcanic activity. In the modern era, carbonyl sulfide is produced during fiber manufacturing.

Carbonyl sulfide also has varied sinks, but the largest and most important is uptake by terrestrial plants during photosynthesis. Using ice cores collected from five locations around Antarctica, *Aydin et al.* have produced a record of atmospheric carbonyl sulfide that goes back 8000 years. They suggest that this record may track long-term changes in the productivity of land plants.

The ice cores used come from Antarctica's Byrd, Siple Dome, Taylor Dome, West Antarctic Ice Sheet Divide, and South Pole drill sites. Measuring the concentration of carbonyl sulfide in air extracted from the core samples, the authors found that these five different sites generally agree for the past 1,000 years. Further back, however, the carbonyl sulfide records begin to diverge.

Because the same carbonyl sulfide concentration should be recorded at all sites, the authors suggest that the levels preserved in the ice core air have evolved over time, being destroyed by a slow temperature-dependent hydrolysis reaction. Using an ice flow model and a heat flux model, the authors estimated the temperature histories for the different core sites and accounted for the carbonyl sulfide loss to hydrolysis at each site for every core sample.

After applying this correction, the adjusted records converged, displaying a decrease in atmospheric carbonyl sulfide from around 300 parts per trillion 7000 years ago to around 250 parts per trillion 5000 years ago. Carbonyl sulfide levels increased in later years, reaching 330 to 350 parts per trillion around 1000 years ago. Since the dawn of the industrial era, carbonyl sulfide concentrations have increased again, now measuring close to 500 parts per trillion. (*Journal of Geophysical Research: Atmospheres*, doi:10.1002/2014JD021618, 2014) **—Colin Schultz, Freelance Writer**

How Solar Wind May Affect Weather and Climate

The Sun over Antarctica. New research suggests that the link between solar wind and atmospheric pressure seen in Antarctica (the Mansurov effect) may be driven by atmospheric electric effects on tropospheric clouds.

The Sun plays a large role in providing the Earth with light and heat, but its more subtle effects on the Earth's weather, climate, and atmospheric processes are still a mystery. Scientists are especially puzzled by how the solar wind—streams of plasma ejected from the Sun—affects the Earth's climate system.

Earlier research found that the interplanetary magnetic field (IMF)—which is the magnetic field swept Earthward by the solar wind—causes certain effects in the Earth's ionosphere. However, how those ionospheric changes may influence climate dynamics remains relatively unknown.

Lam et al. present new research into the correlations between changes in the IMF and atmospheric pressure anomalies found in the Earth's polar troposphere, modulated by a global circuit of electrical current continuously moving between the ionosphere and the surface of Earth. The researchers were specifically investigating whether the Mansurov effect, which is a response in atmospheric pressure to changes in the IMF, involves cloud physics and can thus have a wider effect on weather and climate.

Using national records of high-resolution data, the authors tracked instances over 4 years when some changes in the IMF correlated with pressure anomalies above the Earth's poles. The authors saw effects in the lower troposphere, which were driven by electric potential difference between the ionosphere and the Earth's surface, days sooner than in the mid-to-upper troposphere. The findings support the idea that the Mansurov effect is linked with changes to cloud microphysics, which can then in turn have an effect on meteorology. (*Geophysical Research Letters*, doi:10.1002/2014GL061421, 2014) **—JoAnna Wendel, Staff Writer**

Warming Hiatus Periods to Become Increasingly Unlikely

There's been a much-ballyhooed slowdown in the rise of global land surface temperatures since 1998. The so-called hiatus, a leveling off of the long-term surface warming trend, has been used by some to argue—incorrectly—that anthropogenic climate change has stalled. Past research has shown that warming in the ocean makes up most of the difference.

The modern pause is not, of course, the only hiatus on record. Yet the question analyzed by *Maher et al.* is whether that will continue to be the case. In the shadow of rampant anthropogenic warming, will we continue to see long stretches without surface warming?

Hiatus periods, defined as any 10-year stretch with a global negative trend in surface temperatures, have happened before and will happen again. Large volcanic eruptions, variability stemming from large climate systems such as the Interdecadal Pacific Oscillation, and even the effects of anthropogenic aerosols have all previously contributed to similar pauses in surface warming, such as those that occurred from 1937 to 1950 and from 1956 to 1968.

Based on analyses using 31 climate models, however, *Maher et al.* found that the era of warming hiatuses may soon be coming to an end. Anthropogenic warming, they found, will soon make it unlikely that the world will ever again see a prolonged downturn in the temperature. The authors' calculations focused only on short-term to midterm climate drivers and ignored longer-term factors such as orbital forcing.

Running their model ensemble under two scenarios (the Intergovernmental Panel on Climate Change's representative concentration pathway (RCP) 4.5, which forecasts that anthropogenic emissions taper off by the end of the century, and RCP 8.5, which forecasts that unconstrained greenhouse gas emissions), the authors found that as emissions increase, hiatus periods become increasingly rare.

Under RCP 8.5, they found that past the year 2032, hiatus periods are unlikely to occur. In addition, by the end of the century, even a large Krakatoa-style volcanic eruption would be unlikely to cause enough cooling to counteract accumulated warming and trigger a hiatus. (*Geophysical Research Letters*, doi:10.1002/2014GL060527, 2014) **—Colin Schultz, Freelance Writer**

Satellite Imaging Improves Study of Sinking River Deltas

More than half a billion people around the world live near river deltas that are slowly sinking due to human activities, sea level rise, and the settling of sediments. Subsidence of river deltas can have serious impacts on populations, including increasing the risk of storm surge and infrastructure degradation. However, current methods of tracking delta subsidence—via tide gauges or scattered GPS devices—have not provided the spatial variability needed to take measurements that are of use to the public.

Higgins et al. used a satellite-based interferometry technique to map the subsidence of the Ganges-Brahmaputra river delta over a period of 4 years. The satellite readings covered more than 10,000 square kilometers and were validated against separate GPS readings.

The authors found that the Ganges-Brahmaputra river delta, which is home to a population of more than 150 million people, is subsiding at a rate of about 10 millimeters per year around Dhaka, Bangladesh's capital, and about 18 millimeters per year outside of the city. The authors note that their results indicate that satellite interferometry can be a useful method in accurately gauging the subsidence in deltas. (*Journal of Geophysical Research: Earth Surface*, doi:10.1002/ 2014JF003117, 2014) **—JoAnna Wendel, Staff Writer**

Ancient Earthquakes Made an Island Rise and Fall

Over the past 2300 years Sitkinak Island has repeatedly risen above the waves and been plunged into the ocean as the Alaska-Aleutian megathrust underlying it ruptured. Using a variety of observational techniques, *Briggs et al.* tracked the changing elevation of Sitkinak Island, in the process uncovering a previously unstudied history of the megathrust.

The Alaska-Aleutian subduction zone has a record of producing powerful earthquakes, including three magnitude 8.6 or greater events since 1957. These earthquakes, and the tsunamis they can generate, pose a threat to people living along the Pacific coasts. However, despite the seismic potential of the subduction zone, little research has been done on the western extent of the megathrust near and beyond Sitkinak Island. The eastern extent, nearer south central Alaska, has been relatively well studied.

Damage from the 1964 Good Friday earthquake and tsunami in Alaska.

Using radiocarbon, radiocesium, lead isotope, lithostratigraphic, and microfossil observations, the authors found indications of five periods of uplift and subsidence. Changes in sediment layers and species of foraminifera and diatom fossils indicate which way the island moved because some species live in salt water and others in freshwater. Radioisotope measurements indicate when these changes took place.

Using their observations, the authors found three sudden periods of uplift and two of subsidence over the past 2300 years. The most recent subsidence marks the edge of the magnitude 9.2 earthquake in 1964, an event that caused the island to tilt above the western end point of the megathrust rupture. An earlier earthquake in 1788 C.E. had the opposite effect: Uplift records rupture propagation beneath and beyond Sitkinak.

Previous research into the Alaska-Aleutian fault suggested that fault ruptures stalled out near Sitkinak Island, propagating no farther west, as was observed in 1964. Following their observations of mixed abrupt vertical motions, the authors suggest that this was not the case. The identification of this boundary as nonpersistent throughout history is important for seismic hazard analyses of Alaska. (*Geophysical Research Letters*, doi:10.1002/ 2014GL059380, 2014) **—Colin Schultz, Freelance Writer**

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Atmospheric Sciences

Aerosol Researcher in Atmospheric Processes and Chemistry at Princeton University

The Atmospheric and Oceanic Sciences Program at Princeton University in cooperation with NOAA's Geophysical Fluid Dynamics Laboratory (GFDL) seeks a postdoctoral fellow to develop and apply satellite based dust emission parametrization to improve our understanding of dust effects on climate and air quality, with a particular focus on anthropogenic contribution. Topics of particular interest include: statistical methods of parameter estimation, analysis of satellite aerosol products, advancing numerical representation of chemical and optical properties of dust, modeling heterogeneous reactions on aerosol surface, modeling aerosol interactions with radiation and cloud properties. Personnel will join an active group at Princeton and GFDL conducting research to advance the fundamental understanding of atmospheric and land processes in governing climate variability and change (http://www.gfdl.noaa.gov/atmospheric-processes). We are seeking candidates with quantitative, interdisciplinary knowledge from subsets of fields including aerosol modeling, statistical analysis, and atmospheric chemistry. Experience analyzing large data sets and/or model output is also critical, as is model development experience. These are two-year positions (subject to renewal after the first year) based at GFDL in Princeton, New Jersey. Complete applications, including a CV, publication list, contact information for 3 references, who will be contacted automatically in order to solicit letters of recommendation, and a one-to-two page statement of research interests should be submitted by February 28, 2015 for full consideration, though evaluation will be ongoing. Applicants should apply online to http://jobs.princeton.edu, Requisition # 1400940. For additional information, please contact Paul Ginoux (paul.ginoux@noaa.gov). This position is subject to the University's background check policy. Princeton University is an equal opportunity employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability status, protected veteran status, or any other characteristic protected by law.

Biogeosciences

The Marine Science Institute (University of California, Santa Barbara) seeks a PhD level postdoctoral fellow to contribute to studies of

coastal watersheds and fluxes into coastal waters associated with an on-going LTER project (http://sbc.lternet.edu/).

The position will involve analyses of hydrological and hydrochemical data and watershed-scale modeling of fluxes of solutes and particulates. Salary and benefits will depend on academic background and experience. 100% time appointment for one year from start date with possibility for second year renewal. Start date is negotiable, but is anticipated by April 2015. Electronic applications (including a full CV, description of research interests and names and addresses of three references) should be sent to: https://recruit.ap.ucsb.edu/apply/JPF00438. Application review will begin February 10, 2015 and continue until position is filled. The department is especially interested in candidates who can contribute to the diversity and excellence of the academic community. The University of California is an Equal Opportunity/Affirmative Action Employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or any other characteristic protected by law including protected Veterans and individuals with disabilities.

Geochemistry

Research Associate in Stable Isotope Geochemistry Northern Illinois University

The Dept. of Geology and Environmental Geosciences at Northern Illinois University (NIU) invites applications for a research associate position in stable isotope geochemistry. The successful candidate will hold a full-time, non-tenure track appointment. We seek candidates with a research focus in isotope ratio mass spectrometry, the ability to operate and maintain analytical laboratory facilities supporting allied research across the university, and a desire to train students in analytical laboratory techniques. The capacity to collaboratively develop successful research proposals, publish research results, and successfully generate and conduct contracted analyses is essential to the position. Applicants must have a Ph.D. in geoscience or a related field; post-doctoral experience in a stable isotope laboratory is preferred. Applications including CV, statement of research experience, accomplishments and interests, and 3 letters of recommendation should be submitted electronically to the Dept. Chair, Mark P. Fischer, at mfischer@niu.edu. Screening of applications will begin March 1, 2015, and continues until the position is filled. For additional information about the position and the department, visit: www.niu.edu/geology. NIU is an AA/EEO institution that values diversity in its faculty, staff and students: we strongly encourage applications from diverse candidates, including women and minorities. A state-mandated pre-employment criminal background investigation is required.

Hydrology

Research Scientist in Fluvial Geomorphology.

The U.S. Geological Survey's National Research Program (NRP) in Golden, Colorado, seeks to hire a Research Hydrologist to conduct research at the GS-12 or GS-13 grade level in the field of fluvial geomorphology. Candidates are expected to have a background in computational flow and sediment transport modeling as well as experience in field programs and remote sensing in riverine environments. Technical expertise in the physics of sediment transport, the mechanics and fluid dynamics of fluvial bank erosion, and the application of remote sensing are of particular interest. Research goals will focus on understanding and modeling the complex linkages between physical and biological processes in fluvial environments.

The primary responsibility of this position is to serve as a science leader who manages, coordinates, and actively participates in interdisciplinary science investigations. Candidates will identify and formulate relevant hypotheses, plan and design specific experimental strategies, and conduct field, laboratory, or numerical modeling investigations that solve critical problems faced by the nation and contribute to strategic priorities in USGS Water, Ecosystems, Global Change, and Natural Hazards Mission Areas (see http://www.usgs.gov/science_strategy/). This position requires strong collaborative skills and an enthusiasm for interdisciplinary science, as well as excellent written and verbal communication skills.

Effective Feb. 2, 2015, applications for this position will be accepted through the USAJOBS website at https://www.usajobs.gov (vacancy announcement ATL-2015-0118) through March 2, 2015. For additional information, contact the USGS Office of Human Resources at (303) 236-9589. U.S. citizenship is required. The U.S. Geological Survey is an Equal Opportunity Employer.

THE UNIVERSITY OF TEXAS AT SAN ANTONIO DEPARTMENT OF GEOLOGICAL SCIENCES ENDOWED DISTINGUISHED PROFESSORSHIP IN HYDROGEOLOGY

The University of Texas at San Antonio (UTSA) seeks applications from senior scholars in the field of Hydrology to fill a tenured position at the Professor or Associate Professor level, subject to qualifications, to begin Fall 2015 in the Department of Geological Sciences. The successful candidate will be awarded the Dr. Weldon W. Hammond, Jr. Endowed Distinguished Professorship in Hydrogeology. Read more about the endowed chair at http://www.utsa.edu/geosci/pdf/wwh_endowment_brief.pdf. Information on the geoscience program and details on what to include in an application can be viewed at http://www.utsa.edu/geosci/positions.html. Review of completed applications will begin February 5, 2015 and continue until the position is filled. UTSA is an AA/EEO employer.

Ocean Sciences

Faculty Positions in the Department of Geological Oceanography, Xiamen University, China

Xiamen University (XMU) is located in the city of Xiamen, a "garden on the sea" in southern China, and has established a new Department of Geological Oceanography as part of the College of Ocean and Earth Sciences (http://coe.xmu.edu.cn/) that offers undergraduate and graduate degrees. The college is one of the top oceanographic programs in China. We are also building a 3600-ton (78 m) research vessel and a marine station for cutting-edge education and research in oceanography. XMU envisions the development of a world-class program in Geological Oceanography with focus on interdisciplinary studies of sediment processes and the sedimentary record in China's unique marginal seas.

POSITION ONE: HEAD OF DEPARTMENT

We are seeking applications from international scientists for the position of the head of the department. The search will remain open until the position is filled.

Duties:

1. Be in charge of the organization and general operation of the Geological Oceanography Department, formulating and implementing the strategy in the development of the Geological Oceanography discipline, and leading the Department towards growth and excellence.

2. Be responsible for building up a strong teaching and research team; and improving the overall academic level of the team in such efforts as devising a long-term team-building plan, recruiting high-level talents, cultivating young researchers and enhancing teamwork.

3. Explore new approach for talent cultivation and nurture talents with creative thinking.

Qualifications:

1. The applicant should hold a doctoral degree and a full professorship (or an equivalent position) in a prominent overseas university (or research institutes).

2. The candidate may be a specialist in any field related to geological oceanography, including (but not exclusively): sedimentology, sedimentary geochemistry, sediment transport, seismic stratigraphy, sediment acoustics, geotechnology, remote sensing, and numerical modeling of sediment transport and sedimentation.

3. Overseas experience (study or work) is required for this position. The candidate should have international perspective, strategic and creative thinking on the discipline development.

4. The candidate is expected to have distinguished academic credentials and international recognition for his/her achievements in research, scholarship and teaching.

5. The candidate should have a proven record of high-level administrative and leadership experience in a university setting, such as a department, a research institute or a laboratory, and will be able to take charge of teaching, research, team-building, discipline development, social services and administration.

Salary and Benefits:

1. Contract term: 4 years;

2. Annual Salary: 600K-900K RMB (1 US$~ 6.18 CYN) ;

3. Other benefits and issues can be negotiated.

POSITION TWO: FACULTY MEMBERS

We are seeking applications from international scientists for up to 15 faculty positions. The search will remain open until positions are filled.

Duties:

1. To teach undergraduate and graduate courses in a full English or bi-lingual capacity;

2. Be capable to obtain university and outside funding to establish their own research laboratories and facilities and build a research program of global interests;

3. Be able to participate in research cruises.

Qualifications:

1. Applicants must hold a doctoral degree in any field related to geological oceanography, and be a specialist in any field related to geological oceanography, including (but not exclusively): sedimentology, sedimentary geochemistry, sediment transport, seismic stratigraphy, sediment acoustics, geotechnology, remote sensing, and numerical modeling of sediment transport and sedimentation.

2. The applicants should be able to work across disciplinary boundaries, and have essential qualities for teamwork.

3. The rank of the appointment will be commensurate with the applicant's qualifications and experiences.

Salary and Benefits:

1. Contract term: 3 years for assistant professor; 5 years for associate

professor and full professor.

2. The appointment system will be applied to the successful candidates. The selected candidates will receive the standard compensation for the faculty members of Xiamen University at the same rank.

HOW TO APPLY

Interested applicants should send a cover letter indicating the intent of the application (department head or faculty), his/her CV, contact information for 3–5 references, a statement of purpose that includes courses intended to teach and research interests and professional goals, and other supporting materials for the evaluation process to the Dean, Prof. Kejian Wang (wkjian@xmu.edu.cn).

Postdoctoral & Research Professor Positions in School of Environmental Science and Engineering at POSTECH

Core Lab. for Innovative Marine and Atmospheric Technology (CLIMATE, PI: Prof. Kitack Lee) in the School of Environmental Science and Engineering at POSTECH in South Korea invites applications for a postdoctoral research fellow and a research professor position in the general area of ocean biogeochemistry. We are interested in applicants whose research plan involves global ocean carbon & nitrogen cycle and ocean acidification.

POSTECH (www.postech.ac.kr) is one of the top research-oriented universities in Korea and became globally recognized as one of Asia's premier universities. The university is made up of 11 departments and 22 graduate programs. We promote a globalized research environment. The number of international research scientists from diverse countries continues to grow.

Our group is taking a lead on international collaborative research project (Global Research Laboratory Program funded by the Korean Ministry of Science & Technology) and more relating to the impacts of emerging environmental threats (climatically active gases and anthropogenic pollutants) to the ocean. Our group includes experimental scientists and modelers who have diverse backgrounds in chemistry, biology, oceanography and environmental sciences. Our interests extend from the biological/chemical feedback mechanisms to their role in the global cycles of carbon, nitrogen and sulfur.

Application Details: Submit a curriculum vitae including contact information for three references, copies of representative publications, and a brief statement of research interests. Applications should be respectively submitted via email to Prof. Kitack Lee (ktl@postech.ac.kr). Review of applications will begin immediately and remain open until the position is filled.

Postdoctoral Research Opportunity.

The Naval Research Laboratory (NRL) is seeking a postdoctoral associate in physical oceanography to expand our understanding of Arctic Ocean dynamics important for increasing the forecast capabilities of the Navy's state-of-the-art coupled ice-ocean and ice-ocean-atmosphere model prediction systems. The candidate will work with NRL researchers in developing new techniques for the assimilation of snow and ice thickness data into the Community Ice Code (CICE) and study Arctic processes with global and relocatable ice-ocean-atmosphere coupled modeling systems. This challenging work requires a broad understanding of physical oceanography and Arctic processes. The selected applicant will work with NRL to study the impact of reduced ice volume in the Arctic using satellite, airborne, and in situ observations with our coupled models. Strong programming skills, especially with MATLAB and FORTRAN, are required. Familiarity with CICE, HYCOM and WaveWatch III models and data assimilation would be beneficial.

The Naval Research Laboratory provides an opportunity to work with a large group of highly skilled and internationally recognized physical oceanographic researchers. We have access to excellent supercomputing and general computational resources in addition to extensive historical and real-time regional and global data sources. For an overview of research projects in the Ocean Dynamics and Prediction branch of the Naval Research Laboratory located at the Stennis Space Center in Mississippi, visit http://www7320.nrlssc.navy.mil/projects.php.

A postdoc will be hired with stipends approximately of $75,621 through the National Research Council (NRC) Research Associateship Programs (RAP; http://sites.nationalacademies.org/pga/rap/), or the American Society for Engineering Education (ASEE; http://www.asee.org/fellowships/nrl) Naval Postdoctoral Programs. NRL is an equal opportunity employer and this position is open to U.S. citizens and foreign nationals with green cards. Interested applicants should contact Mr. Richard Allard (Richard.allard@nrlssc.navy.mil).

Vacancy Announcement Tenure Track Assistant Professor in Chemical Oceanography

December 2014

The School of Fisheries and Ocean Sciences (SFOS) at the University of Alaska Fairbanks (UAF) seeks applications from exceptional candidates for a tenure-track assistant professor position in chemical oceanography. Specialties of interest include ocean acidification, marine inorganic carbon chemistry, carbon biogeochemistry, carbon cycle-climate interactions, isotope biogeochemistry, and evaluation of the biological impact of ocean acidification. We are particularly interested in applicants whose research plan involves the new ice-capable, Global Class Research Vessel Sikuliaq.

UAF is Alaska's research university, North America's Arctic university and a world leader in Arctic and climate change research. The successful applicant will enjoy opportunities for collaboration within SFOS's vibrant high-latitude research program. The School offers a Minor in marine science, and MS and PhDs in oceanography and in marine biology. The UAF campus houses the Ocean Acidification Research Center (OARC), Alaska Stable Isotope Facility (ASIF), UAF's Advanced Instrumentation Laboratory (AIL), the Core Facility for Nucleic Acid Analysis, and is linked to the joint NOAA, UAF Kasitsna Bay Laboratory, Alaska SeaLife Center and the Seward Marine Center. SFOS has over 60 faculty based throughout Alaska and over 150 graduate students engaged in thesis research in Alaska waters, and throughout the world.

Applicants must hold a Ph.D. in oceanography or closely related discipline, and preferably have post-doctoral and teaching experience. The position requires research, education and service that support Alaska's ocean resources and the communities that rely on them. The successful candidate will be expected to teach core and/or develop specialty oceanography courses for the graduate and undergraduate academic programs, develop a vigorous externally-funded research program and mentor graduate students. Applicants must submit a statement of interest that outlines their qualifications for this position and includes a research plan, teaching statement, curriculum vitae, and names and contact information of at least three references. Applications must be submitted to Job Posting #0069942 at https:// www.uakjobs.com. For questions about the position, please contact Dr. Matthew Wooller, chair of the search committee, at mjwooller@alaska.edu. Review of applications will begin February 15th. For full consideration applications should be received by March 1st, 2015.

Solid Earth Geophysics

College Lecturer–Department of Geosciences

The University of Akron is expanding its teaching strengths in the Department of Geosciences by opening two non-tenure track positions with foci on earth systems history and mineralogy. Current faculty members serve approximately 40 M.S. students and 130 undergraduates majoring in geology, environmental science, geographic information systems and geography. Candidates must possess Ph.D (or abd) in a geosciences field. Competitive earth systems history candidates (Job #8534) must have the ability to teach courses including Historical Geology and Paleobiology/Paleontology. Competitive mineralogy candidates (Job #8535) must have the ability to teach courses in mineralogy and petrology. We expect strong candidates for both positions to demonstrate the ability to teach Physical Geology, Geology for Engineers, and general education courses that focus on the earth sciences. Successful candidates will be expected to develop field-based experiences for undergraduate courses. In addition to strong abilities in teaching, we anticipate that successful candidates will have records of scholarship.

For complete details and to apply visit: http://www.uakron.edu/jobs. Refer to the job # listed above.

When completing the application be prepared to attach the following documents: a curriculum vitae; 2) a brief statement of teaching philosophy that describes your pedagogical approaches and how your teaching and research experiences will contribute to the growth and success of the department; 3) unofficial transcripts; 4) contact information for at least 4 references. Applicants should fully describe their qualifications and experience with reference to the minimum and preferred qualifications. Review of applications will begin February 16, 2015. The start date is August 2015. Questions about the Geosciences position can be directed to Dr. Ira Sasowsky at ids@uakron.edu.

The University of Akron is an equal education and employment institution. It is the policy of this institution that there shall be no unlawful discrimination against any individual in employment or in its programs or activities at The University of Akron because of race, color, religion, sex, age, national or ethnic origin, disability, or status as a veteran.

Department of Marine, Earth, and Atmospheric Sciences Assistant Professor – Structural Geology and Tectonics NC State University – Raleigh, NC

Founded in 1887, NC State is a land-grant institution distinguished by its exceptional quality of research, teaching, extension, and public service. Located in Raleigh, North Carolina, NC State is the largest university in North Carolina, with more than 34,000 students and 8,000 faculty and staff. National rankings consistently rate Raleigh and its surrounding region among the five best places in the country to live and work, with a highly educated workforce, moderate weather, reasonable cost of living, and a welcoming environment. A

collaborative, supportive environment for business and innovation and research collaborations with area universities and the Research Triangle Park are compelling reasons for relocation to the area.

Located within the College of Sciences at NC State, MEAS is one of the largest interdisciplinary geoscience departments in the nation. Opportunities exist for disciplinary and interdisciplinary interactions with more than 30 marine, earth and atmospheric scientists. Additional information about the department and its facilities can be found on the web page: http://www.meas.ncsu.edu. NC State also hosts large programs in geotechnical and construction materials engineering http://www.ce.ncsu.edu, and has recently established the Center for Geospatial Analytics: http://geospatial.ncsu.edu.

The department seeks to fill a tenure-track faculty position at the rank of assistant professor in structural geology and tectonics. Possible research areas include, but are not limited to: rock mechanics, neotectonics, thermochronology, sedimentary basin analysis, plate kinematics and geodesy. Candidates that combine field observations with precision measurement techniques, numerical simulations, analogue models, or laboratory experiments are preferred, and applicants should have a strong interest in interdisciplinary collaborations across and beyond the geosciences.

Position Responsibilities: This position will teach an undergraduate-level course in structural geology, as well as other undergraduate and graduate classes commensurate with the candidate's interest and expertise. An interest in participating in the Department's capstone undergraduate geology field course also is desirable. MEAS places a high value on excellent instruction and the use of innovative teaching methods.

Minimum Education/ Experience: Applicants must hold a Ph.D. degree in the geosciences or a related field, or equivalent professional experience.

Department Required Skills: The successful candidate must demonstrate strong potential for outstanding accomplishments in research, research supervision, and teaching.

Application Instructions: Review of applications will begin on 10 February 2015; the position will remain open until filled. The start date of this position is 15 August 2015. Applications, including cover letters, curriculum vitae, teaching and research statements, and contact information for three references must be submitted online at https://jobs.ncsu.edu/. Please search for position number #00104417. You can also apply directly using the link below:

https://jobs.ncsu.edu/postings/46092

NC State University is an equal opportunity and affirmative action employer. All qualified applicants will receive consideration for employment without regard to race, color, national origin, religion, sex, age, veteran status, or disability. In addition, NC State University welcomes all persons without regard to sexual orientation. Persons with disabilities requiring accommodations in the application and interview process please call (919) 515-5575.

Geomagnetics Postdoctoral Researcher

Applications are now being accepted for a Postdoctoral Research Associate, funded through the University of Maryland College Park (UMCP) and the Center for Research and Exploration in Space Science and Technology (CRESST). The postdoc would work in the Planetary Geodynamics Laboratory of the NASA Goddard Space Flight Center (GSFC) in the area of geomagnetism, with emphasis on one of the following sub-areas: (1) numerical modeling of electric currents and the associated magnetic fields generated by oceanic flow processes, and the integration of these elements into the global geomagnetic field modeling; (2) determination of core flow utilizing surface geomagnetic observations and geomagnetic data assimilation. The postdoc will be expected to work closely with the core and crustal magnetic group at NASA/GSFC, but is also strongly encouraged to carry out independent research. The position is for one year, with possible extension depending on future funding and mutual agreement.

Applicants must have a Ph.D. degree (or expect to have the degree by the start of the appointment) in a related field of physics, geophysics and/or applied mathematics. Applicants are expected to have strong quantitative analysis and modeling skills - in addition to knowledge of geomagnetic fields, satellite or ground observatory data, geomagnetic field models, and core dynamics. Applicants also familiar with UNIX, Fortran, and parallel computing will be preferred.

Each applicant should send a Curriculum Vita, list of publications, statement of research interests, and contact information for three references to:

Geomagnetics
CRESST/UMCP
Mail Code 660.8, NASA/GSFC
Greenbelt, MD 20771, or
Via e-mail to virginia.c.peles@nasa.gov

Salary and benefits are highly competitive and commensurate with experience and qualifications.

Information regarding the Planetary Geodynamics Laboratory is found at:

http://science.gsfc.nasa.gov/solarsystem/planetarygeodynamics/

For information on CRESST and the UMCP's Department of Astronomy, please contact Tracy Huard (thuard@astro.umd.edu). The appointment may start as early as March 2015.

The University of Maryland is an Affirmative Action, Equal Opportunity Employer.

Women and minorities are encouraged to apply.

All applications received by March 2, 2015 will receive full consideration.

Interdisciplinary/Other

ASSISTANT PROFESSOR Neotectonics (tenure-track)

The Nevada Bureau of Mines and Geology (NBMG) at the University of Nevada, Reno seeks applicants with expertise in neotectonics and Quaternary geology. Nevada is one of the most exciting regions in the world to conduct research in the geosciences, particularly in the fields of neotectonics and geologic hazards. Position Responsibilities: The primary responsibilities of this position will be to develop programs in research and education in the field of neotectonics with emphasis on paleoseismic and earthquake hazard research in Nevada and the surrounding region. Research will focus on landscape evolution primarily as it relates to Quaternary faulting, utilizing innovative approaches, such as LiDAR, to conduct detailed geologic mapping and dating of Quaternary units and surfaces. The successful candidate will also be expected to contribute to the development of datasets and reports on Nevada's Quaternary faults and seismic activity, including periodic assessments and syntheses of hazards facing its major cities and infrastructure. Education will include teaching courses in the successful candidate's area of expertise, such as neotectonics, geologic hazards, and Quaternary geology in the Department of Geological Sciences and Engineering and supervising graduate students. Research and educational efforts will involve integrated multi-departmental (e.g. Nevada Seismological Laboratory) and multi-institutional efforts, with scientists from academia, industry, other institutions, and government labs. The successful candidate will be asked to communicate effectively with the public and community leaders regarding natural hazards in Nevada and coordinate mitigation and response efforts with

local and federal emergency management agencies.

Qualifications: Applicants must have a doctorate in geology or a related geoscience field by the time of hire and a demonstrated record of research on topics related to neotectonics as indicated by dissertation research, industry experience, and/or peer-reviewed publications. Excellent communication skills, as demonstrated in written application materials; commitment to public service; potential for, or established record of publications; and ability to attract funding are essential. The successful candidate must also have the ability to develop and coordinate programs and work in teams to accomplish major goals.

Preference will be given to candidates with academic or industry experience in neotectonics. Expertise in paleoseismology (e.g. trenching), surficial processes, Quaternary dating techniques, LiDAR, and/or InSAR will be valued. Preference will be given to candidates who have demonstrated research productivity with publications in peer-reviewed literature. The successful candidate will compete for funding from a variety of sources, including federal agencies interested in fundamental and applied geoscience research (e.g., NSF, USGS, Department of Energy, and Bureau of Land Management) and industry. Therefore, preference will be given to candidates who explain achievable plans for funded research on Nevada-focused topics in neotectonics in their letters of interest. In addition, preference will be given to candidates who understand the role of NBMG as the state geological survey of Nevada and can articulate how NBMG can better serve stakeholders (citizens, government, and industry) on issues related to geologic hazards.

Salary and Date of Appointment: The position will be a tenure-track faculty appointment at the assistant professor level with an academic-year base salary that is competitive with other research universities. Starting date will be July 1, 2015 or shortly thereafter, depending on availability of the successful candidate.

To apply, please visit: https://www.unrsearch.com/postings/16813. Please submit a letter expressing your interest in the position and research plans; names, e-mail addresses, postal addresses, and telephone numbers of at least three references; a complete curriculum vitae; and electronic copies of up to three of your publications to http://jobs.unr.edu/. Application deadline is March 10, 2015. For further information about NBMG, please consult our website (http://www.nbmg.unr.edu).

The University of Nevada, Reno is committed to Equal Employment Opportunity/Affirmative Action in recruitment of its students and employees and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability, and sexual orientation. The University of Nevada employs only United States citizens and aliens lawfully authorized to work in the United States. Women and under-represented groups are encouraged to apply.

GDL Foundation Fellowships in Structure and Diagenesis

The GDL Foundation supports study and research of chemical and mechanical interactions, structural diagenesis, in sedimentary basins. Practical applications are of particular interest.

We are currently seeking applications from M.S. and Ph.D. candidates, post-doctoral researchers, and scientists for fellowships, up to $10,000, based on specific proposals for research and participation in meetings and conferences to share results.

Submit applications (available at: www.gdlfoundation.org) by April 1, 2015.

RESEARCH ASSOCIATE PROFESSOR (tenure track) Geothermal Specialist

The Nevada Bureau of Mines and Geology (NBMG) at the University of Nevada, Reno seeks applicants with expertise in geothermal energy research. Nevada is one of the most exciting regions in the world to do research in the geosciences and one of the best in the U.S. for the study of geothermal resources.

Position Responsibilities: The primary responsibilities of this position will be to develop broad programs in research and education in the field of geothermal energy while serving as Director of the Great Basin Center for Geothermal Energy. The applicant is expected to conduct a nationally competitive research program that will include innovative approaches to understanding the complexities of fluid flow in the crust with a concentration on Nevada and the surrounding Great Basin region. The successful candidate will also be expected to contribute to the development of datasets and reports on Nevada's geothermal resources, maintain geothermal databases as part of NGDS (National Geothermal Data System), and provide state resource assessments. Education will include teaching courses in geothermal related topics in the Department of Geological Sciences and Engineering (DGSE), supervising graduate students, and contributing to developing a geothermal curriculum. Research and educational efforts will involve multi-departmental and multi-institutional efforts, with scientists from academia, industry, other institutions, and government labs. The successful candidate will be asked to communicate effectively with the public and community leaders regarding the geothermal resources of Nevada.

Qualifications: Applicants must have a doctorate in geology, geologic engineering, geophysics, reservoir engineering or a related geoscience or engineering field by the time of hire and a demonstrated record of research on topics related to geothermal energy as indicated by funded research, industry experience, and/or peer-reviewed publications. The successful candidate must have at least 5 years of experience in geothermal research in such areas as rock mechanics, 3D modeling, geophysical techniques, reservoir engineering, and/or geochemistry. Excellent communication skills, as demonstrated in written application materials, commitment to public service, established record of publications, and ability to attract funding are essential. The successful candidate must also have demonstrated ability to develop/coordinate programs and work in teams to accomplish major goals.

Because the individuals will be competing for funding from a variety of sources, including industry and federal agencies, for fundamental and applied geoscience research (e.g., NSF, DOE, and USGS), preference will be given to candidates who explain achievable plans for funded research on Nevada-focused topics in geothermal energy in their letters of interest. In addition, preference will be given to candidates who understand NBMG's role as the state geological survey of Nevada, especially to those who can articulate a plan of how NBMG can better serve stakeholders (citizens, government, and industry) on issues related to geothermal resources.

Salary and Date of Appointment: The position will be a tenure-track faculty appointment at the associate professor level with an academic-year base salary that is competitive with other research universities. Starting date will be July 1, 2015 or shortly thereafter, depending on availability of the successful candidate.

Application: Please submit a letter expressing your interest in the position and research plans; names, e-mail, postal addresses, and telephone numbers of at least three references; a complete vita; and electronic copies of up to three of your publications to https://www.unrsearch.com/postings/16685. Application deadline is March 1, 2015. For further information about NBMG, please consult our website (http://www.nbmg.unr.edu).

The University of Nevada, Reno is committed to Equal Employment Opportunity/Affirmative Action in recruitment of its students and employees and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability, and sexual orientation. The University of Nevada employs only United States citizens and aliens lawfully authorized to work in the United States. Women and under-represented groups are encouraged to apply.

The stable isotope lab at Duke (DEVIL) seeks new clients for 13C,15N, 2H and 18O analyses. Quick turn-around for EA, GC-C, TCEA, dual inlet, GasBench. 20% discount for first-time clients. Contact Jon Karr at jkarr@duke.edu or 919-660-7418.http://nicholas.duke.edu/devil/

Student Opportunities

Applications are invited for PhD graduate research assistantships covering a broad range of natural scientific disciplines within the SFB/TR32 "Patterns in Soil-Vegetation-Atmosphere-Systems: Monitoring, Modelling and Data Assimilation" based at three German universities in Aachen, Bonn and Cologne as well as the Research Centre Jülich.

The TR32 is an interdisciplinary collaborative research center dealing with patterns in state variables, mass and energy fluxes in the coupled soil-vegetation-atmosphere system due to complex exchange processes and interactions between the compartments. For details regarding the available positions and the application process, please visit www.tr32.de.

The University of Virginia is hosting its third annual "Intensive Summer School in Computing for Environmental Sciences" (ISSCENS), our summer school and internship initiative geared toward environmental science graduate students and upper level undergraduate students. The ISSCENS application form-as well as detailed information containing schedules and eligibility requirements-can be found at http://web.uvacse.virginia.edu/

UNAVCO Summer Internships in Boulder: This summer UNAVCO is offering unique internship opportunities for undergraduate and graduate students. Our internships are real-world work experiences related to geoscience research and education. We are looking for two Geo-Outreach Specialists with video experience and three Education Specialists (geo-workforce, terrestrial laser scanning and geodetic data). For more information and to apply visit www.unavco.org/careers.

Postcards from the Field

Sunrise in Amazon! We took this picture from a 50-meter tower called ZF2 north of Manaus. Instruments on this tower measure the "breath" of the tropical forest. Just amazing to see the forest from the top!

Xi Yang (Brown University)

View more postcards at *http://americangeophysicalunion.tumblr.com/tagged/postcards-from-the-field.*

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