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Celebrating the "Blue Marble"

NASA

The "Blue Marble" photograph, taken 7 December 1972 by the Apollo 17 crew about 5 hours after launch.

An unplanned photograph taken more than 20,000 miles from Earth may have had more influence on humanity than any other photograph in our history.

Forty years ago this week, on 7 December 1972, geologist Harrison "Jack" Schmitt, an astronaut and a member of the crew of Apollo 17, took the photograph of the Earth that is often credited with changing the way people think about our planet. The first photograph of the entire round, fully illuminated Earth was snapped at more than 20,000 miles from Earth a little more than 5 hours after Apollo 17's launch. Apollo 17, on its way to the Moon and with the capsule oriented such that the Sun was directly facing the Earth, had reached a distance far enough away for the crew to see the entire planet [*Reinert*, 2011]. The crew was instructed not to take photographs at that time, but the astronauts were fascinated by their views of the Earth.

Although the crew had already taken other photographs, this one was special. Apollo 17 was the last manned lunar mission, and yet the astronauts on board were the only three thus far to see the full Earth. Apollo 17's perspectives of Earth did not end with the "Blue Marble" photo. After two of the Apollo 17 crew landed on the Moon and had finished their first major task—getting the rover assembled on the Moon's surface—astronaut Eugene Cernan was distracted by the view of the Earth in the distance. He called to Schmitt, who was working with him on the Moon's surface: "Oh, man. Hey, Jack, just stop. You owe yourself 30 seconds to look up over the South Massif and look at the Earth!" Schmitt replied, "What? The Earth?" Cernan instructed, "Just look up there." Schmitt quipped, "Ah! You seen one Earth, you've seen them all." Usually, the quote ends there, but what Cernan said next just as he got back to work on the rover hints at why scientists devote so much time to studying our planet. He said, "No you haven't, babe. When you begin to believe that…"

By the time the Apollo team got back to Earth, they were surprised to see that various environmental organizations had already picked up this exchange; as a result, posters and T-shirts were beginning to appear that had the picture of the "Blue Marble" and the saying "You seen one Earth, you've seen them all."

Actually, the "Blue Marble" shows the Earth from afar as the complex system of air, water, and land we all recognize: "Its blue expanse of ocean, its thin yet dynamic veil of atmosphere, and its brown and green jigsaw of continents all give the Earth a vitality not seen anywhere else in the known universe" (National Geographic Society, http://science.nationalgeographic.com/science/space/solar-system/earth/). The abundance of water on our planet visible in the "Blue Marble" photo clearly separates us from all others in the solar system. The flows and interactions of clouds as part of our weather also appear prominently in the photo. The interconnectedness of all the spheres—hydrosphere, atmosphere, cryosphere, and lithosphere—into one sphere is the power of this image and of later images of the Earth taken from unmanned spacecraft. Together, these photographs form what NASA calls the "Blue Marble" series.

A Symbol of a Fragile Earth

For me, 1972 was the year I decided to switch my career from engineering to studying the chemistry and physics of the Earth's atmosphere. I cannot say that the "Blue Marble" photo made a difference in that decision, but I can say that the first time I saw that photograph it took my breath away. The Earth looked so fragile, very unlike the roughness of the earth beneath my feet. Like everyone else, I had seen many artists' depictions and models of the Earth, but none of those had the same visceral impact on me as did seeing our planet surrounded by the blackness of space, sitting there alone with nothing to support it.

I was not alone in feeling that the photograph evoked how beautiful, fragile, and unique our home is and how important it is to understand and preserve it. Seeing for the first time "our" "Blue Marble" in a vast void has brought home to many how much we depend on the Earth and that it is our responsibility to protect the health and well-being of this collective, interdependent ecosystem. So it is not surprising that the "Blue Marble" became the symbol of the environmental movement that had started with the first Earth Day two and half years earlier. Indeed, the "Blue Marble" and other pictures from space (most notably, the "Earthrise" photograph taken from Apollo 8) are often mentioned as playing a significant role in the growth of environmental awareness during the 1970s. Many "green" organizations have used the photograph in their reports and advertisements. Robert Poole, in his book *Earthrise: How Man First Saw the Earth*, quotes ecologist Donald Worster, who explained that the "Blue Marble" was "a stunning revelation…Its thin film of life… was far thinner and far more vulnerable than anyone had ever imagined." Poole goes on to say, "Suddenly the image of the Earth was everywhere; it seemed to some to mark 'a new phase of civilisation', the beginning of the 'age of ecology'"—slogans of a society coming to grips with its place in the vastness of space [*Poole,* 2008].

As an atmospheric scientist, I have been particularly struck by the thinness of the atmosphere in the "Blue Marble" photograph and in the many other photographs taken from space. Sitting on the Earth, watching our weather, we tend to think of the atmosphere as being vast. Not only does this atmosphere sustain life on Earth through the interplay of oxygen and carbon dioxide in different forms of life, but it also provides special protections to life through the existence of the ozone layer, which protects organisms from harmful levels of solar ultraviolet radiation, and the greenhouse effect, which, because of heat-trapping gases in the atmosphere, prevents ours from being a frozen planet. But the thinness we see from space brings home to us why we need to be concerned about pollution and the effects we are having on those very aspects that protect us.

To some degree, it is surprising just how large a role the "Blue Marble" has had in the environmental movement. As Joseph N. Tatarewicz of the University of Maryland, Baltimore County put it, "It is a great irony that this photograph should become the icon for environmental stewardship and an awareness of the limits of technology and science, since it was made possible largely by technological systems originally designed for military purposes. Still, 'The Blue Marble' is an aesthetic of considerable power and simplicity—and one acquired through very complex and even accidental means" (see "The Blue Marble," http://invention.smithsonian.org/resources/online_articles_detail.aspx?id=552). As astronaut Bill Anders of Apollo 8 once stated, "It's ironic that we had come to study the Moon" when the trip to the Moon was "really discovering the Earth."

A Glimpse of a United World

Another obvious feature of the "Blue Marble" photograph is the lack of borders and boundaries between nations. Astronaut Russell Scheickhart, in describing his experience from space on the Apollo 9 mission said, "When you go around the Earth in an hour and half, you begin to recognize that your identity is with the whole thing. And that makes a change. You look down there and you can't imagine how many borders and boundaries you cross, again and again and again, and you don't even see them. And from where you see it, the thing is a whole, the Earth is a whole, and it's so beautiful. You wish you could take a person in each hand, one from each side in the various conflicts, and say, Look. Look at it from this perspective. Look at that. What's important?'" [*Schweickart*, 1977].

Poet Archibald MacLeish, in the book *Riders on the Earth: Essays and Recollections* [*MacLeish*, 1978], makes a similar statement in a different way. Because of images like the "Blue Marble" photograph, "for the first time in all of time men have seen it [Earth] not as continents or oceans from the little distance of a hundred miles or two or three, but seen it from the depth of space; seen it whole and round and beautiful and small." He then went a step further to imagine how this would affect humanity: "To see the Earth as we now see it, small and beautiful in that eternal silence where it floats, is to see ourselves as riders on the Earth together, brothers on that bright loveliness in the unending night…who see now they are truly brothers."

Taking this one step further, *Poole* [2008] calls the "Blue Marble" "a photographic manifesto for global justice."

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A Public Transformed

Looking closer at ourselves, we will likely never know exactly what impact the "Blue Marble" has had on the geosciences over the last 40 years. I find it interesting that younger geoscientists have grown up entirely with this view of the Earth and take it as their birthright that the Earth is in their care.

However, we do know that subsequent to the emergence of a perspective of Earth as a fragile home, there has been a dramatic increase in the study of our planet and its environment. Since 1972, AGU has grown by almost a factor of 6, from 10,592 members to now more than 62,000 members. For the last several years, I have had the pleasure to chair the Global Environmental Change focus group within AGU; this focus group has grown extremely rapidly in recent years and now has more than 11,600 members associated with it. From 1972 to 2011, 24,342 Ph.D.s were awarded in the geosciences in the United States (C. Keane, American Geosciences Institute, private communication, 2012). The number of Ph.D.-granting departments has grown from 210 to about 250 over this time period. At the undergraduate level the number of degree-granting programs in the geosciences has swelled from 300 in 1972 to just shy of 700 now. Undergraduate and graduate enrollments in the geosciences especially grew substantially during the 1960s and 1970s [*American Geosciences Institute*, 2009]. In comparison, enrollments in undergraduate and graduate physics programs have been roughly constant over the last 4 decades and have not seen this kind of growth (American Institute of Physics, http://www.aip.org/statistics/).

No study can quantify how the "Blue Marble" image has changed societal attitudes. However, anecdotally, the "Blue Marble" photograph made it difficult for us to look at our lives and our planet in the same way. Physician and atmospheric chemist James Lovelock, in his book *Gaia: A New Look at Life on Earth* [*Lovelock*, 1979] put it this way: "To my mind, the outstanding spin-off from space research is not new technology. The real bonus has been that for the first time in human history we have had a chance to look at the Earth from space, and the information gained from seeing from the outside our azure-green planet in all its global beauty has given rise to a whole new set of questions and answers." Those few people who have been to space seem to have been the ones most affected by this beauty. Astronaut Alan Shepard, commander on Apollo 14, showed this emotion when he said, "If somebody'd said before the flight, Are you going to get carried away looking at the Earth from the moon? I would have [said], No, no way. But yet when I first looked back at the Earth, standing on the moon, I cried" (see http://www.nmspacemuseum.org/halloffame/detail.php?id=55). It will be interesting as we look at the future of the first tourists going to space to see if the view of the "Blue Marble" will affect them in the same way.

The "Blue Marble" and the photographs that have come after it have given us a fresh look at the world around us. Apollo 17 astronaut Eugene Cernan has reflected about his experience on that flight [see *Rienert*, 2011]: "You have to literally just pinch yourself and ask yourself the question, silently: Do you know where you are at this point in time and space, and in reality and in existence, when you can look out the window and you're looking at the most beautiful star in the heavens—the most beautiful because it's the one we understand and we know, it's home, it's people, family, love, life—and besides that it is beautiful. You can see from pole to pole and across oceans and continents and you can watch it turn and there's no strings holding it up, and it's moving in a blackness that is almost beyond conception."

I cannot imagine a better description of the "Blue Marble," our home.

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NEWS

Congress Reviews Antarctic Program Report

The U.S. National Science Foundation (NSF) agrees with most of the recommendations that are detailed in the U.S. Antarctic Program Blue Ribbon Panel's 23 July report about Antarctic infrastructure, logistics, and other concerns, NSF director Subra Suresh said at a 15 November hearing of the House of Representatives Committee on Science, Space, and Technology. Suresh said this does not mean there are areas where NSF may have differences with the report; an NSF internal task force is still conducting its review. Suresh said NSF will present its response to the report at the 4–5 December meeting of the National Science Board. He noted that some report recommendations, including those regarding U.S. icebreaker capabilities, require action by other parts of the federal government.

The report, *More and Better Science in Antarctica Through Increased Logistical Effectiveness*, in part calls for diverting some planned science expenditures over the next 4 years to help upgrade the science support system, noting that subsequent savings on infrastructure and other expenses would allow for increased science funding while ensuring safe and effective science support.

At the hearing, Warren Zapol, chair of the U.S. National Research Council's Committee on Future Science Opportunities in Antarctica and the Southern Ocean, said that "many in the science community are worried about the potential impacts of the Blue Ribbon Panel's recommendations on the conduct of science. With limited resources, we need to assure a balance between improving our capability to support our future presence in Antarctica and the actual conduct of research today."

Norman Augustine, chair of the panel report, said that if Antarctic logistics improved, "without question" more money could go to science. He added that if federal budget sequestration occurs with an 8.2% cut to NSF, it would "disproportionately" affect the science rather than the logistics aspects of the U.S. Antarctic program.

—Randy Showstack, Staff Writer

FORUM

Collaborative Partnerships Help Bridge the Gap Between Science and Education

Scientists talk to scientists and educators talk to educators, but seldom do the two camps interact in a collaborative fashion. This gap between science and education results in poor student achievement and a general lack of interest in sciences.

To address the gap, we developed a model for partnering scientists, educators, and students in a 6 week research-education collaboration, designed to provide meaningful communication between science and education spheres. Our program involved a team of participants who worked together to learn from one another and to convey research concerning coastal ocean systems through developing an education module—complete with background information about the research topic, lesson plans with student projects, and video logs—based on the science.

Evaluation studies of the partnership program showed successful outcomes for both research scientists and educators. In addition, the project developed effective education materials that communicated complex research topics to both formal and informal audiences. Our hope is that this model of focused interaction between scientists, students, and educators to produce educational materials can serve as a guide to those interested in generating educational materials involving other topics in the geosciences.

The Need for Collaborative Partnerships

Recent studies have suggested that the United States, as a society, is falling behind in science and mathematics, particularly at the upper levels of secondary education (Trends in International Mathematics and Science Study, http://nces.ed.gov/timss/). Additional reports suggest that relatively few students relate to scientific concepts or understand the scientific process [*National Academy of Sciences*, 2007; American Association for the Advancement of Science, Project 2061, http://www.project2061.org].

Studies show that partnerships between research and formal education institutions can establish the necessary links to open-ended, real-world explorations that make science come alive for students and help bridge the gap between current scientific research and the secondary classroom, ultimately improving student achievement in science and mathematics [*Silverman*, 2009]. Collaborations between teachers and scientists can be made mutually beneficial by improving teachers' scientific knowledge and scientists' communication skills while forming sustained partnerships between scientists and educators [*Dressner and Worley*, 2006].

Development of Collaborative Partnerships

We have developed a model, which we call the Scientist-Educator Partnership Program, to foster collaborative partnerships that help facilitate communication between research science and education. To test this model, we assembled four-member teams, each consisting of a research scientist, graduate student, secondary science teacher, and undergraduate student. Each team focused

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on one relevant research topic associated with coastal ocean systems, matched with the scientist's area of expertise. The components of the Scientist-Educator Program included a 6-week research-education experience and the development of an education module associated with the research.

To initiate the Scientist-Educator Partnership Program, we first selected a scientist who was conducting research in coastal systems and was willing to work with a partnership team. Next, we assembled the team through an application process. The team members first participated in a 2-day orientation where they learned about the program and research topic, practiced teamwork, and shared ideas about the assembly of the education materials focused around their topic. The orientation was immediately followed by a 6-week research and education experience in which the teacher and undergraduate student learned about research and the scientist and graduate student learned about communicating science to a broad audience (middle school level).

During this 6-week period, team members worked together to develop content for education modules based on research. The process of module development served as the unifying tool through which all team members could contribute on an equal basis. The science content came from the scientist and graduate student, while the interpretation came from the teacher and undergraduate student, thus creating a two-way learning experience for participants (Figure 1). Details for our 10 Scientist-Educator Partnerships, associated research topics, team members, and educational modules can be found at http://www.teachoceanscience.net/teaching_resources/education_modules/. The module lessons were tested in the classroom by the participating teacher, were reviewed by a panel of 10 teachers, and are currently available for use in classrooms.

A Specific Education Module in Detail: Bringing Research Into the Classroom

One of our scientist-educator partnership teams focused on coastal hypoxia. In coastal marine environments, hypoxic areas (or "dead zones") are regions of low oxygen concentrations caused by interactions between biological, chemical, and physical factors. During the past 50 years, increases in nutrients and labile organics derived from human activities on land have infiltrated runoff, throwing many coastal ecosystems out of balance when these substances reach the sea, which results in expanded hypoxic regions. Although scientists across the globe are studying the controlling factors and ecological effects of hypoxic zones, public knowledge of these processes is limited. Recent media attention on dead zones has increased public awareness; however, details of the causes and consequences of hypoxia are often poorly explained.

Our "Dead Zone" Scientist-Educator Partnership team worked together to study hypoxia and to produce an educational module focusing on dead zones and the associated scientific research. This Web module (http://www.teachoceanscience.net/teaching_resources/education_modules/dead_zones/get_started/) is visually based, with video clips, real-time data, and computer animations that make the science come alive for students. The module provides background and resource information on dead zones as well as hands-on student experiments, which can be conducted in the classroom and which address current National Science Education Content Standards.

Summary of Results and Benefits of the Collaborative Partnership

Our evaluation studies on the Scientist-Educator Partnership Program indicate that the experience provided the scientists and graduate students with new skills needed to communicate their research to a broader audience. Teachers also gained research experience and increased scientific content knowledge, and the undergraduate students built up their research and professional training, gained access to new contacts, and improved their communication skills. In postproject surveys and interviews involving 19 participants in the Scientist-Educator Partnerships, team members identified the following personal benefits:

- Team scientists reported that they gained science communication skills and that they and their colleagues on multi-investigator projects used materials produced by the team to help them meet their research grant requirements for outreach that extends the knowledge generated by research beyond the scientific community.
- All of the educators surveyed agreed or strongly agreed that the educational materials they helped produce will assist them in teaching science topics, and most strongly agreed that they gained useful field experience that they will draw on to teach ocean sciences.
- The undergraduate students from underrepresented groups agreed or strongly agreed that they had a research experience not obtained in the classroom and that the team experience gave them unique opportunities to explore or advance careers in science.

After the partnership ended, the professional relationships established among team members continued. For example, several educators contacted the scientists they worked with for advice on developing in-classroom experiments, and several of the undergraduate students who chose to pursue a career in science requested letters of recommendation from the scientists they worked with on the team.

These positive outcomes show that the model is both functional, in terms of delivering key communications products and teaching resources, and effective, in terms of facilitating sustainable scientist-educator linkages. Therefore, the model has proven useful in bridging the gap between research science and education in both formal classroom and informal educational settings. We hope that you will consider using a similar model to help bring current geosciences research to the K–12 classroom.

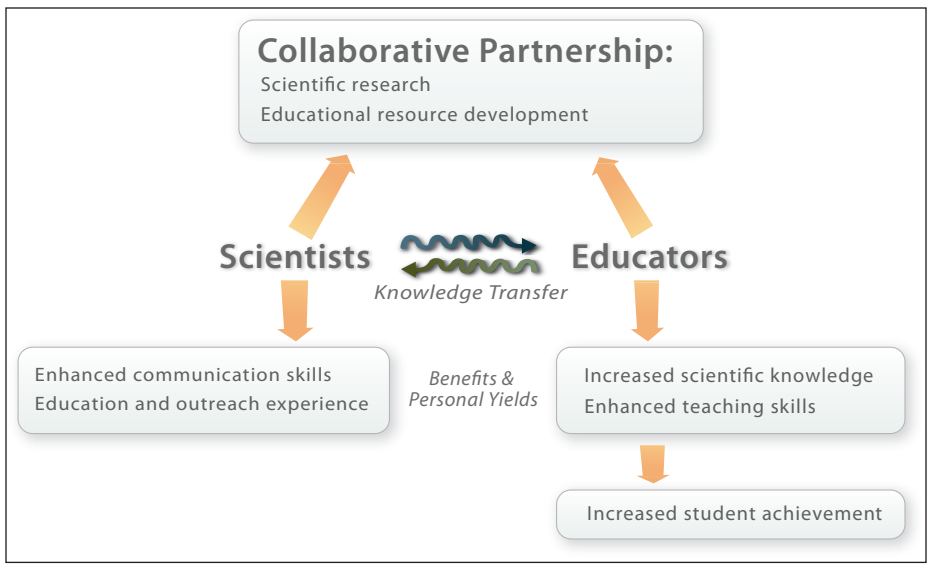

Fig. 1. Visual representation of the collaborative partnership between scientists and educators and the associated benefits.

Acknowledgments

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MEETINGS

Volcanism and the Atmosphere

AGU Chapman Conference on Volcanism and the Earth's Atmosphere; Selfoss, Iceland, 10–16 June 2012

Volcanic eruptions release volcanic ash and gases into the atmosphere that alter atmospheric chemistry and climate, and represent a hazard to aviation, particularly for modern jet aircraft. At the AGU Chapman Conference on Volcanism and the Earth's Atmosphere, 124 scientists gathered to discuss the effects of volcanism on the atmosphere at timescales ranging from billions of years, over which volcanic emissions have changed the composition of the atmosphere, to the Icelandic Eyjafjallajökull eruption in 2010, which caused a 10-day-long shutdown of North Atlantic air traffic. This was the third Chapman Conference on Volcanism and the Atmosphere, following those held in Hilo, Hawaii, in 1992 and in Santorini, Greece, in 2002, all of which were organized under the auspices of the Commission on Volcanism and the Earth's Atmosphere of the International Association of Volcanism and Chemistry of the Earth's Interior (IAVCEI) and the International Association for Meteorology and Atmospheric Sciences.

Several items contributed to the success of the conference:

Controversy. Much good science was presented at the meeting (see the online supplement to this meeting report at http://www.agu.org/journals/eo/v093/i049/2012EO490004/2012EO490004_suppl.pdf), and new research collaborations were forged. Students were exposed to new work and had the chance to talk informally with experienced scientists. These are the usual benefits of Chapman Conferences. But the controversy was interesting and unusual. Two of the issues that arose deserve particular mention: Franck Lavigne (Panthéon-Sorbonne University) and coworkers claimed to have discovered which volcano erupted in 1258 C.E. (not revealed by him at the conference), producing the largest stratospheric cloud of the past millennium (according to ice core records) and initiating the Little Ice Age, as described in new

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work by Gifford Miller (University of Colorado Boulder) and colleagues. On another topic, back-to-back talks by Michael Mann (Pennsylvania State University) and Rosanne D'Arrigo (Lamont-Doherty Earth Observatory) debated how well tree rings can quantify the climate response to large volcanic eruptions, such as that in 1258. The jury is still out.

Location, location, location. Each of the previous two Chapman Conferences on volcanism and the atmosphere was held in a volcanic location, and this one did not disappoint. Thanks to the guiding from local experts Thor Thordarson, Ármann Höskuldsson, Jónas Guðnason, and Karl Grönvold, the field trips during and after the conference were successes. Included in the conference were Tuesday afternoon trips to the active volcano Hekla, to a geothermal power plant, and to Thingvellir, where the mid-ocean ridge and the splitting of the tectonic plates are dramatically exposed. On Wednesday, conference attendees visited outcrops of historic and prehistoric ash layers, the products of the 2010 Eyjafjallajökull eruption, and climbed to the ice sheet near the base of the volcano. The postconference trip viewed the spectacular geology of the Reykjanes peninsula en route back to Reykjavík.

The location of Iceland also made for easy access from the United States and Europe, the home of the vast majority of attendees. Hotel Selfoss had excellent conference facilities, the town had enough restaurants, and it was close enough to Reykjavík (Iceland's capital) to allow access but isolated enough to ensure that attendees spent a lot of time together.

Scheduling. The conference organizers used the Gordon Conferences as a model, with talks in the morning, the afternoon free for discussion and collaboration, and an evening keynote lecture, followed by poster sessions lubricated by beer and wine. Every speaker also brought a poster, so as to participate fully in the poster sessions. One of the talks was adjusted to accommodate football fan attendees (for a Euro 2012 game), as was done in Santorini for a 2002 World Cup game. Spontaneous meetings were organized during some of the free afternoons to organize future work on the Laki eruption and volcano monitoring, and they were well attended. In fact, every poster session, even on the last day (Friday), saw people avidly discussing until past 11 P.M., not only because of the interesting science, but also because it was still light outside and did not seem like time for bed.

Support. AGU staff provided support during all phases of the planning and conduct of the conference. They gave individual attention to the needs of all the attendees and submitted a successful proposal to NSF (grant AGS-1213114) to provide travel assistance for all who requested support. In particular, Lynn Ervin, Cynthia Wilcox, and Brenda Weaver made the conference possible. In addition, the conference received support from IAVCEI and the Atmospheric Sciences and Volcanology, Geochemistry, and Petrology Sections of AGU.

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Seabed Authority Implements Regime for Mining Marine Minerals From Deep Seabed

Thirtieth Anniversary of United Nations Convention on the Law of the Sea and Eighteenth Session of the International Seabed Authority; Kingston, Jamaica, 16–27 July 2012

The United Nations Convention on the Law of the Sea (UNCLOS) is described as "the constitution for the oceans" because it pertains to all aspects of ocean space and maritime issues. A meeting celebrating the 30th anniversary of when the Convention became open for signature was held on 24 July 2012 in conjunction with the Eighteenth Session of the International Seabed Authority (ISA) at ISA headquarters in Kingston, Jamaica. The meeting and session had broad implications for the development of deep seabed mineral resources and for research on ocean ridges.

The Convention entered into force, and the ISA was established in 1994 (UNCLOS article 308, United Nations, 1997). Presently, 161 countries and the European Union are parties to the Convention and thus are ipso facto members of ISA (UNCLOS article 156, paragraph 2, United Nations, 1997). The United States has not yet signed the Convention; when signed, the United States will have governance over the largest exclusive economic zone (EEZ) and continental shelf in the world, extending national sovereign rights over ocean resources to an area greater than the Louisiana Purchase and Alaska combined.

A roster of speakers, many of whom were instrumental in framing the Convention, provided perspective on the history and scope of the treaty. A key concept of the Convention, discussed by the speakers, is that the "area" and its resources are the "common heritage of mankind" (UNCLOS article 136, United Nations, 1997). The area is defined as the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction, which is beyond the 200-nautical-mile-wide EEZ (article 57, United Nations, 1997). ISA is an autonomous agency independent of the United Nations that administers the mineral resources of the area "on behalf of mankind" (UNCLOS articles 153 and 156). The texts of the official documents of ISA are accessible at http://www.isa.org.jm.

ISA's management of potential marine mineral resources of the area primarily deals with mining polymetallic nodules ("manganese nodules"), polymetallic sulfides, and cobalt-rich ferromanganese crusts. Management involves granting exclusive 15-year exploration contracts based on rules, regulations, and procedures adopted by ISA following UNCLOS guidelines (UNCLOS, part XI, 1997). Five exploration contracts were approved at the eighteenth session. Three of the contracts were for polymetallic nodules, which are golf ball– to tennis ball–sized spherules with regionally variable contents of nickel, copper, cobalt, manganese, iron, and rare Earth elements. These nodules lie on sediment in vast expanses of abyssal plains, potentially covering some 60% of the ocean basin at a typical water depth of about 5 kilometers. The three nodule contracts were for tracts up to 150,000 square kilometers each in the eastern equatorial Pacific and were sponsored by the United Kingdom, the Republic of Kiribati, and Belgium. The remaining two contacts were for polymetallic sulfides concentrated by hydrothermal solutions driven by magmatic heat at ocean ridges. The sulfides contain variable concentrations of iron, copper, zinc, silver, gold, and trace quantities of elements used in electronics. The two sulfide contracts, each for a total area of 10,000 square kilometers, were sponsored by France and South Korea for sites on the Mid-Atlantic Ridge and the Central Indian Ridge, respectively. France's contract includes the large deposits of the trans-Atlantic geotraverse (TAG) hydrothermal field. This brings the number of exploration contracts approved by ISA to 17.

A more detailed version of topics discussed at both meetings can be found in the online supplement to this meeting report (http://www.agu.org/journals/eo/v093/i049/2012EO490005/2012EO490005_suppl.pdf).

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ABOUT AGU

2011 Editors' Citations for Excellence in Refereeing

In the 2 October 2012 issue of *Eos,* the 2011 Editors' Citations for Excellence in Refereeing were announced (*Eos, 93*(40), 391–394, doi:10.1029/2012EO400012). The editors' citations recognize this special service to the Union, and these individuals are to be commended for consistently providing constructive and thoughtful reviews.

The reviewers listed below were inadvertently omitted from that announcement. They, too, have been cited by editors of AGU journals for excellence in refereeing.

Jasa Calogovic
Cited by Geoffrey Tyndall
Geophysical Research Letters

John N. Christensen
Cited by Geoffrey Tyndall
Geophysical Research Letters

Todd K. Hinkley
Cited by Geoffrey Tyndall
Geophysical Research Letters

Randy Korotev
Cited by Michael Wysession
Geophysical Research Letters

Youssef Moudden
Cited by William Peterson
Geophysical Research Letters

Kerri A. Pratt
Cited by Geoffrey Tyndall
Geophysical Research Letters

Anne K. K. Smith
Cited by William Peterson
Geophysical Research Letters

Look Again: AGU Logo Has a New Look

For the first time since 1978, AGU has updated its logo. The logo's new look features a modernized icon and contemporary typography, and its balance has been improved by equalizing the weight of the icon and typography. The serifs have also been removed from the typography, giving the logo a more simple and contemporary feel. Though subtle, the new elements of the logo are clean, clear, and up to date.

Periodically refreshing an organization's logo is a common practice, and the new logo will ultimately strengthen AGU's brand and identity. The logo refresh is part of a broader effort to update the Union's visual image. AGU's mission continues to be the promotion of discovery in Earth and space science for the benefit of humanity. The updated logo will be incorporated within all program areas, presenting a clear and consistent picture of what AGU represents as an organization.

The updated logo will first be visible at the 2012 AGU Fall Meeting and subsequently will be incorporated throughout AGU's various programs and communications vehicles.

—MIRELLE MOSCOVITCH, Strategic Marketing Analyst, AGU; E-mail: mmoscovitch@agu.org

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AGU Updating Position Statement on Ocean Research: Call for Comments

AGU is in the process of revising its ocean research position statement. AGU position statements relate the understanding and application of the Earth and space sciences to relevant public policy. Members are encouraged to use position statements to help educate policy makers about important geoscience topics. The current list of AGU statements is available on the position statement Web page at http://www.agu.org/sci_pol/positions/. Statements are limited to one page in length to be most useful to legislators and other policy makers.

The AGU Council leadership team has appointed a panel to prepare an update on the AGU ocean research position statement for Council consideration in 2013. The draft revised statement appears below. The members on the panel include Phillip Taylor (chair), Brian Baird, Lora Clarke, Jana Davis, Scott Doney, Robert Gagosian, Miriam Kastner, Margaret Leinen, Frank Muller-Karger, Susan Roberts, Martin Visbeck, and Robert Weller.

The current ocean research statement was adopted in 2005 and focused primarily on the U.S. Commission on Ocean Policy's 2004 report "An Ocean Blueprint for the 21st Century." As such, the statement is significantly out of date. The panel was charged with rewriting the statement to reflect current scientific knowledge as well as policy and budget developments while also representing a global worldview, representative of AGU membership.

AGU members have an opportunity to provide comments to the panel on this draft Union position statement. Please submit all comments by 4 January 2013 to sciencepolicy@agu.org under the subject "AGU Ocean Research Statement."

—Erik Hankin, Public Affairs Coordinator, AGU, E-mail: ehankin@agu.org

Ocean Research and Education Are Foundations for Economic Growth

Investments in ocean research and education benefit the economic well-being of nations through greater understanding of devastating environmental hazards, sustainable use of ocean resources, safer and efficient maritime transportation, and a healthier ocean environment for a changing world.

Growing human populations and accelerating environmental change challenge our ability to provide food, energy and materials, and security from natural hazards. Our ocean plays a central role in all of these problems. AGU advances collaboration and international relationships across the sciences, works with private and government entities, and informs the public on the role of a changing ocean in our lives. AGU calls on policymakers, agencies, and private organizations worldwide to forge cooperation and make bold investments that enable scientific discovery and solutions to support the global economy.

The ocean and its resources are vital to life and our livelihoods on Earth. The ocean provides efficient global transportation routes and vast energy resources. It modulates weather and global climate, regulates the supply of fresh water on land, and supports a wealth of biological diversity. This diversity is a source of novel pharmaceuticals and the fisheries which are essential sources of protein for people the world over. Clean and productive seas play a central role in many cultures, and are pivotal for recreation and tourism in coastal communities.

The ocean is a major economic asset for coastal and land-locked nations. For example, in the U.S. and using 2010 statistics, 52% of the population lived in coastal watershed regions generating nearly 60% of the nation's GDP in 2010. Most imported goods (over $1.2 trillion/yr) and exports moved through coastal waterways and ports. Commercial fishing generated over $32B in income and more than one million jobs, while recreational fishing supported $19B in income and millions of additional jobs. Over 25% of U.S. domestic oil was produced from coastal and offshore waters. Oil refineries and wind farms, military installations and assets, rail and road networks, all crucial for national security, energy, commerce, and transportation, are concentrated along coasts. In our globally connected world, land-locked nations derive many benefits from the ocean such as general commerce and ocean products, and are impacted by the ocean's influence on the distribution of rainfall and heat. Innovative opportunities exist in ocean resources, technology, energy, transportation, and tourism.

Nations, people and economies worldwide face mounting risks today from rapid changes in the ocean. Protection of life, property, and critical infrastructure requires the scientific comprehension of our vulnerability to rising sea level, extreme storms, floods, droughts and tsunamis. We need to know how the atmosphere and ocean function together to affect weather and climate through the exchange of heat and moisture. We need to understand the influence of land use on pollution in coastal seas. Science provides the new knowledge we need to respond to rising ocean temperatures, the decline of fisheries, expansion of low oxygen zones, and changes in the chemistry of the ocean caused by increased carbon dioxide. The ability to predict and prepare for changing ocean conditions will depend on scientific research programs, disciplinary and interdisciplinary, international in scope, and involving the ocean sciences with other earth and social sciences. Greater knowledge and prediction skill is urgent when we consider the effort, time and costs of protecting infrastructure along coasts, rebuilding fish populations in our seas, developing new water resources for manufacturing and agriculture, and restoring communities in the wake of hazards.

Enhanced international cooperation is required to observe, understand and predict the ocean on a global scale for the near future and over decades of change ahead. Public-private-academic partnerships can empower the robust research programs needed to understand natural and human processes. Increased investments in ocean science and technology will be needed to yield the advancements to decrease vulnerability of coastal communities; improve safety at sea for the transportation industries; produce new medicines from unique marine bioactive compounds; and improve weather and decadal climate forecasts. These investments will build a foundation for environmental and economic futures of nations around our world.

What's on the Web?

Read the latest offerings from the AGU Blogosphere:

Mountain Beltway: "Digital images of the "Digital Geology Speed Dating" session at GSA" (http://goo.gl/6uMQ6)

Georneys: "What to buy a geologist for Christmas: 2012 edition" (http://goo.gl/XJLW3)

The Landslide Blog: "Boulders!" (http://goo.gl/2ySJe)

The Martian Chronicles: "MSL instrument papers available!" (http://goo.gl/wKUGi)

Dan's Wild Wild Science Journal: "NASA Terra satellite sees the fading fall colors" (http://goo.gl/ktHNI)

GeoSpace: "Huge signal-distorting space bubbles spawn along equator as night falls" (p).

CLASSIFIED

ADVERTISING INFORMATION

Eos is published every Tuesday, except the last week of December. For a classified or display advertisement to be published in a future issue of *Eos*, electronic copy must reach us by 23:59 eastern time, 9 days prior (Sunday) to publication, except around certain holidays, which have earlier deadlines. No cancellations accepted after deadline.

For inquiries on advertising pricing and availability:

E-mail: advertising@agu.org Phone: +1-202-777-7536 Facsimile: +1-202-777-7478

POSITIONS AVAILABLE

Atmospheric Sciences

Assistant, Associate or Professor Department of Atmospheric Sciences.

The Department of Atmospheric Sciences at the South Dakota School of Mines & Technology is inviting applications from qualified candidates for a tenure-track faculty position to complement and expand current areas of research in biogeochemistry, ecology and/or water resources. We are especially interested in candidates that have a strong background in aquatic resources, ecosystem integrity, ecology of streams and rivers, or environmental science, and that complement current department strengths in weather and climate science. Applicants should possess a PhD, or obtain it by the start date, in environmental sciences, and/or another natural science discipline. The successful candidate will teach graduate and undergraduate courses, acquire external research funding, and supervise student research in the Atmospheric and Environmental Science academic programs. Start date is negotiable, however is anticipated it will be no later than August 22, 2013. Individuals interested in this position must apply online at http://www.sdsmt.edu/employment. Human Resources can provide accommodation to the online application process and may be reached at (605) 394-1203. Review of applications will begin on February 1, 2013, and will continue until the position is filled. Employment is contingent upon completion of a satisfactory background investigation. SDSM&T is an EEO/AA/ADA employer & provider

Faculty Position Announcement DEPARTMENT OF ATMOSPHERIC SCIENCES NATIONAL TAIWAN UNIVERSITY TAIPEI, TAIWAN.

The Department of Atmospheric Sciences is seeking applicants for one to two faculty positions at the assistant, associate or full professor levels to begin in August 2013. Applicants with Ph.D. and research expertise in the field of atmospheric sciences and other related areas are welcomed. Candidates with post-doctoral experience are preferred.

Applicants should send their curriculum vitae, statement of research and teaching interests before December 31, 2012, to:

-Prof. Chun-Chieh Wu, Chair
-Faculty Search Committee
-Department of Atmospheric Sciences,
-National Taiwan University,
-No.1, Section 4, Roosevelt Road,
-Taipei 106, Taiwan
-Tel: +886-2-3366-3913
-Fax: +886-2-2363-3642
-E-mail: cwu@as.ntu.edu.tw

Both regular and electronic mails are acceptable. Please also arrange for three recommendation letters to be sent directly to the Chair of the Faculty Search Committee. Upon receipt of the application, an acknowledgement email will be sent to the applicant within a week. Applicants who do not receive the acknowledgement email please contact the Chair of the Faculty Search Committee via fax or telephone for confirmation.

Postdoctoral Fellow (12-125).

The data assimilation group at the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University seeks to fill a postdoctoral fellowship as part of a National Science Foundation (NSF) award to be located at CIRA in Fort Collins, Colorado. This Postdoctoral Fellow will investigate the impacts of non-Gaussian errors in both satellite retrievals and mesoscale data assimilation systems and test a new non-Gaussian, Bayesian-based system against the Gaussian approach. Review of applications will begin on December 15, 2012 and may continue until the position is filled. For complete position description and qualification requirements, visit https://www.cira.colostate.edu/personnel/employment_opportunities/requisition.php?id=58. Apply electronically by sending a resume, cover letter, and the names of three references to the attention of Human Resources Manager at the following e-mail address: humanresources@cira.colostate.edu. Please put your last name and 12-125 in the subject line of the e-mail. Colorado State University conducts background checks on all final candidates. CSU is an EO/EA/AA employer.

Tenure track position in Climate Science of Cold Regions, CIRES, University of Colorado Boulder.

The Cooperative Institute for Research in Environmental Sciences (CIRES, www.cires.colorado.edu), an interdisciplinary research institute within the University of Colorado Boulder, seeks a junior tenure-track appointment specializing in climate science of cold regions. Subjects of special interest to CIRES include sea ice, ice sheets, glaciers, and permafrost. The successful applicant will create a research program with productive collaborations both within and outside of CIRES leading to novel insights about climate mechanisms in cold regions, which may include the collection and analysis of original data. Candidates who employ technologies including satellite remote sensing, suborbital data acquisition, ground-based instrumentation or advanced earth system models in ways that enhance existing expertise within CIRES are particularly desirable. The successful candidate will have a tenure track affiliation in a relevant academic department, including, but not limited to, Geography or Atmospheric and Oceanic Sciences. The distribution of effort will be 40% research, 40% teaching, and 20% service. Minimum education requirements include a PhD in Atmosphere Science, Geography, Physics or a related field. Applications must be submitted to www.jobsatcu.com, posting #819483. Alternative formats of the job posting can be provided upon request for individuals with disabilities by contacting hr-ada@colorado.edu. The University of Colorado is an Equal Opportunity Employer committed to building a diverse workforce and encourages applications from women, racial and ethnic minorities, individuals with disabilities and veterans. The University of Colorado Boulder conducts background checks on all final applicants. Review of applications will begin December 1, 2012 and will continue until a successful applicant is selected. Questions can be sent to Professor Mark Serreze (Chair of the Search Committee) at mark.serreze@Colorado.EDU

Biogeosciences

Montana State University, Bozeman Postdoctoral Researcher in Geomicrobiology.

The research involves the geomicrobiological characterization of debris-rich glacial ice and is funded by a NSF Arctic Sciences grant to Drs. Mark Skidmore and Eric Boyd. Experience and expertise in microbial ecology is required, and experience working in systems with low biomass is advantageous. The position is available immediately, for one year initially, with potential for renewal based upon satisfactory performance and availability of

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funds. Dr. Boyd will be at AGU Fall Meeting from 4th - 6th December for discussions about the position. Please email him (eboyd@montana.edu) to arrange a meeting. Full details on the required and preferred qualifications for the position and application procedures can be found at http://www.montana.edu/jobs/research. AA/ADA/EEO/Vet Pref Employer.

Geochemistry

Assistant Professor of Geosciences.

Tarleton State University in Stephenville, Texas seeks applicants for a tenure-track Assistant Professor position to start September 2013. Applicants must have a Ph.D. in geosciences. ABD will be accepted if degree will be completed by September 2014. Expertise preferred in field geology, structural geology, geophysics and/or petroleum geology. Ability to establish and maintain a research program at the undergraduate level expected. All submissions must be made electronically through Tarleton's Human Resources site, http://www.tarleton.edu/hr/ . Review of applications will begin on March 1, 2013 and continue until the position is filled. Tarleton State University, an Equal Opportunity and Affirmative Action Employer and Educator, is committed to excellence through diversity. Tarleton State University is a proud member of the Texas A&M University system with an enrollment just over 10,000 students.

Assistant Professor Position in Paleoclimatology, Biogeochemistry, Environmental Geochemistry and Carbon Sequestration, Institute of Surficial Geochemistry(ISG), Nanjing University.

The ISG, a Ministry of Education Key Laboratory at Nanjing University, China, is seeking qualified candidates worldwide to fill multiple positions in geology/low temperature geochemistry/atmospheric sciences/marine sciences/environmental sciences/hydrology or any closely related fields. ISG provides a cutting-edge, multidisciplinary research platform aiming at exploring and developing new approaches and theories, as well as methodologies and their applications to the research of earth's surface system. For assistant professor position, a salary package of 200 thousands RMB annual salary, startup funds and housing bonus is offered.

Applications include a letter of application, curriculum vitae, publication list, summary of academic achievements (within 500 words), statement of future work plans (within 1 page), and two references. For further information and submission of applications, please contact: Dr. Yang Chen (phone: 8625-83686042,

email: chenyang@nju.edu.cn).

Hydrology

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING SAN DIEGO STATE UNIVERSITY 2013/2014 VPAA #2013/14-8.

The Department of Civil, Construction and Environmental Engineering at San Diego State University (SDSU) invites applications and nominations for a tenure-track faculty position in the water resources area, effective Fall 2013, at a rank commensurate with experience. A Ph.D. in Civil Engineering is required. Competitive candidates must have the ability to maintain a strong, extramurally funded, research program and demonstrated commitment to both undergraduate and graduate instruction, with a focus on hydrologic modeling and related water resource areas. The review of applications begins immediately and will continue until the position is filled. Full application guidelines are available at http://affiliated.sdsu.edu/ColEng/civilconsteng.htm.

SDSU is an Equal Opportunity/Title IX Employer.

FLORIDA, DELAND. Stetson University seeks a Physical Geographer or cognate at the Assistant or Associate level with interest in hydrology, i.e., dynamic water processes broadly defined in the Earth system. Research program with an international focus is considered an asset. We seek a teacher-scholar who is devoted to undergraduate education through leadership by example and shared research. A Ph.D. in geography or similar discipline is required with evidence of active scholarship and excellent undergraduate teaching. Review of applications will begin on January 11 and continue until the position is filled. Application materials may be submitted electronically to GESsearch@stetson.edu. For a complete description of the position, application procedures, and information about Stetson's commitment to inclusive excellence and our EOE statement, see http://www.stetson.edu/administration/academic-affairs/facultyopenings.php

Post Doc - Hydrologic Monitoring, Modeling, and GIS. The Warnell School of Forestry & Nat. Res. and USDA Forest Service Savannah River seek a Post-Doctoral Researcher to model and monitor watershed hydrology in small forested watersheds of the Savannah River Site, SC. The researcher will build and maintain climate, chemistry, soil, vegetation, LiDAR, geology, and GW data to support an on-going paired watershed study. The researcher will run and evaluate hydrologic models of critical flow paths, residence times, and streamflows to assess forest management scenarios at landscape scales. Experience needed in GIS, programming, and hydrologic modeling. Starting salary is $45,000 with benefits. Funding is available for at least two years. Work will be based at the Savannah River Site with funded travel to Athens, GA and other locations. Contact: Dr. C. Rhett Jackson, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30603-2152, rjackson@warnell.uga.edu, 706-542-1772.

Postdoc - Remote Sensing of Evapotranspiration.

The California Institute of Technology (Caltech), Postdoctoral Scholars Program at the Jet Propulsion Laboratory (JPL) invites applications for a postdoctoral research position in JPL's Water & Carbon Cycles Group - Climate, Oceans & Solid Earth Section.

The research will involve extensive analyses, validation, and product generation for global terrestrial evapotranspiration (ET). The work will entail running our ET algorithm (PT-JPL) in addition to other algorithms already running at JPL in a variety of manners: Evaluation of climate model (CMIP5) ET output using our remotely sensed ET data; Extension back in time of ET product beyond what has already been done; Extension forward in time of ET product using Visible Infrared Imaging Radiometer Suite (VIIRS) and other data when available; Projections forward in time running the ET algorithms with climate projections; Compiling and running ET algorithms with 250 m MODerate resolution Imaging Spectroradiometer (MODIS) data, 30 m Landsat data, and very high spatial resolution airborne data; Continued development of PT-JPL algorithm physics and applicability to upcoming NASA missions. Knowledge and understanding of global as well as regional ET algorithm remote sensing approaches and physical theory is expected. Strong programming skills are required. Ability to navigate a supercomputing system is desirable. The postdoc is expected to publish lead and co-authored papers with the project team. The successful applicant will be based out of JPL, and integrate into a larger ecosystems team led by Dr. Joshua Fisher. The postdoc will also work closely with Dr. Kevin Tu from Theiss Research. The postdoc will link in with international projects, i.e., GEWEX-LandFlux, as well as more regional applications-focused activities. Dr. Joshua Fisher, in JPL's Water & Carbon Cycles Group - Climate, Oceans & Solid Earth Section, will serve as JPL postdoctoral advisor to the selected candidate. The appointee will carry out research in collaboration with the JPL advisor, resulting in publications in the open literature.

Candidates should have a recent PhD in Environmental Science, Biometeorology, Hydrology, Engineering, Ecology, Biogeochemistry, Applied Mathematics, Physics, or related field with a strong background in computer programming skills (e.g., Matlab). Experience in ET remote sensing approaches and physical theory, and demonstrated ability and motivation to publish high impact scientific articles is highly desirable. Candidates who have received their PhD within the past five years since the date of their application are eligible. The annual starting salary for recent PhDs is $52,000 USD and can vary somewhat according to the selected applicant's qualifications. Postdoctoral Scholar positions are awarded for a minimum of one-year period and may be renewed up to a maximum of three years.

Please send a letter describing your research interests, a curriculum vitae, a list of three references (with telephone numbers, postal and email address) and arrange the reference letters to be sent to:

Name: Joshua Fisher

Address: 4800 Oak Grove Dr., Pasadena, CA, 91109

Telephone: 3235404569

Fax: (818) 354-3223

E-Mail: jbfisher@jpl.nasa.gov

Caltech and JPL are equal opportunity/affirmative action employers. Women, minorities, veterans, and disabled persons are encouraged to apply.

Postdoctoral Research in Mountain Hydrology and Water Sustainability.

The University of Colorado and National Center for Atmospheric Research invites applications for two full-time Postdoctoral Research Associates to work on projects related to observing and modeling the coupled hydrological, ecological, and engineered systems of the Colorado River Basin headwaters. Specific areas of research include the following areas:

i) Snowpack Characterization from Modeling and Remote Sensing

ii) Hydroclimatology of Mountainous Regions

iii) Water Resource Management Optimization and Modeling

The projects involve collaboration between researchers at the University of Colorado (CU) and the National Center for Atmospheric Research (NCAR). The post-doctoral associates will be funded by NSF's Water Sustainability and Climate Program under a project which integrates Social, Biological, Hydrological, and Engineering dimensions of climate change and water sustainability. Successful applicants will work with the PI's (Dr. Noah Molotch and Dr. David Gochis) and project Co-investigators to synthesize information regarding water cycling in the Colorado River Basin headwaters.

The positions require a Ph.D. in hydrology or related physical science or engineering field. Candidates with skills in remote sensing, hydrologic modeling, and / or data assimilation are encouraged to apply. Outstanding oral and written communication skills are required. To learn more about potential research topics, go to http://instaar.colorado.edu/research/labs-groups/mountain-hydrology-group/.

The University of Colorado is an equal opportunity employer committed to excellence through diversity. All qualified candidates, including women, minorities, veterans and disabled persons are encouraged to apply.

Appointment rank and compensation will be commensurate with background and experience and based on published CU and/or NCAR salary scales. Positions are open immediately and will remain open until filled.

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Applicants should electronically submit a CV, cover letter, one-page description of research interests, and the names of three references, all in PDF format to:

Prof. Noah Molotch
Institute of Arctic and Alpine Research
University of Colorado at Boulder
noah.molotch@colorado.edu

Postdoctoral Researcher Job Opening #372063 SWOT Hydrology Satellite Mission Ohio State University, Byrd Polar Research Center, Columbus Ohio.

Job Description:

The Postdoctoral Researcher is part of an international, multi-disciplinary team all working on the Surface Water and Ocean Topography satellite mission (SWOT, http://swot.jpl.nasa.gov). OSU's Climate, Water, and Carbon Program (CWC, http://cwc.osu.edu) is a lead university partner in SWOT. The new researcher will join our team conducting pre-launch planning for SWOT with a particular emphasis on discharge algorithms, risk-reduction studies, and operation of the SWOT instrument simulator. Given that SWOT's launch is scheduled for 2019-2020, this is an exciting opportunity to get involved. Overall, our research includes surface water hydrology and hydraulics, and both satellite-based measurements and physical modeling. Expertise in one or more of the following areas is desired: data assimilation methods, hydrodynamic modeling, hydrologic mass-balance modeling, or fluvial geomorphology. The successful candidate will work within our team and cooperate by exchanging results with colleagues at other universities, at NASA centers, and with international partners. Publication of results and submission of proposals for follow-on activities is required.

Salary:

$55,000 to $60,000 per year.

Requirements:

A PhD in fields such as hydrology, civil engineering, earth sciences, physical geography, or computer science is required for the position. This position requires successful completion of a background check.

Contact Information:

Doug Alsdorf, Associate Professor, the Ohio State University, alsdorf.1@osu.edu

Mike Durand, Assistant Professor, the Ohio State University, durand.8@osu.edu

Apply online at the OSU jobs web site at: https://www.jobsatosu.com/postings/search

The Department of Civil & Environmental Engineering & Earth Sciences (CEEES) at University of Notre Dame invites applications at all tenure-track/tenured levels in the areas of environmental fluid mechanics, environmental hydraulics and hydrology. We are seeking candidates with potential for developing a vigorous, broad, externally funded research program that compliments exisiting departmental strengths while participating in integrative collaborative research within and outside the department. Current strengths of CEEES are in the areas of computational hydraulics, environmental fluid mechanics, groundwater and surface hydrology, ocean and atmospheric fluid dynamcis, stratified and rotating flows and coastal engineering. The presence of vibrant structures, environmental engineering and earth sciences groups within the department, large inter-departmental strategic research partnerships such as the Environmental Change Initiative as well as world class laboratory and computational facilities offer unparalleled opportunities for multidisciplinary research in a dynamic intellectual environment. The successful candidate is expected to exhibit enthusiasm, promise and dedication to undergraduate and graduate teaching, consistent with departmental academic goals, and commitment to professional service. Applicants must have earned a doctorate at the time of appointment, and post-doctoral experience is preferred. Exceptionally well qualified candidates may be considered for an endowed professorship. For more information on the department, visit http://ceees.nd.edu and on the environmental fluid mechancis group www.nd.edu/~dynamics. Applicants should include in a single pdf document a copy of their curriculum vita, a letter describing their research and teaching interests and the names and contact information of four references. Applications should be uploaded directly, as a single PDF file, to the EFD position posted at http://ceees.nd.edu/Positions_Available_Environmental_Fluid_Dynamics. Please direct any questions to Professor H.J.S. Fernando, Chair of the Environmental Fluid Dynamics Search Committee, Department of Civil and Environmental Engineering and Earth Sciences, 156 Fitzpatrick Hall, University of Notre Dame, Notre Dame, IN 46556-0767 (efd@nd.edu). Review of applications will begin immediately, but the search will continue until the position is filled. The University of Notre Dame is committed to diversity and equality in education and employment, and women and members of underrepresented minority groups are strongly encouraged to apply.

The Department of Geology at SUNY Potsdam invites applications for a tenure track Assistant Professor in Hydrogeology and/or Geomorphology to begin Fall 2013. Responsibilities: teaching hydrogeology, geomorphology, an introductory course (Physical Geology, Environmental Geology or Dynamic Earth) and an elective of the successful candidate's choice and design. Normal teaching load is 12 contact hours per semester. Knowledge of GIS is an asset. Scholarly research, with student participation, is expected. We emphasize undergraduate research and fieldwork with all majors. Courses taught will complement existing courses in paleontology, sedimentology, mineralogy, igneous and metamorphic petrology, structural geology, GIS, geophysics, and geochemistry. The Geology Department, consisting of five full time faculty, currently has about 75 majors. Requirements: Applicants should have a PhD by August 15, 2013. Preferred qualifications: Doctoral research should emphasize hydrogeology or geomorphology. To apply for this job posting, No. 0600381, visit employment.potsdam.edu and complete the on-line application. This position is open until filled.

The University of Texas at Austin Postdoctoral Research Position: Hydrate Dissociation and Gas Venting due to Warming in Geological Systems.

The Institute for Geophysics and the Petroleum and GeoSystems Engineering Department at The University of Texas at Austin (UT) invites applications for a postdoctoral research position to study hydrate melting and gas venting in geological systems. For information, please go to:

http://www.ig.utexas.edu/people/staff/flemings/opportunities.htm

The candidate will be part of a research team composed of geoscientists and petroleum engineers exploring the impact of rising temperature on hydrate melting and gas venting. The candidate will help develop conceptual and numerical models of hydrate melting and will assist in an experimental program simulating the melting of hydrate systems. The ideal candidate will have experience in modeling multi-phase flow and in experimental analysis. Above all, we look for creative individuals with a passion for quantitative analysis of active hydrodynamic processes.

Qualified individuals should have a Ph.D. in Geosciences, Petroleum Engineering, Geotechnical Engineering, or a related field at the time of appointment. Salary will be competitive. Review of candidates will begin Dec. 15, 2012; applications will be accepted until the position is filled. Send an application consisting of (1) letter of interest, (2) CV, and (3) names of three references to:

Peter Flemings (pflemings@jsg.utexas.edu)
The University of Texas at Austin

The University of Texas at Austin is an equal employment opportunity/affirmative action employer. All positions are security sensitive, and conviction verification is conducted on applicants selected.

Utah State University. Department of Civil and Environmental Engineering invites applications for a tenure-track faculty position at the assistant professor level in the area of hydrology and environmental engineering with an emphasis on hydrologic and environmental data management and information systems, environmental monitoring and sensor networks, and data intensive modeling. The successful applicant will help lead groundbreaking projects to develop hydrologic information systems and cyberinfrastructure to advance hydrology and water resources modeling and management.

Utah State University is Utah's flagship institution of higher education and research in the areas of water, natural resources, and the environment. The successful candidate will have a joint appointment at Utah's lead water research facility, the Utah Water Research Laboratory. Both Utah State University and the Utah Water Research Laboratory are situated in Logan, Utah in the heart of scenic Cache Valley, approximately 80 miles north of Salt Lake City and known for world class skiing, hiking and other year around outdoor activities.

Applications should be completed on-line at: http://jobs.usu.edu/applicants/Central?quickFind=58113. Review of applications will begin December 10, 2012 and continue until the position is filled. Questions should be directed to Professor David Tarboton, Search Committee Chair, (435) 797-3172, dtarb@usu.edu. Utah State University is an affirmative action/equal opportunity employer and is dedicated to recruiting stellar candidates from a diverse pool including women, minorities, veterans and people with disabilities.

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UNIVERSITY of
HOUSTON

Faculty Positions

The Department of Earth and Atmospheric Sciences of the University of Houston invites applicants for the following tenure track faculty positions. Candidates must have completed their PhD at the time of appointment. Successful candidates will be expected to build a vigorous externally-funded research program, and should be able to demonstrate productivity in peer-reviewed publication. Candidates will also be expected to teach at both the undergraduate and graduate levels and will be expected to mentor MS and PhD students. We expect to fill the positions by August, 2013. Candidate evaluation will begin **January 20, 2013** and continue until the position is filled.

Exploration Geophysics

Assistant to Full Professor level in the field of Exploration Geophysics, specializing in reflection seismic processing, imaging, and interpretation. We seek candidates of outstanding ability in signal processing, algorithm development, and seismic data analysis. Strength in subjects such as elastic-wave propagation, tomography, migration, and inversion will be especially valued. The successful candidate should have the ability to use high-performance computing to image, visualize, and interpret seismic data and will have use of our wide variety of seismic software packages, hardware systems, and geophysical data. The successful candidate will participate with an enthusiastic team of geophysics faculty and students in one of the leading energy communities in the world. Preference will be given to candidates with related industry experience.

Organic Geochemistry

Assistant to Full Professor level in the broad field of organic geochemistry. Applicants should have experience in the application of chemical principles to the study of the origin, migration, accumulation, and alteration of hydrocarbons and organic contaminants using a range of petroleum geochemical techniques, such as stable isotope geochemistry, hydrocarbon analysis of organic compounds and biomarkers with GC and GC-MS, vitrinite reflectance or other maturity indicators, laboratory pyrolysis, and/or kerogen typing. The successful candidate will also enjoy access to new major and sophisticated organic geochemical research equipment being delivered in the Fall of 2012 to the Department, including an Agilent GC-QQQ 7000, an Agilent GC-Q-TOF 7200, an Agilent GC-MS 5975, an Agilent GC 7890, a Finigan Delta 5 Gas Stable Isotope Mass Spectrometer coupled with a GC-C-IRMS, and a Rock Eval VI Pyrolisis Instrument. Research analytical expertise in these instruments and/or experience in related environmental organic fluid and rock geochemistry, especially aligned with studies of water quality, identifying natural water and rock contaminants and toxicity levels, carrying out epidemiologic environmental forensics studies, environmental remediation monitoring, and/or ground water quality studies in gas and oil shale fracking regions, is considered advantageous to the broad areas of research in the Department.

Sedimentary Geology

Assistant Professor level in the general field of Sedimentary Geology and Stratigraphy. Candidates may conduct research on ancient or modern systems and may have expertise in areas such as facies and stratigraphic architecture, sedimentary petrology, experimental or numerical modeling, and/or reservoir characterization. Ideally the candidate will have experience with field-based research to solve fundamental geological problems. This position is linked to the UH Energy initiative, and we encourage applications from candidates with some industry experience.

Information for Applicants

Candidates for each position should submit: 1) a letter of application including statements of teaching and research interests, 2) a curriculum vitae, and 3) three letters of reference (letters must be received before the applications will be considered) to:

Dr. Janok P. Bhattacharya, Chair,
Department of Earth and Atmospheric Sciences
College of Natural Sciences and Mathematics
Room 312 Science Research 1
University of Houston
4800 Calhoun Rd.
Houston, Texas 77204-5503.

Signed reference letters may be submitted by referees as attached files via email to Penny Maher: plmaher@uh.edu. Further information can be obtained by viewing the departmental web page at http://www.geosc.uh.edu/ or by calling the Department at (713) 743-3399.

The University of Houston is an Equal Opportunity/Affirmative Action Employer. Minorities, women, veterans, and persons with disabilities are encouraged to apply.

GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel

The GEOMAR Helmholtz-Centre for Ocean Research Kiel is a German "foundation under public law", financed by both the Federal Republic of Germany and the State Schleswig-Holstein. GEOMAR is one of the leading international organisations in the field of marine sciences, with a current annual budget of about € 60 million and about 750 employees.

The GEOMAR Helmholtz Centre for Ocean Research Kiel is offering a

staff geophysicist position

in the research unit "geodynamics" of the research division "Dynamics of the Ocean Floor".

Job Description / Duties

The successful candidate will be in charge of developing his/her own research portfolio in the field of marine slope stability. Possible working areas include sedimentology, seismic imaging, tsunami modelling, slope and landslide mechanics, and marine geodesy. We expect the successful candidate to participate in marine geophysical expeditions and corresponding experience will be an asset.

Qualification

- PhD in geosciences
- International publication record

This is a full-time position that cannot be split.

This full-time position is available for an initial funding period of six years. The salary depends on qualification up to the class 13 TVöD of the German tariffs for public employees.

The GEOMAR Helmholtz Centre for Ocean Research is an equal opportunity employer and encourages female scientists and scientists with disabilities to apply.

Please send your applications for this post not later than **5 January 2013** using the keyword **„landslide"** to the following address:

GEOMAR Helmholtz Centre for Ocean Research Kiel
Personalabteilung
Frau Einfeldt
Wischhofstraße 1-3
D-24148 Kiel
GERMANY

Please mention the keyword on the envelope and on the application.
A readdressed envelope is greatly appreciated.

For further information please contact Prof. Christian Berndt, ph.: +49 431 6002273 (cberndt@geomar.de).

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Ocean Sciences

ASSISTANT PROFESSOR, CHEMICAL OCEANOGRAPHY, The Florida State University.

The Department of Earth, Ocean and Atmospheric Science at Florida State University is seeking applications for a Ph.D.-level chemical oceanographer to fill a nine-month, tenure-earning appointment at the Assistant Professor level to begin as soon as August 2013.

The position involves research, teaching (at the graduate and undergraduate level), and service. The successful candidate will have completed a Ph.D. degree (or equivalent) in chemical oceanography, marine biogeochemistry, environmental chemistry, or a closely related field and will have had postdoctoral research experience. A well-qualified candidate will have a record that reflects their high level of research productivity.

We are particularly interested in a person who will complement our existing strengths in light stable isotopes, microbial biogeochemistry, and trace element cycling (see faculty research at http://ocean.fsu.edu/Faculty.php) and who will expand our curriculum by teaching in our Environmental Sciences undergraduate major and in our Chemical Oceanography and Biogeochemistry graduate programs, as described on these web sites:

http://www.eoas.fsu.edu/Earth-Ocean-and-Atmospheric-Science/Undergraduate-Education/Environmental-Science-Undergraduate-Degrees

http://www.eoas.fsu.edu/Earth-Ocean-and-Atmospheric-Science/Graduate-Education

http://biogeochem.fsu.edu/

Women and members of minority groups are especially encouraged to apply. The review of applications will begin immediately and continue until the closing date of January 18, 2013. Please send a pdf of your cover letter, curriculum vitae, research statement, teaching philosophy and contact information for three references to:

Prof. William Landing, Department of Earth, Ocean and Atmospheric Science, Florida State University, Tallahassee, FL 32306-4320; www.eoas.fsu.edu, wlanding@fsu.edu.

Florida State University is a Public Records Agency and an Equal Opportunity-Equal Access-Affirmative Action Employer.

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 a relocatable ice-ocean-atmosphere coupled modeling system. 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 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 $74,872 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).

Solid Earth Geophysics

Assistant Professor in Solid Earth Geophysics, Boston University.

The Department of Earth and Environment at Boston University invites applications for a tenure-track position at the Assistant Professor level in the broad field of Solid Earth Geophysics, starting as early as July 1, 2013.

We seek an applicant whose research emphasizes quantitative study of the Earth's lithosphere and mantle at either a regional or a global scale. Fields of study might include, but are not limited to, rock and mineral physics, seismology, geodynamics, tectonophysics, and marine geophysics. We encourage applications from individuals who employ field-based, experimental, or computational methods in their research. The successful applicant will be expected to supervise graduate research in M.A. and Ph.D. programs, maintain an externally funded research program, and teach at all levels in the department's curriculum.

We seek an applicant whose research complements departmental expertise in seismology, geodynamics, geochemistry and surface processes. Interaction is encouraged with various departments and programs, including Astronomy, Physics and Engineering, as well as the Center for Computational Science, the Center for Remote Sensing, and the B.U. Marine Program. For more information about the department, see http://www.bu.edu/earth. A Ph.D. at the time of appointment is required. Applicants should submit a curriculum vitae, a statement of research and teaching interests, and the names and addresses of at least three referees at https://academicjobsonline.org/ajo/jobs/2245. Review of applications will begin on January 1, 2013. Women and underrepresented minorities are particularly encouraged to apply. Boston University is an equal opportunity/affirmative action employer.

Tenure track assistant professor in geophysics/petroleum geology job ad.

The department of Geography, Geology, and the Environment at Slippery Rock University of Pennsylvania (SRU) invites applications for a tenure-track Assistant Professor position in Geophysics/Petroleum Geology to begin August 2013. We seek candidates with expertise in applied geophysics, exploration seismology, and/or petroleum geology. The successful candidate will teach introductory geology courses and develop and teach geophysics, petroleum geology, and other appropriate upper-level courses. The successful candidate should also have the potential to develop a successful undergraduate research program. A Ph.D. in Geosciences with an emphasis in geophysics or petroleum geology is required at the time of appointment.

Apply: Candidates should submit applications online at https://careers.sru.edu/hr. Attachments to the application include a letter of application, including statements of teaching and research interests, curriculum vitae, e-copies of all academic transcripts, and three letters of reference. For those unable to submit electronically, please send applications to: Dr. Xianfeng Chen, Chair, Search Committee, Department of Geography, Geology, and the Environment, Slippery Rock University of Pennsylvania, 329 Advanced Technology and Science Hall, Slippery Rock, PA 16057; e-mail: [xianfeng.chen@sru.edu]. Review of application will begin January 22, 2013 and applications will be accepted until the position is filled. Slippery Rock University of Pennsylvania is an Affirmative Action/Equal Opportunity Employer. SRU encourages minorities, women, veterans and persons with disabilities to apply.

Tenure Track Position in Solid Earth Geosciences (Earthquake Physics, Active Tectonics and Quantitative Geomorphology).

The Center for Earthquake Research and Information (CERI) at the University of Memphis invites applications for a tenure-track faculty position, with tenure in the Department of Earth Sciences, at the Assistant Professor level to begin August 2013. We seek an individual with research interests in the fields of Earthquake Physics, Quantitative Geomorphology, or Active Tectonics that complement our existing strengths in seismology, geodesy, tectonophysics, seismic hazard and geodynamics. We particularly encourage applicants with research interests related to fault zone processes and seismogenic crustal deformation. Applicants must have a Ph.D. at the time of employment, and show a demonstrated record or strong promise of research productivity. The successful candidate is expected to build a vigorous, externally funded research program, mentor M.S. and Ph.D. graduate students, and teach graduate courses in her or his specialty. CERI faculty are engaged in a variety of regional, national, and international research projects in seismology, geodesy, geology, geophysics, and earthquake hazards (http://www.ceri.memphis.edu). More information about this position can be obtained by contacting the chair of the search committee, M. Beatrice Magnani (mmagnani@memphis.edu).

Applicants should submit an application letter, full curriculum vitae, statements of research and teaching interests, and the names and addresses (with phone numbers and email) of at least three references. To receive full consideration, applications must be submitted through the University of Memphis workForum online application system (http://workforum.memphis.edu) by February 1, 2013. The University of Memphis is an Equal Opportunity/Affirmative Action employer.

Interdisciplinary/Other

Assistant Professor at NMSU, Neotectonics/Thermochronology (Revised).

The Department of Geological Sciences seeks applications from neotectonicists/thermochronologists who are interested in teaching and research in a geologically and culturally diverse environment in the Rio Grande rift of southern New Mexico for a permanent, 9-month, tenure track position as Assistant Professor.

For more information, including application procedures, see the department web site at http://www.nmsu.edu/~geology/ and the advertisement on the NMSU job web site athttp://www.nmsu.edu/~personel/postings/faculty/16554338.html. NMSU is an EEO/AA employer.

Assistant Professor at NMSU, Sedimentology/Stratigraphy (Revised).

The Department of Geological Sciences seeks applications from sedimentologists/stratigraphers who are interested in teaching and research in a geologically and culturally diverse environment in the Rio Grande rift of southern New Mexico for a permanent, 9-month, tenure track position as Assistant Professor.

For more information, including application procedures, see the department web site at http://www.nmsu.edu/~geology/ and the advertisement on the NMSU job web site at http://www.nmsu.edu/~personel/postings/faculty/16501738.html. NMSU is an EEO/AA employer.

Assistant Professor in Planetary Sciences.

Purdue University invites applications for a tenure-track assistant professor position in the Department of Earth, Atmospheric, and Planetary Sciences (EAPS). The position is open to all areas of EAPS, but with a particular focus on candidates who would contribute to our strong new effort in Planetary Sciences. Jay Melosh has joined the Purdue Faculty and, together with Andy Freed, Marc Caffee, and David Minton, has a mandate to expand Planetary Sciences.

The successful candidate will be an outstanding researcher with potential for excellence in teaching at both the graduate and undergraduate levels. EAPS has outstanding programs in geodynamics, isotope geochemistry, terrestrial climate and extreme weather systems. In Planetary Sciences, we seek someone who will complement our existing strengths in modeling and isotopic cosmochemistry, and, given Purdue¹s emphasis on science, mathematics and engineering, we seek a quantitatively

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Max-Planck-Institut für Meteorologie

MAX-PLANCK-GESELLSCHAFT

The **Max Planck Institute for Meteorology (MPI-M)** is a multidisciplinary center for climate and Earth system research located in Hamburg, Germany. The **Hans Ertel Research Center for Clouds and Convection**, a basic research initiative located at the MPI-M is funded by the **German Weather Service (DWD)** to advance basic research related to the parameterization of clouds and convection in large-scale models. As part of the Hans Ertel Center a

Postdoctoral Scientist - SAS2012-17

of exceptional ability is sought to understand the scale dependence of poorly resolved convective processes in the context of the WGNE Greyzone Project.

This individual will be responsible for analyzing simulations over a wide range of scales, using large-eddy simulation models, numerical weather forecast models and short time integrations of the ECHAM or ICON climate models, to better understand the scale dependence of convective processes in cold air advection, or outbreak, conditions. Frequent exchanges with scientists at DWD and interactions with other Hans Ertel Research Centers across Germany are expected as well as taking some leadership role in organizing part of the intercomparison study under the WGNE Greyzone umbrella. Prerequisites for the position include strong analytic/diagnostic skills, a strong programming background, and experience working with large data set and meteorological analysis. Interests in advanced methods of sub-gridscale modelling are also welcome, as the work can be extended to explore new formulations of parameterizations of partially resolved processes.

A Ph.D. in meteorology or atmospheric science is desired although exceptional candidates with a PhD in a related field will also be considered.

The initial appointment will be for a period of two years. Payment will be in accordance with a civil service position (TVoeD E13), including extensive social security plans. Conditions of employment follow the rules of the Max Planck Society for the Advancement of Sciences, and those of the German civil service. For further information on the position, please contact Dr. Cathy Hohenegger *(cathy.hohenegger@zmaw.de)* and visit *http://www.mpimet.mpg.de*.

The Max Planck Institute for Meteorology seeks to increase the number of female scientists and encourages them to apply. Handicapped persons with comparable qualifications receive preferential status. All applications (including a cover letter, a curriculum vitae, copies of scientific degrees, and the names and contact information of two references), received **before January, 2nd 2013** will receive full consideration. The position will remain open until filled.

Please send your application, preferably by e-mail to *jobs@vw.mpimet.mpg.de* (one PDF-attachment with max. 5MB only including all documents) or by post to:

Max Planck Institute for Meteorology
Administration (SAS2012-17)
Bundesstrasse 53
D-20146 Hamburg
Germany

UTD The University of Texas at Dallas
Department of Geosciences

TENURE-TRACK FACULTY POSITION IN THE FIELD OF BASIN ANALYSIS

The Department of Geosciences at the University of Texas at Dallas (UTD) has an open tenure-track faculty position in the field of basin analysis. The position is at the Assistant Professor level and will commence during the 2013-2014 academic year. The successful candidate should have interests in fundamental processes of basin architecture and evolution, and in the application of basin analysis to energy and environmental issues. We seek individuals with the potential to develop a vibrant, sustained, externally funded research program that complements existing departmental strengths and who will contribute effectively to the Department's educational programs at the BS, BA, MS and Ph.D. levels.

This position is part of a departmental expansion in the field of tectonics and will play a pivotal role in the University's strategic emphasis on energy and the environment. We are seeking individuals who will complement and expand departmental strengths in structural geology, active and ancient tectonics, isotope geochemistry, geophysics, geospatial science, and computational geoscience. Basin analysis is a critical element in the commitment by UTD and the Geosciences Department to develop an integrated graduate research and educational program with the Department of Earth and Environmental Studies at the University of Texas at Arlington. Furthermore, we plan to build upon our traditional collaboration with the petroleum and minerals industry in areas that encompass carbon dioxide sequestration and the exploration and development of petroleum and mineral resources.

The Department of Geosciences has strong undergraduate and graduate programs and UTD is a relatively young, rapidly growing university. It attracts very talented students (mean freshman SAT> 1200) with great diversity and is situated in a metropolitan area that is undergoing rapid growth.

Applications will be reviewed beginning **January 15, 2013** but will be considered until the position is filled. Indication of gender and ethnicity for affirmative action statistical purposes is requested as part of the application.

Questions about the position should be directed to the Department Head, Professor John S. Oldow, **oldow@utdallas.edu**.

Applicants should submit a a complete resume, a statement of research interest and the names and contact information of five professional references via the ONLINE APPLICATION FORM available at **http://go.utdallas.edu/pne121015**

The University of Texas at Dallas is an Equal Opportunity / Affirmative Action Employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability, age, citizenship status, Vietnam era or special disabled veteran's status, or sexual orientation.

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focused researcher with an interest in planetary surface processes.

Applicants must have a Ph.D. in a field related to EAPS. Salary and benefits are highly competitive. The appointment will begin in August 2013. Candidates are expected to develop a vigorous research program, obtain external funding, supervise graduate students, and teach undergraduate and graduate courses. Interested candidates should submit their curriculum vitae, publication list, and brief descriptions of their planned research program and teaching philosophy to EAPSsearch@purdue.edu. Names and contact information for at least three referees must be included in the application. Information on the EAPS department can be found at http://www.eaps.purdue.edu. Applications completed by January 1, 2013 will be given full consideration, although the search will continue until the position is filled. A background check is required for employment in this position.

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

CALIFORNIA STATE UNIVERSITY, CHICO.

College Of Natural Sciences invites applications for a full-time, tenure-track faculty position in the Department of Geological and Environmental Sciences at the Assistant Professor level to start August 2013. The candidate must possess a Ph.D. in Energy Resources, Climate Science, or Atmospheric Science. Prefer expertise in renewable energy resources, earth system science, climate change, or air pollution. The full position announcement is available at http://csucareers.calstate.edu/Detail.aspx?pid=34250

Environmental Science/STEM education. The Department of Earth and Environmental Sciences at California State University East Bay invites applications for an assistant professor tenure-track position in Environmental Science to begin in Fall 2013. The successful candidate will be broadly trained in Environmental Science with a specialization in one or more subdisciplines including water resources, pollution control and mitigation, global/climate change, ecology, environmental toxicology, etc. The person filling this position should be qualified to teach a range of undergraduate courses in the department's growing Environmental Science program. Undergraduate courses could include Environmental Biology, Introductory Environmental Science, Applications of GIS, Hazardous Waste Management, or Water Resource Management, and courses in the candidate's area of expertise. The applicant must also have significant experience and/or a commitment to engage in STEM education with an emphasis on the K-12 environment. Applicants should have a Ph.D., outstanding teaching skills, and a commitment to pursue an active research program in partnership with the Institute for STEM Education at CSUEB. For additional information, view our department's web site at: www20.csueastbay.edu/csci/departments/earth/index.html. Review of applications will begin December 17, 2012. Please submit a cover letter, a curriculum vitae, a brief statement of teaching philosophy, and a description of research plans to: Dr. Jean Moran, Department of Earth and Environmental Sciences, California State University, East Bay, 25800 Carlos Bee Blvd., Hayward, CA 94542-3088. CSUEB is an Equal Opportunity Employer.

Faculty position at Department of Geosciences, National Taiwan University.

The Department of Geosciences at NTU is seeking active scientists to fill faculty positions starting from 1st August, 2013. The position is open to all fields in geosciences, but those who have strong background in the fields of geology (paleontology and stratigraphy, geo-resources, mineralogy and petrology, structural geology), geochemistry, geophysics, and applied geology will receive more favored consideration. Applicants are requested to submit the following documents: CV, list of publications, three to five reprints of refereed publications (one of which shall be designated as representative paper and must be published after 1st August, 2008), plans for teaching and research, and names of three potential referees to Professor Mao-Hua Teng, Chairman of Department of Geosciences, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan. Also, please email the above material to Professor Yuancheng Gung, the Convener of the searching committee, at ycgung@ntu.edu.tw.

Deadline for application: 31st January, 2013. Web site: http://www.gl.ntu.edu.tw/

HEAD OF SCHOOL POSITION OSU BOONE PICKENS SCHOOL OF GEOLOGY.

The Boone Pickens School of Geology at Oklahoma State University invites applications for the School Head position. This is a tenured position at the rank of Associate Professor or Full Professor to be filled by July 1, 2013. Salary is competitive and commensurate with the experience and qualifications of the successful candidate. Applicants should have a PhD in geosciences or a related field, have an outstanding research and teaching record and be highly regarded and recognized by the national and international geoscientific community. A record of an established collaboration with the energy industry is desirable. Prior administrative experience is preferred and potential for academic leadership and mentoring is expected. The Boone Pickens School of Geology Head position is designated 50% administration and 50% academic. The successful candidate will be allowed to have reduced teaching load, but will maintain a research program through externally-funded projects, peer-reviewed publications and mentoring of graduate students. The specific research field is open but the successful candidate is expected to strengthen the School's research foci in conventional and unconventional hydrocarbons, continental tectonics and neotectonics, and surficial processes and environmental studies. Currently the School has 14 tenured and tenure-track faculty, 3 research scientists/post-doctoral fellows, 15 PhD students, 50 MS students, and 140 undergraduate students. The School has recently expanded and will continue growing in terms of student enrollment, additional faculty, and external resources. The School houses modern research and teaching facilities, including well-equipped geochemistry, geophysics, remote sensing, sedimentology, and tectonics laboratories, as well as technology-enabled classrooms and the Devon Visualization Laboratory. The School also maintains a Field Camp in Canon City, Colorado. The School's mission and activities are strongly supported by an extended network of alumni and an active advisory board. The School maintains a strong faculty-student-alumni relationship and active student chapters for professional organizations. Applicants should submit statements detailing: (1) Leadership vision, (2) Research interests, and (3) Teaching philosophy, along with a Curriculum Vitae, and the names, addresses, e-mail addresses, and phone numbers of three references to: Boone Pickens School of Geology Head Search c/o Dr. Loren M. Smith, Department of Zoology, 501 Life Science West, Oklahoma State University, Stillwater, Oklahoma 74078, Phone: (405)-744-5555, Fax: (405) 744-7824. Screening of candidates will begin January 1, 2013 and continue until the position is filled. The filling of this position is contingent upon available funding. More information on Oklahoma State University and the Boone Pickens School of Geology can be found on the web at http://go.okstate.edu and http://geology.okstate.edu, respectively. OSU is an AA/EEO/E-Verify employer committed to diversity. OSU-Stillwater campus is a tobacco-free campus.

Multiple faculty positions in Limnology/Oceanography.

The University of Minnesota Duluth (UMD) invites applications for multiple tenure-track, assistant-professor positions in the general areas of limnology and oceanography, or related field. The positions are joint research and teaching appointments, shared between Large Lakes Observatory (LLO; www.d.umn.edu/llo) and appropriate academic departments (e.g. Biology or Physics), starting August 26, 2013. Areas of interest for research include, but are not limited to: biological remote sensing, aquatic ecology, physical limnology, and atmospheric dynamics in aquatic systems. Required qualifications include a Ph.D. (or foreign degree equivalent) in limnology, oceanography, or a related field from a university with at least the equivalent of regional accreditation in the US system at the time of the appointment. Evidence of potential for successful university-level teaching and externally funded research related to limnology or oceanography is also required. A complete position description and the required online application is available at https://employment.umn.edu/applicants/central?quickFind=107362

Complete applications will be reviewed starting the first week of January 2013 and will be accepted until the positions are filled.

The University of Minnesota is an equal opportunity educator and employer.

Senior Scientist/Engineer Position.

ASTRA LLC is a growing business in Boulder, CO. We are recognized worldwide for creative solutions in fundamental space research, and technology development. Our mission is to develop and exploit innovative concepts for industry and government by combining fundamental research, scientific expertise, and technology. ASTRA has a reputation for over-delivering to our customers.

Our existing research and engineering projects include modeling of the upper atmosphere, development and deployment of ground-based and space-based instruments for upper atmosphere/space weather applications, Cubesats, and Lidar applications.

There is now an opportunity to grow other divisions within the company. Candidates with a background in theory, modeling, instrument development or technology applications are invited to submit their resume, with a list of three professional references. ASTRA provides a dynamic team environment, and we envisage growing our team in the areas of solar, magnetosphere, and ionosphere-thermosphere science and applications. However, we welcome candidates with research interests in other areas (e.g. oceanography, seismology, lidar, radar). The ideal candidate must demonstrate a strong record of externally funded research, publications, and professional leadership. Successful candidates are expected to build a strong program of funded research.

ASTRA recognizes and rewards superior performance. We offer a competitive benefits package, which includes profit sharing, 401K, and medical insurance. Salary will depend on experience and qualifications. ASTRA is an equal opportunity employer with a diverse workforce.

Please send resumes to Dr. Geoff Crowley at gcrowley@astraspace.net

Tenure Track Position in Engineering Seismology.

The Center for Earthquake Research and Information (CERI) and the Department of Civil Engineering (CE) at the University of Memphis invite nominations and applications for a tenure track position at the Assistant Professor level to begin August 2013. We seek a colleague to complement existing expertise in seismology, earthquake hazards, earthquake engineering, and structural engineering at both CERI and CE. Desired areas of research interest for this position include, but are not limited to, strong ground motion analysis, source characterization, wave propagation, site response characterization, and loss estimation. Applicants must have a strong engineering background, at least at the Bachelor's level, and a Ph.D. in engineering, geophysics, or closely related field, at the time of employment and show a demonstrated record of research productivity or strong promise in research. The successful candidate is expected to build a strong, externally funded research program, mentor M.S. and Ph.D. graduate students, and teach undergraduate and graduate courses in her or his specialty. The academic home for the successful candidate will be with the Department of Civil Engineering (http://www.memphis.edu/ce). CERI is a Tennessee Center of Excellence, and CERI

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faculty members are engaged in a variety of regional, national, and international research projects in geodesy, geology, geophysics, and earthquake hazards (http://www.ceri.memphis.edu).

Applicants should submit a complete curriculum vita, a letter expressing their research and teaching interests, and the names and contact information (phone numbers and email) of at least three references using the University of Memphis workForum online application system (http://workforum.memphis.edu). Screening of all applications will begin on January 1, 2013. The University of Memphis, a Tennessee Board of Regents Institution, is an Equal Opportunity/Affirmative Action Employer. Appointment will be based on qualifications as they relate to position requirements without regard to race, color, national origin, religion, sex, age, disability, or veteran status.

The Joseph P Obering Postdoctoral Fellowship. The Department of Earth Sciences at Dartmouth College seeks outstanding candidates for the Joseph P. Obering Postdoctoral Fellowship in Earth Sciences. This competitive fellowship provides two years of full-time salary and a research allowance, with a third year contingent upon performance and funding. In concert with Dartmouth's philosophy that scholarship and teaching are inseparable facets of academic life, this fellowship provides recent Ph.D. recipients the opportunity to pursue independent research as well as to develop a teaching portfolio. Candidates will be expected to collaborate with one or more Dartmouth Earth Sciences faculty members, taking advantage of existing resources and facilities, and will teach one course (under the quarter system) per year. The starting date is negotiable, but could be as early as July 1, 2013. Details about Dartmouth Earth Sciences may be found at www.dartmouth.edu/~earthsci.

Candidates should submit a CV, statements of research and teaching interests, and selected preprints/reprints by January 8, 2013. Applications should be sent to: Obering Postdoctoral Fellowship Committee, Department of Earth Sciences, Dartmouth College, 6105 Fairchild Hall, Hanover, NH 03755. In addition, applicants should arrange for three letters of recommendation to be sent directly to the above address. Dartmouth College is an EO/AA Employer.

The U.S Geological Survey Pacific Coastal Marine Science Center will be recruiting for two Research Geophysicists/Research Geologists from November 26, 2012 to January 4, 2013. To apply, please go to www.usajobs.gov and search for vacancy announcement # PAC-2013-0047 (no earlier than November 26). Please use resume template so you do not omit required information. These positions will be located in Santa Cruz, CA.

Turner Postdoctoral Fellowship University of Michigan.

The Department of Earth and Environmental Sciences at the University of Michigan invites applications for the Turner Postdoctoral Fellowship. This highly competitive fellowship is open to all fields within Earth Sciences.

The Department is interested in innovative research proposals that can be pursued in collaboration with a faculty member. Interested applicants are encouraged to contact prospective hosts ahead of the application deadline to discuss areas of common interest and potential collaborations (http://www.lsa.umich.edu/earth/people/faculty).

Turner Postdoctoral Fellows receive an annual salary of $55,000, discretionary research funds totaling $10,000, and a generous benefits package. The fellowship is awarded for a one-year period, with an anticipated extension for a second year.

Interested applicants should send a single pdf file with the following: a curriculum vitae, research proposal (5 pages maximum), and the names and addresses of at least three references no later than January 15, 2013. Applications should be sent to turnerpdf@umich.edu.

The University of Michigan is an affirmative action/equal opportunity employer. Women and minorities are encouraged to apply.

Two Remote Sensing of Global Croplands Scientist Positions plus a PhD student position: for NASA MEaSUREs Project: There are 2 remote sensing scientist positions based in Flagstaff Arizona to work on NASA Making Earth System Data Records for Use in Research Environments (MEaSUREs) funded (a 3.5 million dollar, 5 year) U.S Geological Survey (USGS) led proposal on Global Cropland Area Database (GCAD30). First position for a period of 5 years at Research Scientist level with a starting salary of 69k and second position for a period of 4 years at post doctoral (or in exceptional cases Master's with substantial experience) with a starting salary of 62K. There will also be a PhD position affiliated to Northern Arizona University. The positions start from January 2013 (but no later than March 1, 2013). Full details of the positions are at: https://powellcenter.usgs.gov/globalcroplandwater/

Please send all applications andor inquiries to Dr. Prasad Thenkabail (pthenkabail@usgs.gov; thenkabail@gmail.com).

Virginia Tech College of Science Faculty Positions in Interdisciplinary Science/Science Education Research.

The College of Science at Virginia Tech (http://science.vt.edu) is expanding its research presence in teaching and learning of undergraduate science with two tenure-track openings in interdisciplinary science/science education, to start Fall 2013 at our Blacksburg, VA Campus. Appointments at the rank of Assistant, Associate, or Full Professor will be made in one of the College's eight departments: biological sciences, chemistry, economics, geosciences, mathematics, physics, psychology, and statistics. The position signifies a continued University commitment to the importance of educating future STEM professionals, empowering them to address major interdisciplinary societal challenges in energy, the environment, and health. The new faculty members will participate in the College of Science's recently launched Integrated Science Curriculum (www.science.vt.edu/isc), which serves to build strong research and educational partnerships across the sciences and mathematics. Appointments will be made within the departments that best suit the background and interests of the successful candidates.

Job requirements include a Ph.D. in a scientific field, a research focus in interdisciplinary science/science education, and experience teaching science. The successful candidate will be expected to establish a vigorous research program and to provide effective instruction and advising to a diverse population of undergraduate and graduate students. Other responsibilities include continuing development of professional capabilities and scholarly activities, travel to professional conferences, curriculum development, participation in department, college, and university governance, and professional service. The faculty handbook (available at http://www.provost.vt.edu) provides a complete description of faculty responsibilities.

Preference will be given to scientists experienced in undergraduate interdisciplinary science teaching and learning who demonstrate the potential to create an outstanding research program that explores topics in interdisciplinary science/science education. Science research interests that intersect with existing areas of STEM education at Virginia Tech will be looked upon favorably.

Further information can be found at www.science.vt.edu. Questions regarding the position can be directed to Dr. Barbara Bekken, (bekken@vt.edu). Applications must be submitted online at http://listings.jobs.vt.edu (#TR0122516) and should include a cover letter, curriculum vitae, a research plan, a statement of teaching philosophy that describes an integrated vision for learning in the sciences, and an annotated list of up to five references. Review of applications will begin on December 1, 2012 and continue until the position is filled. As part of the hiring process, the successful applicant must pass a criminal background check.

Virginia Tech is an EO/AA university, and offers a wide range of networking and development opportunities to women and minorities in science and engineering. Individuals with disabilities desiring accommodation in the application process should notify Ms. Mikhelle Taylor, College of Science, (540) 231-5422, or call TTY 1-800-828-1120.

Virginia Tech College of Science Faculty Position in Computational Science.

The College of Science at Virginia Tech (http://science.vt.edu) is expanding its research presence in the interdisciplinary field of Computational Science and Data Analytics. Thus, Virginia Tech has a tenure-track opening in Computational Science and Data Analytics to start Fall 2013 at our Blacksburg, VA Campus. An appointment at the rank of Assistant, Associate or Full Professor will be made in one of the College's eight departments. The position signifies a continued University commitment to the importance of interdisciplinary science to help solve major societal challenges in energy, the environment and health. The new faculty member will participate in the College of Science's recently launched Integrated Science Curriculum (www.science.vt.edu/isc), which collectively serves to build strong research and educational partnerships across the sciences, in particular, in a new, interdisciplinary, computational science and data analytics focused program. The appointment will be made within the department that best suits the background and interests of the candidate.

Job requirements include a Ph.D. in a related field. The successful candidate will be expected to establish a distinguished, interdisciplinary research program and to provide effective instruction and advising to a diverse population of undergraduate and graduate students. Senior applicants must have an internationally recognized and well-funded research program with publications in the highest-quality journals. Other responsibilities include: continuing development of professional capabilities and scholarly activities, including travel to professional conferences; curriculum development; participation in department, college, and university governance; and professional service. The faculty handbook (available at http://www.provost.vt.edu) gives a complete description of faculty responsibilities.

Preference will be given to interdisciplinary scientists with a strong background in computational science, modeling, or large-scale data analytics, from any relevant discipline. We seek candidates who advance the state of the art of computational methods and applications, and who will complement existing strengths in the College with areas of research including, but not limited to, mathematical, statistical, and physical modeling and simulation (deterministic or stochastic), complex systems, optimization, stochastics, data analytics, and data mining, physics and cosmology, computational geophysics, uncertainty quantification, or inverse problems.

Further information can be found at www.science.vt.edu. Questions regarding the position can be directed to Prof. Eric de Sturler, Chair of the Computational Science faculty search committee, at sturler@vt.edu. Applications must be submitted online at http://listings.jobs.vt.edu (# TR0122517) and should include a cover letter, curriculum vitae, research plan, statement of teaching philosophy, and a list of references. In addition, applicants should arrange for three letters of recommendation to be submitted directly to the search committee at computational_science_search@scholar.vt.edu with the name of the candidate in the subject line. Review of applications will begin on December 15, 2012 and continue until the position is filled. As part of the hiring process, the successful applicant must pass a criminal background check.

Virginia Tech is an EO/AA university, and offers a wide range of networking and development opportunities to women and minorities in science and engineering. Individuals with disabilities

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231-5422, or call TTY 1-800-828-1120.

Visiting Young Scientist: A visiting appointment for a recent Ph.D scientist is available at Dartmouth College. The appointment would be for up to 6 months during academic year 2013-2014. The position includes teaching in the departments of Physics and Astronomy, Engineering, or Earth Sciences. Extension of appointment may be possible using appropriate sponsored research projects. To qualify, candidates must be U.S. citizens engaged in research related to space science, planetary science, astrophysics, remote sensing, aerospace technology, or technology dependent on space-based platforms. To apply, send a 1-2 page summary of teaching and research goals, curriculum vitae, and the names of three references to: Visiting Young Scientist, c/o James LaBelle, Department of Physics and Astronomy, Dartmouth College, 6127 Wilder Hall, Hanover, NH 03755. For more information, e-mail james.labelle@dartmouth.edu. Applications will be reviewed starting February 4, 2013. The position is funded by NASA NH Space Grant. Dartmouth College is committed to diversity in hiring, and members of under-represented groups are encouraged to apply.

WESTERN MICHIGAN UNIVERSITY College of Arts and Sciences, Department of Geosciences Seeks Candidates for TENURE TRACK APPOINTMENT, PETROLOGY AND MINERALOGY.

We seek a dynamic individual capable of teaching undergraduate courses in petrology/petrography, mineralogy, and general introductory geology. The ideal candidate will have some teaching experience in these areas. He/she will also be expected to demonstrate a successful record of research and research funding, and a capacity to contribute to our research mission and graduate programs. He/she will be expected to offer at least one graduate course in his/her area of expertise. Experience in the areas of igneous petrology, metamorphic petrology, or economic geology is desirable. A PhD at the time of employment is required.

Western Michigan University (WMU), located in Southwest Michigan, is a vibrant, nationally recognized student-centered research institution with an enrollment of nearly 25,000. WMU delivers high-quality undergraduate instruction, has a strong graduate division, and fosters significant research activities. The Carnegie Foundation for the Advancement of Teaching has placed WMU among the 76 public institutions in the nation designated as research universities with high research activities. Our faculty is focused on delivering high-quality undergraduate and graduate instruction while fostering significant research activities. The Department of Geosciences is home to the Michigan Geological Survey and the Michigan Geological Repository for Research and Education. The candidate will be encouraged to participate in the economic geology effort of the Survey, particularly as it relates to ore deposits. The department presently has 11 faculty members with active research programs spanning geochemistry, geophysics, hydrogeology, glacial geomorphology, geoscience education, petroleum geology, environ1ental geology, sedimentary systems, remote sensing, tectonics, and basin anal ysis.

Salary is competitive and commensurate with qualifications and experience, with an excellent benefits package.

The appointment will begin in August 2013. Applicants should submit online a cover letter, curriculum vitae, statement of teaching philosophy and interests, statement of research interests and goals. Email three letters of professional references to Dr. Mohamed Sultan, mohamed.sultan@wmich.edu. Review of applications will begin 1/7/13 and will continue until position is filled.

Please visit www.wmich.edu/hr/careers-at-wmu.htm for detailed information and application procedures.

Western Michigan University is an affirmative action/equal opportunity employer consistent with applicable federal and state law.

All qualified applicants are encouraged to apply.

Yale University: Tenure-track professor positions in (i) Geobiology and (ii) Lithosphere and Surface Processes.

The Department of Geology & Geophysics at Yale University solicits applications for two tenure-track faculty positions. We seek candidates with outstanding prospects for research and scholarly leadership who will complement the existing strengths of the Department. The successful applicants will develop and implement independent, externally-funded research programs, advise students, and facilitate interdisciplinary research.

Geobiology (ID #2188). Relevant fields include, but are not limited to: astrobiology, geomicrobiology, and the interactions of Earth and life as revealed by the rock record. This search is affiliated with the Yale Institute for Biospheric Studies.

Lithosphere and Surface Processes (ID #2189). Relevant fields include, but are not limited to, active tectonics, sedimentary basin analysis, geologic time, geomorphology, petrology, volcanology, surface-atmosphere interactions, and planetary evolution.

Yale is an equal opportunity/affirmative action employer. Applications from women and minorities are strongly encouraged. Applicants should submit a curriculum vitae, a statement of research and teaching interests, and a list of publications, plus the names and contact information of four referees. Applications should be submitted online at https://academicjobsonline.org/ajo/yale/G&G. Applications received prior to 1/1/2013 will receive full consideration. For information regarding Yale Geology & Geophysics, visit our web site at http://earth.yale.edu.

Student Opportunities

Biogeoscience PhD Fellowships.

The Department of Earth and Environmental Science of the University of Pennsylvania seeks applicants for competitive, multi-year PhD fellowships. Several research opportunities exist in the areas of: Paleobiology of dinosaurs; Soil organic matter stabilization and destabilization; Modeling of oceans and climate change; Sediment transport mechanics and landscape patterns; Tropical watershed hydrology and Critical Zone Research. Additional information is available on the Departmental web page http://www.sas.upenn.edu/earth/. Applications for 2013 Fellowship are due January 1, 2012

Doctoral Fellowship in Geochemistry or Geophysics at Utah State University.

The Department of Geology at USU seeks outstanding PhD applicants for a Presidential Doctoral Research Fellowship pursuing research in geochemistry or geophysics/geodynamics, starting fall 2013. This highly selective fellowship provides four years of support in the form of a competitive stipend, tuition and health benefits.

Potential research in geochemistry includes geologic CO2 sequestration, origin and history of crustal fluids in active tectonic settings, unconventional fuels, and geothermal energy. Contact Dr. Dennis Newell (dlnewelljr@gmail.com).

Research in geophysics/geodynamics of the lithosphere may include thermal transfer by fluids and melts; imaging of subsurface mass and composition; mapping of lithospheric strength and rheology; and GPS measurement and modeling of fault slip and earthquake cycle deformation. Contact Dr. Anthony Lowry (tony.lowry@usu.edu).

The Department of Geology at USU is field oriented with a dynamic and growing faculty and graduate program. We are located in Logan, Utah with close proximity to a wide variety of recreational and cultural activities.

Please visit http://geology.usu.edu for more information about our program, and http://www.usu.edu/gradateschool/apply/ to apply before February 15, 2013.

Graduate Assistantships at the University of Delaware in Climate, Water Science and Society.

The Department of Geography in the College of Earth, Ocean, and Environment at the University of Delaware has graduate student assistantships available starting Fall 2013, in the broad areas of climate, water science and society, and the cryosphere. Our department has a long-standing tradition in climatological research, and we recently expanded our research foci of watershed science and human-environment interactions. We are seeking outstanding graduate students in one of the following areas: climatology; meteorology; cryospheric science; forest hydrology; watershed hydro-ecology; water and society. The department offers MS and MA degrees in Geography; Ph.D. degrees in Geography and in Climatology; and we also participate in the interdisciplinary Water Science and Policy graduate program.

Applications are due by 1 February 2013. Online applications are handled by the UD Grad Office at http://www.udel.edu/gradoffice/. Also, our departmental website has information on requirements at http://www.udel.edu/Geography/ and highlights the faculty research. Applicants should first contact faculty members to discuss research interests and possible match with one or several faculty. For further information, please contact the department chair Dr. Tracy DeLiberty at tracyd@udel.edu.

PhD positions in Hydrology, Water Resources, Environmental Fate and Transport, and Atmospheric Chemistry.

The Department of Chemical, Biochemical and Environmental Engineering at the University of Maryland, Baltimore County (UMBC) seeks PhD students to work on a variety of research projects. Students with backgrounds in chemistry, physics, engineering, and Earth sciences are encouraged to apply. For more information on specific opportunities, visit http://www.umbc.edu/cbe/ or contact Dr. Claire Welty (weltyc@umbc.edu).

PhD scholarships in Quantitative Marine Science, University of Tasmania (UTAS). The Institute for Marine and Antarctic Studies is seeking applicants for the CSIRO-UTAS PhD Program in Quantitative Marine Science (QMS). Understanding changes in marine systems is critical for advancing global change science. There is a clear demand from government agencies, research institutions and industry for marine scientists with high level quantitative (mathematical and computational) skills and training. QMS is an interdisciplinary graduate training program that merges expertise from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's national science agency, and the University of Tasmania. This partnership enables students to work with leading scientists on research projects that apply mathematics and statistics to marine science problems of local, national, regional and global significance including: using advanced skills to make physical, biological or chemical marine science increasingly predictive and quantitative; providing useful predictions based on understandings of ocean processes to allow economic sectors to respond effectively to climate variability; understanding the role of ocean processes in climate change and the influence of oceanic environments on large marine ecosystems; providing quantitative decision tools and processes to enable Australia to effectively manage marine biodiversity, ecosystem function and use of marine resources.

We provide generous scholarships, access to a world class research community, intensive short courses that offer specialised training in Quantitative Marine Science, well-resourced projects and access to cutting edge laboratories and sea-going facilities. Applicants should have a background in mathematics, &/or, statistics, who also have a major in physics, life sciences, chemistry, engineering , geomatics, and/or economics to undertake PhD projects in physical oceanography, meteorology, ecological modelling, biogeochemical modelling and fisheries economics.

For more information about the QMS program and application processes visit http://www.imas.utas.edu.au/qms or email the Program Manager at Denbeigh.Armstrong@utas.edu.au

PhD student opportunity at University of Oklahoma, investigating Land Use Effects on Water Quality of New Zealand Rivers using Remote Sensing. Visit http://geography.ou.edu/lcluc/ for more information or email jjulian@ou.edu. Preferred Qualifications: MS in Geography or other Remote sensing-related science; skills in Remote sensing analysis, GIS, and statistics. A research assistantship will be provided with competitive salary, research/travel funds, tuition, and health insurance.

Postdoctoral Fellowships.

The Geophysical Laboratory, Carnegie Institution of Washington, invites applications for postdoctoral fellowships. The Geophysical Laboratory emphasizes interdisciplinary experimental and theoretical research in fields spanning geoscience, microbiology, chemistry, and physics. The Laboratory supports world-class facilities in high-pressure research; organic, stable isotope and biogeochemistry; mineral physics and petrology; and astrobiology.

Please visit http://www.gl.ciw.edu/employment/Postdoctoral_Positions to view a list of required materials and application instructions. Also, see http://www.gl.ciw.edu/ for a listing of personnel, current research interests, and major facilities.

Completed applications for Carnegie fellowships should be submitted by January 15, 2013.

The Geophysical Laboratory is an equal opportunity employer.

Randolph and Cecile Bromery Graduate Fellowships.

Graduate fellowships at the UMass Amherst Geosciences Dept were funded by Bill Bromery, a distinguished African American geophysicist, to increase the participation of underrepresented U.S. students in the geosciences. The Geosciences Dept. plans to make two awards to MS and PhD students enrolling in Fall 2013. To learn more, go to http://www.geo.umass.edu/about/bromery. Application deadline is January 15, 2013.

The Department of Geological Sciences at Michigan State University has several has newly endowed funds to support several competitive fellowships for outstanding PhD students. These fellowships are in addition to teaching and research assistantships as well as university and college fellowships. For full consideration, applications should be received in the first week of December. See glg.msu.edu/grad_scholarships.html for details.

RESEARCH SPOTLIGHT

Highlighting exciting new research from AGU journals

Dynamic pressures in porous media

Understanding the relationship between fluid pressures and water content (saturation) in soils or other porous media can be important in a wide range of practical areas, including oil recovery, infiltration and flooding during extreme weather events, and environmental remediation. The relationship between fluid pressures and saturation in porous media has been reported to be dynamic—to depend on the flow rate as saturation changes. However, previous studies designed to understand the dynamic component of this relationship have been highly contradictory. To learn more, *Hou et al.* conducted experiments to quantify the relationship between pressure and rate of saturation change using a small-volume system with highly characterized fluid selective microsensors. Their analyses corrected for two often-overlooked experimental artifacts: gas pressure gradients and sensor response rate. When the researchers applied these corrections, they found that the dependence of pressure on the rate of saturation change may be much less significant than previously thought. (*Water Resources Research*, doi:10.1029/2012WR012434, 2012) —EB

Satellite failures revisited

In January 1994, the two geostationary satellites known as Anik-E1 and Anik-E2, operated by Telesat Canada, failed one after the other within 9 hours, leaving many northern Canadian communities without television and data services. The outage, which shut down much of the country's broadcast television for hours and cost Telesat Canada more than $15 million, generated significant media attention.

Lam et al. used publicly available records to revisit the event; they looked at failure details, media coverage, recovery effort, and cost. They also used satellite and ground data to determine the precise causes of those satellite failures. The researchers traced the entire space weather event from conditions on the Sun through the interplanetary medium to the particle environment in geostationary orbit.

The authors describe how the event began with a solar coronal hole that emitted high-speed solar wind streams, which interacted with the Earth over several days, exciting intense ultralow-frequency waves in Earth's geomagnetic field. These waves accelerated electrons to high energies, which produced high fluxes of energetic electrons for several days. These high fluxes of energetic electrons were more than the satellites' shielding could withstand, and charge built up inside the satellites. The discharge of this built-up internal charge damaged a component of the satellites' momentum wheels, causing the satellites to spin uncontrollably.

The event occurred during the relatively low activity portion of the 11-year solar cycle. The study highlights the fact that coronal holes, though not as spectacular as coronal mass ejections, which cause more extreme space weather, can still contribute to serious events. Thus the authors suggest that it is important for satellite operators to monitor near–real time electron fluxes and forecasts. (*Space Weather*, doi:10.1029/2012SW000811, 2012) —EB

Tree canopy creates ongoing reservoir for Fukushima radiation

When an earthquake-triggered tsunami destabilized the Fukushima Daiichi nuclear power plant in Japan in March 2011, authorities established a 20-kilometer exclusion zone around the failed reactors—a safeguard against the highest radiation concentrations. Radioactive particles were scattered far beyond the immediate vicinity, however, though in much lower concentrations. In a forested site 150 kilometers southwest of the failed plant, *Kato et al.* measured how the concentrations of radioactive cesium and iodine evolved over the 5-month period following the disaster. They found that some of the radioactive material, washed out of the air by the rain, was intercepted by the tree canopy in their study area. They found that though iodine quickly moved through the system, a majority of the radioactive cesium particles remained trapped in the treetop canopy, a potential future source of radioactive material.

Hiroaki Kato

Researchers tracked the flow of radioactive particles by collecting water in cedar and cypress forests, as shown above.

The authors studied forested plots with two different types of trees: cypress and cedar. By measuring the concentrations of radioactive material in rainwater on the ground and in throughfall and stemflow, the authors identified how the trees affected the flow of radionuclides through the ecosystem. They found that as the study went on, the concentration of cesium found in stemflow and throughfall started to surpass that arriving through precipitation, suggesting that the radionuclides were being stored in the tree canopy and later seeping out. The authors determined that cesium-137 concentrations in the forest canopy would have a half-life of 620 or 890 days, depending on whether the trees were cypress or cedar. (*Geophysical Research Letters*, doi: 10.1029/2012GL052928, 2012) —CS

—ERNIE BALCERAK, Staff Writer, and COLIN SCHULTZ, Writer