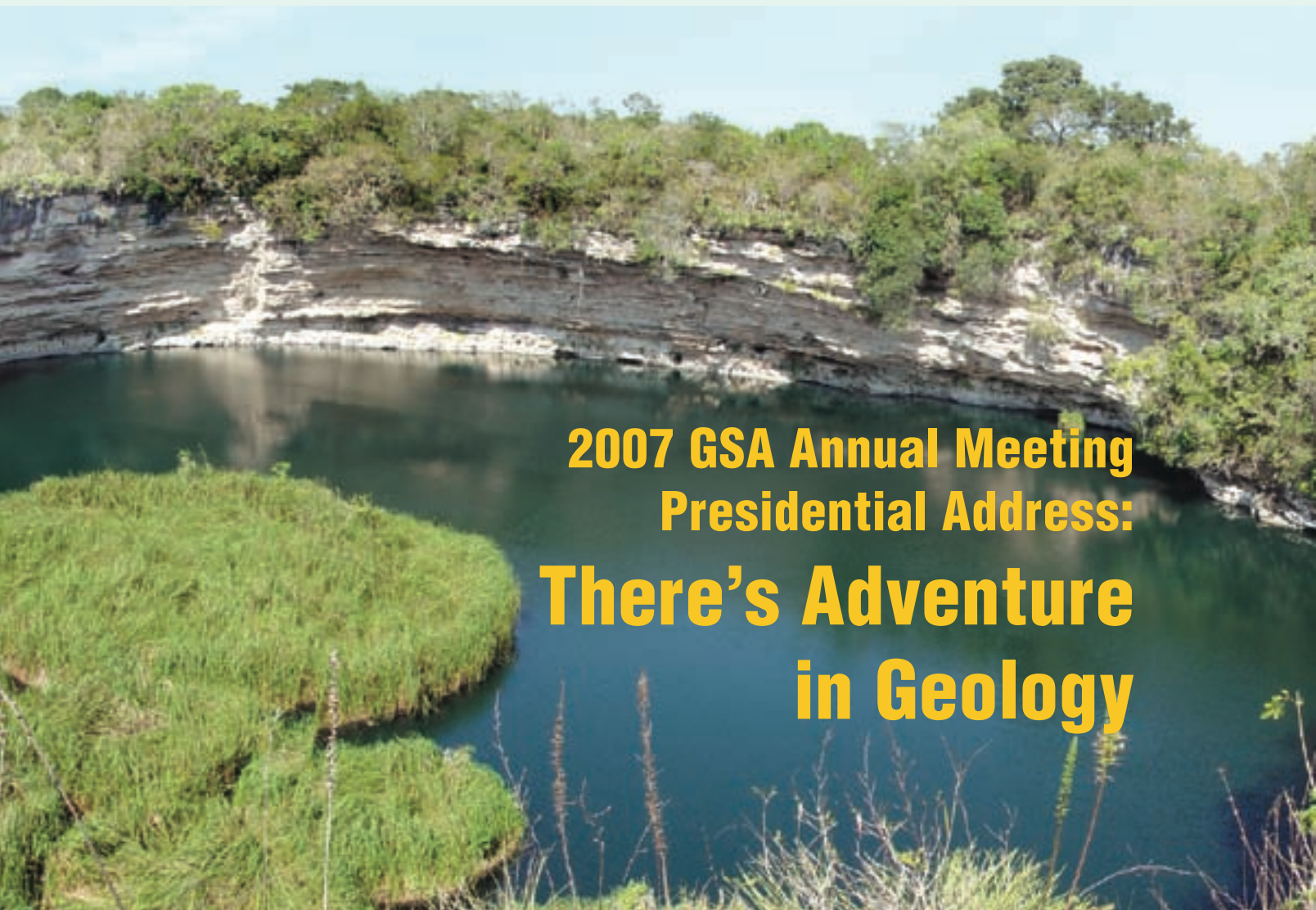


GSA TODAY

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JANUARY 2008



2007 GSA Annual Meeting Presidential Address: **There's Adventure in Geology**

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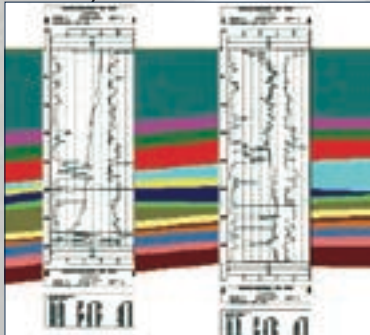
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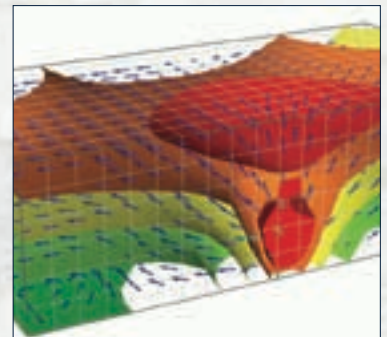


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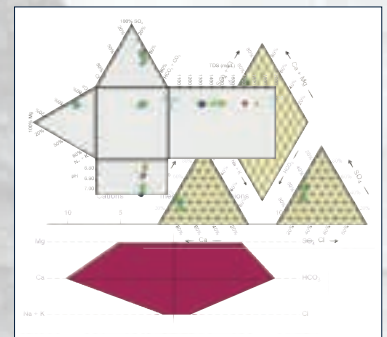


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PRESIDENTIAL ADDRESS

4 2007 GSA Annual Meeting Presidential Address: There's Adventure in Geology

John M. (Jack) Sharp Jr.

Cover: El Zacatón in Tamaulipas, México. Earth's deepest vertical water-filled sinkhole, El Zacatón was formed by hypogene karstic processes. It also served as the first field test site for DEPTHX, the autonomous robot mapper. Hydrogeologic results, instrumentation design, and future plans were presented at the 2007 GSA Annual Meeting in the special session titled "DEPTHX—The Deep Phreatic Thermal eXplorer: Robotic exploration and characterization of Sistema Zacatón on the mission path to Europa." The floating grass islands are called zacate. Photo by Art Palmer. See "2007 GSA Annual Meeting Presidential Address: There's adventure in geology" by John M. (Jack) Sharp, Jr., p. 4–6.



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2007 GSA Annual Meeting Presidential Address: There's Adventure in Geology



John M. Sharp, Jr., Department of Geological Sciences, The University of Texas at Austin, 1 University Station-C1100, Austin, Texas 78712, USA, jmsharp@mail.utexas.edu

There's Adventure in Geology (May, 1959) is a book that was written for young people in the late 1950s. It was given to my wife by one of her best

friends before we were married with the admonition, "If you are going to marry a geologist, you have to read this." In my opinion, it wasn't really a great book, but I can certainly attest that the title is true! As president of the Geological Society of America, it is my privilege to write this 2007 address, in which I wish to stress several points: the uniqueness and the adventure of our science, its importance to society, and some of the key issues that confront us as both scientists and citizens. I illustrate some of these points with some snippets of my own research—my scientific odyssey. This address could also have been called "The Privilege of Being a Geologist," paraphrasing Victor Weisskopf's (1989) *The Privilege of Being a Physicist*, for we are a privileged group.

My scientific odyssey has taken me to places that I never would have imagined in my youth and early career. I suspect that many of you who read this will have similar feelings. Who would have thought—I certainly didn't—that I would conduct field studies and present papers in Egypt (e.g., Bennett et al., 2002), Australia (Robinson et al., 1998), the UK (e.g., Sharp, 1997), México (e.g., Gary et al., 2003; Andring et al., 2006), and Italy (e.g., Sharp et al., 1982), as well as many U.S. states,

most notably Missouri (e.g., Grannemann and Sharp, 1979) and Texas (e.g., Sharp and Banner, 1997, 2000; Uliana and Sharp, 2001)? Fascinating geoscientific problems are everywhere. There is much we don't know and new problems still unimagined. Science, especially geology, is not dead!

International scientific meetings give us an opportunity to meet fascinating scientists from the entire globe. The Geological Society of America provides us a superb platform from which to present our research findings and ideas (as the references prove). GSA and our Allied and Associated Societies provide scientific stimulation, exposure to new ideas, and a great opportunity for camaraderie with fellow scientists. I could not have imagined 35–40 years ago that my research path would have looked at processes in great sedimentary basins (e.g., Sharp and Domenico, 1976; McKenna and Sharp, 1998), surface water–groundwater interactions in major alluvial systems (e.g., Sharp, 1988; Larkin and Sharp, 1992), analysis of free convection (e.g., Simmons et al., 2001), interbasinal and regional flow studies in semi-arid regions of North America (e.g., Sharp, 1989; Mayer and Sharp, 1998), the dominating role of fractures in hydrogeologic systems (e.g., Krasny and Sharp, 2007), the effects of urbanization on groundwater systems (e.g., Garcia-Fresca and Sharp, 2005; Wiles and Sharp, 2007), and karst hydrology (e.g., Halihan et al., 2000; Wolaver et al., 2006, 2007). I never conceived that I would have been even remotely associated with exploring Earth's deepest water-filled sinkholes as a prelude to eventual exploration of the solar system (Gary and Sharp, 2006). Scientific opportunities are constantly offering themselves to us for study. To the geologists of the future: you are lucky; who knows what scientific adventures await you and where they will take you. Have fun! Truly, there is adventure in geology.



Image by Stöckli, Nelson, Hasler Laboratory for Atmospheres Goddard Space Flight Center, <http://rsd.gsfc.nasa.gov/rsd>.

We geologists are a fortunate group of scientists. We work over a range of spatial and temporal scales that is rivaled only by the cosmologists. We look for minute chemical traces of life in ancient rocks and examine isotopic ratios, but we are also looking at deep earth structures and the evolution of the solar system where geology provides the ground-truth data. Unique to our science is the fact that we are concerned with both prediction and retrodiction of the processes that shape the world upon which we live. We are trying to decipher 4.5 billion years of Earth's history. The idea of geologic time (deep time), the evolution of life, and the concept of uniformitarianism are a few of our science's many gifts to mankind. It might, however, be geology's projections of earth processes into the future that are the most important. Much of the early growth of geology was driven by the prediction aspect. Where to find key mineral resources and how much of them exist were questions that led to support for geological mapping and the formation of our geological surveys. These remain critical projections—what are our petroleum, mineral, and water resources? These issues are important politically and economically. One of my first professional slides (Sharp and Domenico, 1976, Figure 2 therein) depicted sedimentary basins in the eastern hemisphere that are receiving such high rates of sediment deposition that they are predicted to contain excess pore-fluid pressures. For many of them, excess pore-fluid pressures had been reported in the literature before 1973, and most have since had such pressures documented. It is an interesting coincidence that these basins seem to correspond with zones of recent political turmoil. Of course, we either have found or expect to find petroleum in these basins. This may not be a coincidence, because wars have commonly commenced over possession of mineral, water, land, and now energy resources. Geology is important politically.

Perhaps the great question of today is—how large a population can a state or region or the world sustain given predicted climate, geologic, hydrologic, technical, and socioeconomic changes? The failure to project these changes and their probable effects continues to be a major source of political and economic conflict.

Prediction of geologic hazards is also critical. In some cases, we do this relatively well—flood stages and major volcanic eruptions are examples—in other cases, we are less precise, such as in predicting major earthquakes, catastrophic subsidence, or the effects of mankind as a primary geologic agent of change. On much of the world's land surface, it is difficult to find a square kilometer that hasn't been profoundly affected by mankind. We are, perhaps, the major geologic agent affecting Earth's surface. Finally, our field of research has expanded beyond planetary confines.

The adventure is there; our predictions involve the real world; even children are excited about geology—they can sense that adventure!

Our challenges are exciting, and daunting. They include

- Appreciation of deep time and Earth's evolution. Clearly, any society that denies either fundamental scientific

facts or scientific uncertainty is in big trouble. We as scientists have to bring our knowledge to the public and do it repeatedly.

- Integrating science, especially geology, into public policy decision making. For instance, we can predict sea level rise and floods, but we continue to build within one meter of mean sea level and on flood plains, areas that we are sure will be inundated eventually. We just cannot predict the timing. Are we rebuilding New Orleans in a rational manner? How do we communicate science to politicians, the business community, and the public?
- Population growth and urbanization. What is the maximum population Earth can sustain and which geographic locations are better than others? How do we best, if we can, find the energy, water, and agricultural productivity to meet the demands? Have we already passed sustainable levels?
- Environmental and climatic change. Geologists are in a unique position—we have documented significant changes over Earth's history. How do we predict the effects more precisely and how do we deal with the predicted change?
- Science and learning for its own sake. A line of research may not have an immediate practical value, but learning for its own sake must be fostered. We don't have to look far to find examples of "dreamer" science later turning out to be of immense practical value. Just because research doesn't have an immediate expected payback doesn't mean it should not be pursued. Follow your scientific insights!

We need to support science and push for financial support of science at all levels whether or not it is basic or applied and whether or not it is immediately practical or "blue sky." The rewards will be great, and the failure to do so will have very negative ramifications.

If addressing these challenges isn't an adventure, what is? We are indeed lucky to be geologists. Rock on! The adventure continues!

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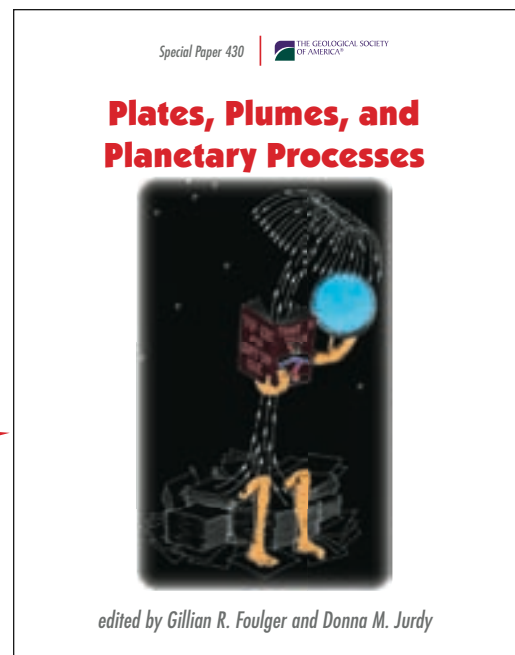
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THE 2007 AWARDEES

Phil and Amy Mickelson

Mickelson ExxonMobil Teachers Academy

Professional golfer Phil Mickelson recently publicized the serious need for improvement in the teaching of physical science and math in elementary schools in order to attract more students into those fields. To address that need, Phil and his wife, Amy, teamed up with ExxonMobil to establish the Mickelson ExxonMobil Teachers Academy, a week-long workshop to help third- through fifth-grade teachers gain the skills to excite their students about science and math. The teachers, selected from school districts around the country in teams of as many as ten from a district, will work in the academy with established science and math education experts.

The Mickelsons support the program financially and also join the teachers on the last day of the academy. Three public

service announcements ("peanut" and "kids scientists" [2006] and "what if" [2005]) about the teachers' academy ran during the television broadcasts of the 2005 and 2006 Masters Tournaments. The delivery of these powerful messages about the importance of science education to a national television audience in such an effective manner is another example of how the Mickelsons are providing outstanding support of the sciences.

For individuals who have reached the highest level of their own profession to offer their public support for science education deserves the gratitude, encouragement, and recognition of The Geological Society of America through the GSA President's Medal.



Stephen G. Wells, Citationist

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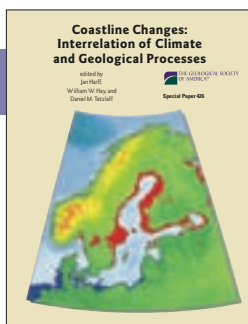
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Tanja Bosak
Massachusetts Institute of Technology



JOHN C. FRYE MEMORIAL AWARD
David K. Brezinski
Maryland Geological Survey



2007 HONORARY FELLOWS



Cheng-Fa Chang
Chinese Academy of Sciences



Martin de Wit
University of Cape Town, South Africa

2007 DIVISION AWARDS



RIP RAPP ARCHAEOLOGICAL
GEOLOGY AWARD
Norman Herz
University of Georgia
*Ervan G. Garrison
and Scott H. Pike, Citationists*



GILBERT CADY AWARD
Andrew C. Scott
Royal Holloway, University of London
John C. Crelling, Citationist



E.B. BURWELL, JR., AWARD
Fred G. Bell
British Geological Survey
Allen W. Hatheway, Citationist



E.B. BURWELL, JR., AWARD
Laurance J. Donnelly
Halcrow, Deanway Technology Centre
Allen W. Hatheway, Citationist



GEORGE P. WOOLLARD AWARD
Alan Levander
Rice University
Eugene D. Humphreys, Citationist



MARY C. RABBITT HISTORY OF
GEOLOGY AWARD
Kenneth L. Taylor
University of Oklahoma
Kennard B. Bork, Citationist



2007 DIVISION AWARDS

(continued)



G.K. GILBERT AWARD

Maria T. Zuber

Massachusetts Institute of Technology
Sean C. Solomon, Citationist



LAURENCE L. SLOSS AWARD

Michael A. Arthur

Pennsylvania State University
Bradley B. Sageman, Citationist



O.E. MEINZER AWARD

Shaun K. Frape

University of Waterloo
F. Edwin Harvey, Citationist

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DISTINGUISHED CAREER AWARD

Alan G. Smith

Cambridge University
Eldridge M. Moores, Citationist



KIRK BRYAN AWARD

Marith Cady Reheis

U.S. Geological Survey, Denver
Fred M. Phillips, Citationist



KIRK BRYAN AWARD

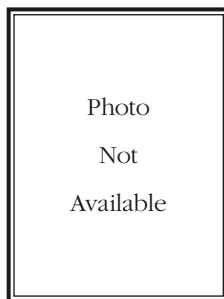
Andrei M. Sarna-Wojcicki

U.S. Geological Survey, Menlo Park
Fred M. Phillips, Citationist



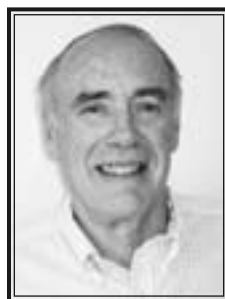
KIRK BRYAN AWARD
Richard L. Reynolds

U.S. Geological Survey, Denver
Fred M. Phillips, Citationist



KIRK BRYAN AWARD
Charles A. Repenning
(deceased)

U.S. Geological Survey, Denver
Fred M. Phillips, Citationist



KIRK BRYAN AWARD
Martin D. Mifflin

Mifflin and Associates
Fred M. Phillips, Citationist



STRUCTURAL GEOLOGY & TECTONICS
CAREER CONTRIBUTION AWARD

Warren Bell Hamilton

Colorado School of Mines
Keith A. Howard, Citationist

The full text of all 2007 citations and responses are online at www.geosociety.org/awards/index.htm. For a paper copy of any or all of the citations and responses, please contact Grants, Awards, and Recognition, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, awards@geosociety.org, +1-303-357-1028.



CALL FOR NOMINATIONS: 2008 GSA DIVISION AWARDS

Funds for the following GSA Division awards are administered through the GSA Foundation.

LAURENCE L. SLOSS AWARD FOR SEDIMENTARY GEOLOGY

Sedimentary Geology Division

Send nominations electronically by 20 February 2008

to Paul Link, secretary, Sedimentary Geology Division, linkpaul@isu.edu.

GSA's Sedimentary Geology Division is soliciting nominations for the 2008 Laurence L. Sloss Award for Sedimentary Geology. This award is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—i.e., achievements that contribute widely to the field of sedimentary geology and service to GSA. Monies for the award are derived from the annual interest income of the Laurence L. Sloss Award for Sedimentary Geology Fund, administered by the GSA Foundation.

Nominations should include a cover letter describing the nominee's accomplishments in sedimentary geology and contributions to GSA, along with a curriculum vitae. The Sedimentary Geology Division's management board will choose the recipient from two nominees selected by the nominations committee, and the award will be presented at the October 2008 GSA Annual Meeting in Houston.

GILBERT H. CADY AWARD

Coal Geology Division

Send three copies of the nomination by 28 February 2008

to Glenn B. Stracher, Division of Science and Mathematics, East Georgia College, 131 College Circle, Swainsboro, GA 30401, USA, +1-478-289-2073, fax +1-478-289-2080, Stracher@ega.edu. Awardees will be notified in early May 2008.

GSA's Coal Geology Division seeks nominations for the 2008 Gilbert H. Cady Award, given for outstanding contributions in the field of coal geology. The first award, established by the Division in honor of Gilbert H. Cady, was presented in 1973. Monies for the award are derived from the annual interest income of the Gilbert H. Cady Memorial Fund, administered by the GSA Foundation. The award recognizes contributions that advance the field of coal geology within and outside North America and will be presented at the Coal Geology Division Business Meeting at the October 2008 GSA Annual Meeting in Houston.

Nominations will be evaluated by the Gilbert H. Cady Award Panel and should include the name, office or title, and affiliation of the nominee; date and place of birth; education, degree(s), and honors and awards; major events in his or her professional career; and a brief bibliography noting outstanding achievements and accomplishments that warrant nomination.

GEORGE P. WOOLLARD AWARD

Geophysics Division

Submit nominations online by 15 February 2008 at www.gsageop.org/woollard.html.

GSA's Geophysics Division seeks nominations for the George P. Woollard Award. This annual award recognizes outstanding contributions to geology through the application of the principles and techniques of geophysics. The award is presented at each annual GSA meeting in conjunction with the Geophysics Division and the Structural Geology and Tectonics Division business meetings. A highlight of the presentation is the honorary George P. Woollard Technical Lecture by the recipient before the award ceremony, to provide an overview of and musings on his or her work. Nominations should include a description of the nominee's specific contributions and their scientific impact.

BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING AWARD

Geoscience Education Division

Submit nominations by 1 February 2008 to Eric J. Pyle, James Madison University, Dept. of Geology & Environmental Science, MSC 7703, Harrisonburg, VA 22807-0001, USA, pyleej@jmu.edu. To access the nomination form, please go to www.geosociety.org/awards/biggs.htm.

Beginning in 2008, the Biggs Award for Excellence in Earth Science Teaching will become a Geoscience Education Division named award. Division-named awards are among the most prominent awards given by GSA.

The Biggs Award recognizes innovative and effective teaching in college-level earth science. Earth-science instructors and faculty members from any academic institution engaged in undergraduate education who have been teaching full-time for 10 years or fewer are eligible. (Part-time teaching is not counted in the 10-years-or-fewer requirement.) Both peer- and self-nominations are accepted for this award.

The US\$750 award is made possible as a result of support from the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA's Education and Outreach Program. An additional travel reimbursement of up to US\$500 is available to the recipient to enable him or her to attend the award presentation at the GSA Annual Meeting.

DON J. EASTERBROOK DISTINGUISHED SCIENTIST AWARD

Quaternary Geology and Geomorphology Division

Send nominations by 2 April 2008 to Lisa L. Ely, Dept. of Geological Sciences, 400 E. University Way, Central Washington University, Ellensburg, WA 98926, USA, +1-509-963-2821, ely@cwu.edu.

GSA's Quaternary Geology and Geomorphology Division seeks nominations for the Don J. Easterbrook Distinguished Scientist Award. This award is given to an individual who has shown unusual excellence in published research, as demonstrated by a single paper of exceptional merit or a series of papers that have substantially increased knowledge in Quaternary geology or geomorphology. No time limitations apply to the recognized research. The recognition is normally extended to an individual, but in the event of particularly significant research, two people may share the award. Monies for the award are derived from the annual interest income of the Don J. Easterbrook Fund, administered by the GSA Foundation.

Although recognition of extraordinary prior research excellence is the principle goal of this award, it carries with it an opportunity to fund additional research. The Easterbrook Distinguished Scientist is eligible to draw funds for research from the GSA Easterbrook Fund in an amount to be determined by availability of funds. This opportunity to fund additional research by the awardee is a secondary consideration of this award.

Members of the Quaternary Geology and Geomorphology Division Award Panel will evaluate nominations for the Easterbrook Award. Because the award primarily recognizes research excellence, self-nomination is not allowed. Nominees need not be members of the Division. Nominations must be accompanied by supporting documentation, including a statement of the significance of the nominee's research, a curriculum vitae, letters of support, and any other documents deemed appropriate by the nominating committee. Nominations are not automatically carried forward to subsequent years, but individuals may be renominated.

FAROUK EL-BAZ AWARD FOR DESERT RESEARCH

Quaternary Geology and Geomorphology Division

Send nominations by 2 April 2008 to Marith C. Reheis, U.S. Geological Survey, MS 980, Federal Center, P.O. Box 25046, Denver, CO 80225-0046, USA, +1-303-277-1843, mreheis@usgs.gov.

GSA's Quaternary Geology and Geomorphology Division seeks nominations for the Farouk El-Baz Award for Desert Research. This award rewards excellence in desert geomorphology research worldwide. It is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it (US\$10,000 anticipated for 2008) may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership. Monies for the award are derived from the annual interest income of the Farouk El-Baz Fund, administered by the GSA Foundation.

Any scientist from any country may be nominated. Because the award recognizes research excellence, self-nomination is not permitted. Neither nominators nor nominees need be GSA Members. Nominations must be accompanied by a statement of the significance of the nominee's research, a curriculum vitae, letters of support, and documentation of published research results that have significantly advanced the knowledge of the Quaternary geology and geomorphology of desert environments.

ATTENTION VOTING MEMBERS

GSA Elections Start 13 March 2008

The success of GSA depends on you, its Members, and on the work of the elected officers who serve on GSA's Executive Committee and Council. All GSA member types are eligible to vote.

In late February, you'll receive a postcard with instructions for accessing our secure Web site and your electronic ballot. Biographical information on each candidate will be available for review at www.geosociety.org beginning in mid-February. Paper versions of the ballot and candidate information will also be available.

Please make your wishes known by voting for the nominees listed here.



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(July 2008–June 2009)

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Aires
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USA

Claudia I. Mora

University of
Tennessee–Knoxville
Knoxville, Tennessee, USA

Ballots must be submitted electronically or postmarked by 13 April 2008.

UPCOMING DEADLINES

MEDALS AND AWARDS

Nominations due 1 February 2008

Nominations are requested for the following medals and awards: Penrose Medal, Day Medal, Honorary Fellows, Young Scientist Award (Donath Medal), GSA Public Service Award, and GSA Distinguished Service Award. For details on the awards and nomination procedures, see the October 2007 *GSA Today*. For the online nomination form, go to www.geosociety.org/aboutus/awards/ or call +1-303-357-1028. Materials and supporting information for any of the nominations may be sent to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

GSA FELLOWS

Nominations due 1 February 2008

The Committee on Membership requests nominations of Members to be elevated to GSA Fellow status. Any GSA Fellow may nominate up to two members per election cycle for this honor. Two supporting letters in addition to the online nomination form are needed. For details on nomination procedures, see the October 2007 *GSA Today*, visit www.geosociety.org/members/fellow.htm, call +1-303-357-1028, or e-mail awards@geosociety.org.

2008 SUBARU OUTSTANDING WOMAN IN SCIENCE AWARD (Sponsored by Subaru of America Inc.)

Nominations due 1 February 2008

This award is given to a woman who has made a major impact on the field of the geosciences, based on her Ph.D. research. For details on the award and nomination procedures, see the October 2007 *GSA Today*. For the new online nomination form, go to www.geosociety.org/aboutus/awards/ or call +1-303-357-1028. Send nominations and supporting material to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

JOHN C. FRYE ENVIRONMENTAL GEOLOGY AWARD

Nominations due 31 March 2008

In cooperation with the Association of American State Geologists, GSA gives an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. For details, see the October 2007 *GSA Today*, visit www.geosociety.org, or call +1-303-357-1028. Nominations must be sent to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

STUDENT RESEARCH GRANTS 2008

Apply online at www.geosociety.org/grants/gradgrants.htm. **Online submission** must be completed by **Friday, 1 February 2008, at 11:59 p.m. (MST)**.

The GSA student research grant application process is **online only**. No paper applications or letters will be accepted.

Students must be GSA Members to apply and may only receive a grant once at the master's level and once at the Ph.D. level. Those who have applied for grant funding but have not received a grant are welcome to apply again. The maximum award per grant is US\$4000.

For further information on the 2008 Research Grant Program, see the October 2007 *GSA Today*, visit www.geosociety.org/grants/gradgrants.htm, call +1-303-357-1028, or e-mail awards@geosociety.org.

NATIONAL AWARDS

Nominations due 30 April 2008

Candidate nominations are needed for the following national awards: William T. Pecora Award, National Medal of Science, Vannevar Bush Award, and Alan T. Waterman Award. For details, see the October 2007 *GSA Today*. Nominations should be sent to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

RESEARCH AWARDS IN GEOMORPHOLOGY AND MICROPALAEONTOLOGY

Application deadline: 1 February 2008

Two of GSA's most prestigious awards supporting research are made possible by the generosity of the late W. Storrs Cole. Qualified GSA Members and Fellows are encouraged to apply. Online application forms are now accepted at www.geosociety.org/grants/postdoc.htm. Supplemental information must be e-mailed to awards@geosociety.org or mailed to Grants, Awards and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140, USA.

Geomorphology

The **Gladys W. Cole Memorial Research Award** provides support for the investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. GSA Members and Fellows between the ages of 30 and 65 who have published one or more significant papers on geomorphology are eligible for the award. While the funds may not be used for work that is already finished, recipients of previous awards may reapply if they need additional support to complete their work. The 2008 award is US\$9300.

Micropaleontology

The **W. Storrs Cole Memorial Research Award** supports research in invertebrate micropaleontology. This award carries a stipend of US\$8200 in 2008 and will go to a GSA Member or Fellow between the ages of 30 and 65 who has published one or more significant papers on micropaleontology.

The Gladys W. and W. Storrs Cole Award funds are managed by the GSA Foundation.

Antoinette Lierman Medlin Scholarship Award

GSA Coal Division

GSA's Coal Geology Division announces the availability of the Antoinette Lierman Medlin Scholarship in Coal Geology for the 2008–2009 academic year. The scholarship provides full-time students involved in coal geology research (origin, occurrence, geologic characteristics, or economic implications of coal and associated rocks) with financial support for their project for one year.

Scholarship funding can be used for field or laboratory expenses, sample analyses, instrumentation, supplies, or other expenses essential to the successful completion of the research project. ~US\$2,000 will be available for the 2008–2009 scholarship award. In addition, the scholarship recipient may be provided with a stipend to present the results of his or her research at the 2008 or 2009 GSA Annual Meeting.

The Coal Geology Division is also offering a field study award of ~US\$1,500 for the 2008–2009 academic year. The recipient of this award will also be eligible to receive travel funds to present the results of his or her study at the 2008 or 2009 GSA Annual Meeting.

A panel of coal geoscientists will evaluate proposals for the scholarship and for the field study award. Students may apply for the scholarship award, the field study award, or both; however, only one award will be made to a successful applicant.

Interested students should submit five copies of the following:

1. A cover letter indicating which award(s) is(are) sought;

2. A concise statement of objectives and methods and a statement of how the scholarship funds will be used to enhance the project (the proposal should be no more than five double-spaced pages, including references); and
3. A letter of recommendation from the student's immediate advisor that includes a statement of financial need and the amount and nature of other available funding for the research project.

Send materials to Ron H. Affolter, U.S. Geological Survey, P.O. Box 25046, MS 939, Denver Federal Center, Denver, CO 80225-0046, USA, +1-303-236-7752, fax +1-303-236-0459, affolter@usgs.gov.

The proposal and letter of recommendation (five copies) must arrive no later than **15 February 2008**. Applicants will be notified of the scholarship committee's decision by 2 April 2008.

This scholarship was established as a memorial to Antoinette "Toni" Medlin, who for many years dedicated her efforts toward the advancement of coal geoscience and the encouragement of students in coal geology. Monies for the scholarships are derived from the annual interest income of the Antoinette Lierman Medlin Scholarship Fund, which is managed by the GSA Foundation.



THE GEOLOGICAL SOCIETY
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CALL FOR APPLICATIONS

Stephen E. Dwornik Student Research Paper Award

GSA Planetary Geology Division

The Award:

Planetary geologist Stephen E. Dwornik established this award in 1991 to provide encouragement, motivation, and recognition to outstanding future scientists. Two awards are given annually: one for the best oral presentation, the other for the best poster presentation. Each winner receives a citation and US\$500. The program is administered through GSA's Planetary Geology Division; the GSA Foundation manages the award fund.

Criteria:

The Dwornik Student Research Paper Award applies to papers presented at the Lunar and Planetary Science Conference held each March in Houston. Student applicants must be (1) the senior author of the abstract (the paper may be presented orally or in a poster session); (2) a U.S. citizen; and (3) enrolled in a college or university, at any level of their education, in the field of planetary geosciences. Papers will be judged on the quality of the scientific contributions, including methods and results, clarity of material presented, and methods of delivery, oral or display.

To Apply: The application form and instructions are in the call for papers for the 39th Lunar and Planetary Science Conference, 10–14 March 2008, League City, Texas, USA. Please go to <http://www.lpi.usra.edu/meetings/> for more information.





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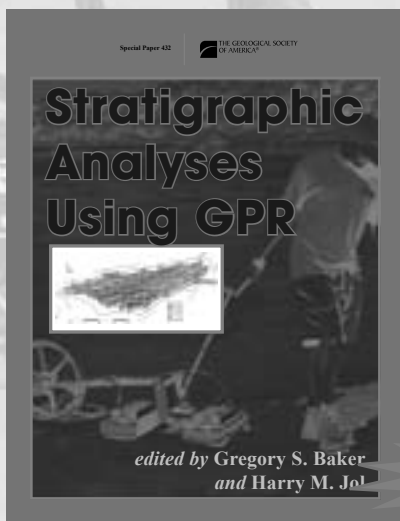
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Special Paper 432



Stratigraphic Analyses Using GPR

edited by Gregory S. Baker and Harry M. Jol



The objective of this publication is to expose the scientific community to the state of the art in ground penetrating radar (GPR) applications related to stratigraphic analyses and imaging of the shallow subsurface. Special Paper 432 begins with an introductory chapter on GPR designed for nongeophysicists. Subsequent chapters summarize the application and interpretation of GPR data collected in numerous geomorphic environments. These stratigraphic studies are derived from locations worldwide and cover an extensive range of topics including: dunes, beach ridges, barriers/beach plains, glacial-marine ice-contact delta deposits, lacustrine strandline deposits, paleolake shorelines, fluvial deposits, paleovalley fills, and clastic dikes. *Stratigraphic Analyses Using GPR* is an invaluable resource for GPR-focused geophysicists and nongeophysicists alike, in terms of both the leading-edge scientific content and the extensive reference lists of prior studies on a diverse array of applications.

SPE432, 181 p., ISBN 9780813724324 \$45.00, member price \$32.00

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57th Annual Meeting
Charlotte, North Carolina, USA

10–11 April 2008

The Department of Geography and Earth Sciences of the University of North Carolina at Charlotte will host the Southeastern Section Meeting of the Geological Society of America on 10–11 April 2008 at the Hilton Charlotte University Place. This is the premiere appearance of a Society meeting in Charlotte.

Details on field trips, workshops, student opportunities, the guest program, and symposia and theme sessions are listed at www.geosociety.org/sectdiv/southe/08mtg/. If you have questions or special requirements, please contact local committee chair, Andy R. Bobyarchick, arbobyar@uncc.edu, Dept. of Geography and Earth Sciences, University of North Carolina, Charlotte, NC 28223, USA, +1-704-687-5998; or technical program chair, John Diemer, jadiemer@uncc.edu, +1-704-687-5994. Please also see the supplementary local meeting Web site: <http://segsa2008.uncc.edu>.



REGISTRATION

Early Registration Deadline: 10 March 2008

Cancellation Deadline: 17 March 2008

Please register at www.geosociety.org/sectdiv/southe/08mtg/registration.htm.

REGISTRATION FEES (all fees are in U.S. dollars)

	Early	Standard	One-day
Professional Member	\$160	\$190	\$80
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Professional Member 70+	\$75	\$90	\$45
K–12 Teacher	\$50	\$50	\$25
Guest or Spouse	\$50	\$60	N/A
Field Trip or Workshop only	\$50	\$60	N/A

CALL FOR PAPERS

Abstract Deadline: 15 January 2008

Submission: <http://gsa.confex.com/gsa/2008SE/index.epl>

Submission Fee: US\$10

Technical program chair: John Diemer, +1-704-687-5994, jadiemer@uncc.edu.

Technical session descriptions are at www.geosociety.org/sectdiv/southe/08mtg/techprog.htm. Contact Nancy Wright, +1-303-357-1061, nwright@geosociety.org, if you have any problems with the electronic submission of your abstract.

FIELD TRIPS

Six field trips will be offered; see details at www.geosociety.org/sectdiv/southe/08mtg/fieldTrips.htm.

STUDENT MENTORING PROGRAMS

These mentor programs are sponsored by GSA Foundation. Questions? Please contact Jennifer Nocerino, jnocerino@geosociety.org.

Roy J. Shlemon Mentor Program in Applied Geoscience. Thurs.–Fri., 10–11 April, 11:30 a.m.–1 p.m. *Free meal included.*

The John Mann Mentors in Applied Hydrogeology Program. Thurs.–Fri., 10–11 April, 5–6:30 p.m. *Free meal included.*

Final Announcement and Call for Papers

NORTH-CENTRAL

42nd Annual Meeting
Evansville, Indiana, USA

24–25 April 2008



True-color image from the Moderate Resolution Imaging Spectroradiometer (MODIS) showing the upper U.S. Midwest on 5 October 2002. Image credit: Jacques Desclotres, MODIS Rapid Response Team, National Aeronautics and Space Administration–Goddard Space Flight Center, http://visibleearth.nasa.gov/view_rec.php?id=4732.



Evansville, Indiana, riverfront on the Ohio River during the arrival of the WWII vessel LST325 for permanent docking. Photo by Paul Doss.

Detailed information on field trips, workshops, student opportunities, the guest program, symposia, and theme sessions for this meeting is listed at www.geosociety.org/sectdiv/Northc/08mtg/. For further information, or if you have special requirements, please contact the local committee chair, Paul K. Doss, +1-812-465-7132, pdoss@usi.edu, or vice-chair, John P. Szabo, +1-330-972-8039, jpszabo@uakron.edu.

REGISTRATION

Early registration deadline: 24 March 2008

Cancellation deadline: 31 March 2008

Please register at www.geosociety.org/sectdiv/Northc/08mtg/registration.htm.

REGISTRATION FEES (all fees are in U.S. dollars)

	Early	Standard	One day
Professional Member	\$160	\$180	\$90
Professional Nonmember	\$185	\$200	\$100
Student Member	\$45	\$70	\$35
Student Nonmember	\$60	\$75	\$40
Professional Member 70+	\$100	\$100	\$50
K–12 Teacher	\$35	\$35	\$20
Guest or Spouse	\$50	\$50	N/A
Field Trip or Workshop only	\$35	\$35	N/A

CALL FOR PAPERS

Abstract deadline: 29 January 2008

Submission: <http://gsa.confex.com/gsa/2008NC/index.epl>

Abstract fee: US\$10

Technical program co-chairs: James M. Durbin, +1-812-465-1208, jdurbin@usi.edu; John Rupp, +1-812-855-1323, rupp@indiana.edu.

Technical session descriptions are at www.geosociety.org/sectdiv/Northc/08mtg/techprog.htm. Contact Nancy Wright, +1-303-357-1061, nwright@geosociety.org, if you have any problems with the electronic submission of your abstract.

FIELD TRIPS

For general information about the trips, please contact the field trip co-chair, Tony H. Maria, ahmaria@usi.edu. View trips and descriptions at www.geosociety.org/sectdiv/Northc/08mtg/fieldTrips.htm.

STUDENT MENTORING PROGRAMS

These mentor programs are sponsored by GSA Foundation. Questions? Please contact Jennifer Nocerino, jnocerino@geosociety.org.

Roy J. Shlemon Mentor Program in Applied Geoscience. Thurs.–Fri., 24–25 April, 11:30 a.m.–1 p.m. *Free meal included.*

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The Geological Society of America is accepting applications for the 33rd International Geological Congress (IGC) Travel Grant Program. This program was established as a final act of the organizing committee for the U.S.-hosted 28th IGC held in Washington, D.C., in July 1989. Surplus funds available at the conclusion of the 28th IGC were transferred to the GSA Foundation with the stipulation that income from the fund be used to support the attendance of young geoscientists at future IGC meetings until such time that the United States again hosts an IGC. Travel grants will consist of economy airfare to Norway.

To be eligible, an applicant must be a resident or citizen of the United States, must have a birth date after 31 August 1968, and must have proof of abstract submission to the meeting.

Applications are on the Web at www.geosociety.org/grants/travel.htm. In addition to the online form and proof of abstract submission, all applicants must provide two letters of reference from current or recent supervisors. All supplemental information must be sent as e-mail attachments directly to awards@geosociety.org. Online applications and supplemental material must be received electronically no later than **1 March 2008**. Applicants will be notified of results no later than June 2008.

Section Meeting & Mentor Program Calendar

CORDILLERAN AND ROCKY MOUNTAIN JOINT MEETING

19–21 March

University of Nevada, Las Vegas, Nevada

www.geosociety.org/sectdiv/cord/08mtg/

General meeting co-chairs: Rod Metcalf, +1-702-895-4442,
rod.metcalf@unlv.edu;

Larry Middleton, +1-928-523-2429,
larry.middleton@nau.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 20–21 March, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Thurs., 20 March, 5–6:30 p.m.

NORTHEASTERN

27–29 March

Hyatt Regency Buffalo, Buffalo, New York

www.geosociety.org/sectdiv/northe/08mtg/

Meeting chair: Gary Solar, +1-716-472-7015,
solargs@buffalostate.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 27–28 March, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Thurs., 27 March, 5–6:30 p.m.

SOUTH-CENTRAL

30 March–1 April

Hot Springs Convention Center, Hot Springs, Arkansas

www.geosociety.org/sectdiv/southc/08mtg/

Local Committee chairs: Jeff Connelly, +1-501-569-3543,
jbconnelly@ualr.edu; Scott Ausbrooks, +1-501-683-0119,
scott.ausbrooks@arkansas.gov.

Shlemon Mentor Program Luncheons:

Mon.–Tues., 31 March–1 April, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Mon., 31 March, 5–6:30 p.m.

SOUTHEASTERN

10–11 April

Hilton Charlotte University Place, Charlotte, North Carolina

www.geosociety.org/sectdiv/southe/08mtg/

Local Committee chair: Andy R. Bobyarchick, +1-704-687-5998,
arbobyar@unccl.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 10–11 April, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

Thurs., 10 April, 5–6:30 p.m.

NORTH-CENTRAL

24–25 April

Casino Aztar, Evansville, Indiana

www.geosociety.org/sectdiv/northc/08mtg/

Local committee chair: Paul K. Doss, +1-812-465-7132,
pdoss@usi.edu.

Shlemon Mentor Program Luncheons:

Thurs.–Fri., 24–25 April, 11:30 a.m.–1:00 p.m.

Mann Mentors in Applied Hydrogeology Program:

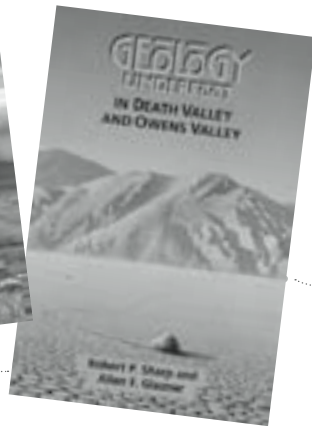
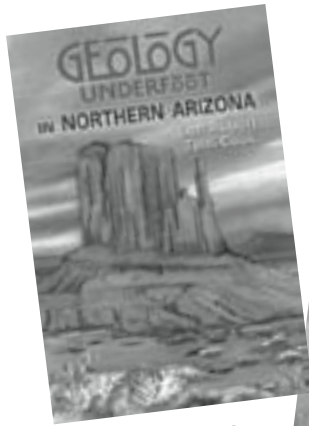
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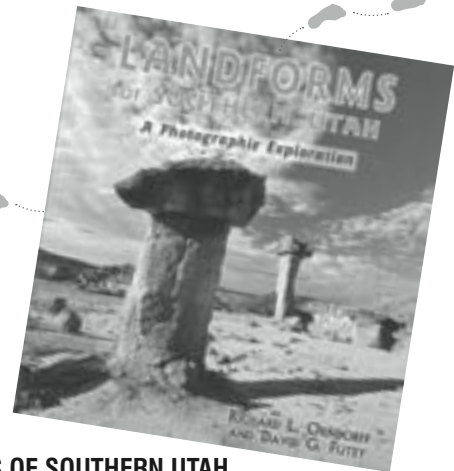


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GEOLOGIC PAST

Highlighting Articles from *GSA Bulletin*

ANTS MOVE THE EARTH

GSA Bulletin, August 1910

J.C. Branner: *Geologic work of ants*

J.C. Branner presented his paper "Geologic work of ants" to GSA's Cordilleran Section on 25 March 1910; it was published in *GSA Bulletin* in August that same year (v. 21, p. 449–496). In this paper, Branner exposes the geologic impact of tropical ants, as seen in "their nests, habitations, refuse heaps, or mounds, above ground and their burrows, tunnels, passages, and other excavations beneath the surface, and the opening up of the soil and the subjacent rocks to various atmospheric influences" (p. 450). The study is focused on the ants of South America (especially Brazil and Paraguay), and Branner notes, "Though the ants of Switzerland and of temperate regions generally exhibit the same ingenuity and intelligence as those of tropical countries, as geologic agents they are very tame indeed" (p. 452).

Branner's article is well illustrated; drawings and descriptions of some mounds constructed by ants in Brazil showed them to be "as much as 5 meters high, with bases 15 or 16

meters in diameter" (p. 465). Extensive tunneling, another ant-impact on geology, is also illustrated and described: "The length of the tunnels has often been demonstrated by forcing smoke through them. I have myself seen fumes blown into one opening and issuing from others as much as 300 meters away" (p. 473).

John Casper Branner (1850–1922) was president of GSA in 1904. He served as assistant geologist to the Geological Survey of Brazil from 1874 to ca. 1884 and was later vice president (1889–1913) and president (1913–1915) of Stanford University. He also served as president of the Seismological Society of America in 1911.



2007 GSA Annual Meeting Wrap-up

2007 EARTH SCIENCES FOR SOCIETY

Beginning of the International Year of Planet Earth

Thanks to all for a successful 2007 GSA Annual Meeting, especially to our organizing committee: Dave Bush, technical program chair; Robert Reynolds, field trip chair; and Richard Berg, Hot Topics chair.

This was our second largest meeting ever, with 6,726 attendees—only bested by our Centennial Meeting in 1988! Two-hundred and thirty-seven sessions were held, and 3,676 abstracts were presented. Our 27 field trips and 11 short courses rivaled those of previous years as well. We are still waiting on hotels to report our post-event numbers, but going into the meeting, 91% of our hotel room block was filled, with a total of 1,822 rooms occupied per night on our peak nights.

The exhibit hall was hopping with 240 exhibitor booths and 175 companies exhibiting. Eighty schools participated in the Graduate School Information Forum: Sunday was just shy of sold out, and Monday was completely sold out.

University and college group and private alumni events were popular: 39 schools participated in the group alumni event; 52 schools participated in private alumni receptions. Some of the private alumni receptions were joint gatherings, bringing together two to four different schools.



Colorado Convention Center. Photo by K.E. Asmus

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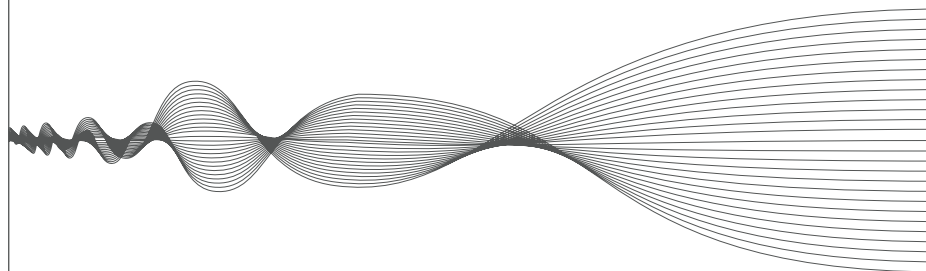
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Houston with Buffalo Bayou
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I'll never forget one Friday morning in late July 1974 in Butte, Montana, when Bill Kelly and Rob Van der Voo masterfully convinced George Brimhall, then with Anaconda, to support my M.S. research and launch a career in academia.

—John W. Geissman



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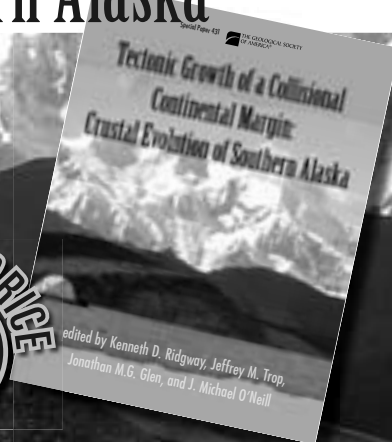
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Hothouse, Icehouse, and Impacts: The Late Eocene Earth

Monte Cònero (Ancona), Italy ■ 3–6 October 2007

Conveners

Alessandro Montanari, *Osservatorio Geologico di Coldigioco, I-62020 Frontale di Apiro (MC), Italy; sandro.ogc@fastnet.it*

Christian Koeberl, *Center of Earth Sciences, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria; christian.koeberl@univie.ac.at*

Frits Hilgen, *Institute of Paleoenvironment and Paleoclimate, Budapestlaan 4, 3584 CD Utrecht, The Netherlands; fhilgen@geo.uu.nl*

Rodolfo Coccioni, *Istituto di Geologia e Centro di Geobiologia dell'Università, Campus Scientifico, Località Crocicchia, 61209 Urbino, Italy; cron@info-net.it*

The late Eocene and the Eocene-Oligocene (E-O) transition mark the most profound oceanographic and climatic changes of the past 50 m.y. of Earth's history, with cooling beginning in the middle Eocene and culminating in the major earliest Oligocene Oi-1 isotopic event. The late Eocene is characterized by an accelerated global cooling, with a sharp temperature drop of about 2 °C near the Eocene-Oligocene (E-O) boundary, and significant stepwise floral and faunal turnovers. These global climate changes, which are reflected by a gradual increase of marine oxygen isotope values and biotic crises, are commonly attributed to the expansion of the Antarctic ice cap following its gradual isolation from other continental masses. However, multiple bolide impact events, possibly related to a comet shower lasting over 2 m.y., may have played an important role in the deterioration of the global climate at the end of the Eocene.

One of the best and most famous exposures of the late Eocene, as well as the site of the Eocene-Oligocene Global Stratotype Section and Point (GSSP), is at Massignano, at the Cònero Riviera near Ancona in east-central Italy; this was the subject and location of a meeting in 1987. The 2007 GSA Penrose Conference was held nearby at the Hotel Monteconero, a converted monastery. The meeting included three days of oral and poster presentations and a one-day field trip (visiting the E-O transition, late Eocene impact layers, K-T boundaries, and rock units in between, of the Umbria-Marche pelagic sequence). The oral and poster sessions covered the following topics: integrated stratigraphy of the late Eocene–early Oligocene transition and reevaluation of the GSSP; paleoecology and paleoclimate through the critical period of transition from hothouse to icehouse; and late Eocene impact processes and impact stratigraphy.

The first two days of sessions focused on a better understanding of the Eocene-Oligocene boundary transition using different climate proxies, improved time control, and climate models. Combined, the presentations gave an excellent overview and impression of the current exciting and detailed studies aiming to unravel this major climate transition.

The first morning session started with an overview by A. Montanari of the 20 years of scientific studies on the Massignano boundary stratotype section following the 1987

meeting. Next were two talks on the chronostratigraphic position and numerical age of the boundary. H. Brinkhuis convincingly showed that the E-O boundary as currently defined does not coincide with the top Priabonian, the youngest stage of the Eocene, or with the major Oi-1 isotope shift as expressed in the dinoflagellate sea-surface temperature record from Massignano. He started the discussion of whether it would be desirable to remove the boundary and place it at a stratigraphically higher level coincident with Oi-1 and the top Priabonian. F. Hilgen reviewed research aimed at numerical dating of the boundary and showed that age-dating using totally independent astronomical and radio-isotopic methods essentially reveal the same age of ca. 33.7 Ma, but that this is not necessarily the case if attempts to intercalibrate these methods are taken into account. Clearly, more research is necessary in this direction.

The afternoon session started with presentations dealing with deep marine stable isotope and cyclostratigraphic records and with the application of the marine osmium (Os) isotope record of the Eocene-Oligocene transition. S. Bohaty outlined recent progress in developing high-resolution benthic stable isotope records and orbital chronologies of deep-sea sections spanning the critical time interval. Ocean Drilling Project (ODP) Leg 199 site 1218 clearly revealed a two-step nature of the Oi-1 isotope shift and a potential link to favorable orbital configurations with a prolonged cool summer over Antarctica. Several sites reveal significant $\delta^{18}\text{O}$ variability throughout the late Eocene, including a $\sim 0.5\text{‰}$ increase associated with the iridium anomaly ca. 35.4 Ma. In addition, significant changes in carbonate content are observed, including a very interesting major dissolution horizon directly preceding Oi-1. However, Eocene carbonate dissolution also hampers the construction of an orbital-tuned continuous cyclostratigraphy necessary to unravel cause and effect across the boundary interval.

The stratigraphic utility of the marine Os isotope record of the Eocene-Oligocene transition was discussed by G. Ravizza, focusing on the marked latest Eocene minimum. The recovery following the minimum roughly coincides with the Oi-1 isotope shift, and similar values below and above the minimum do not point to a

permanent change in global weathering patterns. Using the minimum as a time stratigraphic tool revealed that deposition of biosiliceous, organic-rich sediments along the West African margin culminated during Oi-1. B. McGowran presented the Auversian Facies Shift, which marks a fundamental shift in oceanic facies spanning the Bartonian and Priabonian stages and marking the changeover from the Eocene Climatic Optimum to the major Antarctic glaciation of Oi-1.

Further presentations focused on sea-level (and sea-surface and bottom water temperatures) history during the E-O transition as recorded on the shelves of the East Coast of the United States. B. Wade and others made a comparison between shelf-based sea-level reconstructions and high-resolution $\delta^{18}\text{O}$ records that suggests that no significant sea-level drop occurred during the first (precursor) step in $\delta^{18}\text{O}$ but that the second step is associated with a major 55-m sea-level fall. The resulting large Antarctic ice sheet then became the main driver of major changes in the ocean-climate system. The effect of the Oi-1-related sea-level drop is also evident in shelf successions found in the southeastern United States. R. Fluegeman showed that the boundary between the Jackson and Vicksburg Groups is marked by an erosional unconformity and a



Participants inspecting the impact layers at the Massignano quarry at the Cònero Riviera, Italy (the GSSP for the Eocene-Oligocene boundary is in the very left front of the image).

prominent benthic foraminiferal fauna turnover, neither of which coincide with the biostratigraphic E-O boundary—they are slightly higher, probably coincident with the Oi-1 shift. B. Wade presented sea-surface temperature data and sequence stratigraphic interpretations from the E-O transitional interval in Alabama; the former is clearly evidence of a substantial decrease in subtropical temperatures between 33.9 and 33.5 Ma. Finally, S. Galeotti showed the presence of orbitally controlled glaciomarine sequences in the E-O boundary interval in the CRP-3 core of the Cape Roberts project, noting marked changes in the astronomical frequencies and no major change in ice volume during Oi-1, but only later, in the middle of Chron C12r.

The morning session of the second day focused on the biotic response to the E-O climate transition. S. Schellenberg presented a detailed ostracode study of ODP sites 698 (Maud Rise) and 744B (Kerguelen) separated by $\sim 90^\circ$ longitude. Major faunal changes coincide with the Oi-1 onset and imply a common response to enhanced surface productivity and a disparate (site) response to either subtle changes in productivity or changes in bottom water conditions. A significant size increase in ontogenetic stages may also

be related to increased export production. L. Alegret discussed benthic foraminiferal assemblages from the Fuente Caldera section in Spain. No faunal changes occurred at the major Ni-rich spinel anomaly, which is indicative of an impact event. Higher in the section, two benthic foraminiferal turnovers are found. The first one is recorded at the E-O boundary and may be linked to the global cooling of deep waters at that time. The second one is recorded in the upper Rupelian and is related to a major shallowing event. B. Wade (on behalf of M. Aubry) presented the long-term evolutionary turnover in the coccolithophorids that took place from the late middle Eocene through early Oligocene. The E-O boundary itself appears to have been a drastic event at low latitudes but is essentially unmarked in assemblages from high latitudes.

S. Monechi presented calcareous nanofossil and benthic geochemical evidence from ODP site 1263 from Walvis Ridge (South Atlantic). Interestingly, changes in the calcareous nanofossil



Meeting participants in front of the church at the Hotel Monteconero, Italy (including some visiting undergraduate students from Carleton College, USA): Laia Alegret, Milly Alvarez, Walter Alvarez, Katerina Bartosowa, Steven Bohaty, Henk Brinkhuis, Rachel Brown, Philippe Claeys, Rodolfo Coccioni, Daniel Condon, Cameron Davidson, Robert DeConto, Ken Farley, Kristen Farley, Raquel Fenero, Chiara Fioroni, Richard Fluegemann, Simone Galeotti, Steven Goderis, David Griscom, Scott Harris, Frits Hilgen, Jerry Hooker, Dona Jalufka, Patricia Jannett, Simon Kelley, Christian Koeberl, Paul Kopsick, Brian McGowran, Paula Metallo, Simonetta Monechi, Alessandro Montanari, Silvia Ortiz Sainz-Aja, Mark Pagani, Francois Paquay, Isabella Premoli Silva, Aimee Pusz, Greg Ravizza, Stephen Schellenberg, Birger Schmitz, Nathan Sheldon, Jan Smit, Selena Smith, Dennis Terry, Flavia Tori, Simone Ulmer, Bridget Wade, Paul Wilson, and Alessandro Zanazzi.

assemblages coincident with a dramatic decrease in the discoaster abundance reveal that cooling of the surface waters started ca. 34.5 Ma (i.e., well before the Oi-1 event). This is followed by a second change concurrent with Oi-1. Furthermore, several brief pulses of warm and temperate taxa are found during Oi-1 and correlate with increases in benthic $\delta^{18}\text{O}$, indicating a possible decoupling of surface- and deep-water processes.

B. Wade presented patterns of diversity, extinction, and speciation in excellently preserved calcareous microfossil assemblages from hemipelagic sediments in Tanzania, covering the critical interval across the E-O boundary. Two major, rather closely spaced, planktonic foraminiferal extinction events of turborotalid species and of the five remaining species of the family Hantkeninidae were recognized. The latter coincides with the formally defined E-O boundary. After these extinctions, renewed speciation and diversification occurred, resulting in the characteristic Oligocene associations.

The first presentations on the afternoon of the second day dealt with the E-O boundary interval in the continental record. D. Terry presented data from the White River Group of northwestern Nebraska, which represents the most complete succession of continental deposits across the transition in this region. Paleosol characteristics are indicative of progressively drier climate conditions up-section. In contrast, vertebrate stable isotope records suggest no change in aridity but a temperature drop of up to 8 °C across the boundary. This contradiction may result from a considerable increase in sedimentation rate affecting soil development and explaining the weaker Oligocene paleosols. Clearly, an interdisciplinary approach is needed to decipher the E-O transition as recorded in such very complex terrestrial systems. N. Sheldon presented nonmarine records of climate change across the E-O boundary. He focused in particular on the application of paleosols as climate proxies and showed that, contrary to expectation, the data reveal relatively steady annual climate conditions across the E-O transition, suggesting that other climate variables, such as seasonality, may have driven faunal and floral turnovers. Furthermore, paleosol-derived records of chemical weathering are inconsistent with the timing of the Himalayan uplift hypothesis and reveal a reduction in chemical weathering associated with the E-O transition. J. Hooker summarized studies on the continental Eocene-Oligocene transition in the Hampshire Basin (UK), indicating no major paleo-temperature decrease across the boundary. This raises the question of whether the European mammal turnover, known as the Grande Coupure, is related to changes in seasonality rather than annual changes. However, interpretation of the expression of the E-O boundary also depends on the accuracy of the age model and the calibration of the magnetostratigraphy.

Climate modeling of the Antarctic ice sheet and the reconstruction of paleo- $p\text{CO}_2$ in the atmosphere across the E-O boundary was discussed next. R. DeConto presented results of climate modeling experiments that show an astronomical control on the size of the Antarctic ice sheet and a marked stepwise increase in ice volume—when $p\text{CO}_2$ is gradually reduced with time—that is markedly similar to that observed in the paleo-record. He further used a coupled general circulation–ice sheet model to explore whether the Oi-1 glaciation might have been a bipolar event. Major continent-sized northern hemisphere ice sheets could only start to grow with a significant reduction in atmospheric $p\text{CO}_2$ to near modern, pre-industrial values. This outcome would imply

rapid carbon cycle feedbacks to significantly reduce $p\text{CO}_2$ at the Oi-1 in order to accomplish major bipolar glaciation at that time. M. Pagani focused on this role of $p\text{CO}_2$ during the Eocene-Oligocene transition and outlined the problems associated with using alkenones as a proxy for atmospheric $p\text{CO}_2$. His latest revised alkenone-based $p\text{CO}_2$ records across the boundary now reveal a possible rapid decrease in $p\text{CO}_2$.

Following the field trip, the last day of the meeting dealt with various aspects of the late Eocene impact events. C. Koeberl provided an overview of the impact structures currently known to have a late Eocene age (mainly the 100-km-diameter Popigai crater in Russia and the 85-km-diameter Chesapeake Bay structure in the United States, but also a few smaller structures), as well as of impact ejecta deposits of this age around the world. K. Farley discussed the pros and cons of the comet shower versus asteroid shower hypotheses that have been proposed to explain both the ^3He anomaly and the multiple impacts. B. Schmitz compared the extensive evidence for a large mid-Ordovician asteroid and meteorite shower with the situation at the end of the Eocene; R. Coccioni reviewed the evidence for multiple extraterrestrial signatures at the Massignano quarry; and P. Claeys presented geochemical evidence favoring the asteroid shower hypothesis because the impactors of several late Eocene craters have compositions similar to some ordinary chondritic meteorites. In the final talk of the morning, F. Paquay demonstrated the possible use of the osmium isotope system to derive information on the size of the impactors.

The final afternoon session began with a contribution by D. Griscom on some possible proximal ejecta from the Chesapeake Bay crater, and then S. Kelley showed convincingly that the often-cited apparent correlation between large igneous provinces and mass extinction is a statistical artifact. He also reported some new crater ages that suggest there may be up to half a dozen impact craters with late Eocene ages. This was followed by a report by A. Pusz on how the late Eocene impact events influenced the global carbon cycle. R. Brown demonstrated a disturbance in the Milankovich cyclicity at Massignano that coincided with the timing of the major impact events (Chesapeake Bay, Popigai), implying a causal relationship. The last presentation of the meeting was by A. Montanari, who reported on the Eocene-Oligocene transition in the Monte Cagnero section in central Italy and how it correlates with the GSSP of Massignano, noting that it might contain an even more complete record of the E-O transition than Massignano.

Discussion of the various accomplishments of the meeting and of the past 20 years of research concluded that, for the time being, the location of the GSSP at Massignano and its placement at meter level 19 is sufficient, despite some suggestions that the disturbance of the global carbon signature might be a more suitable time marker. Concerns were raised that some effort needs to be put into the correlation between the marine and terrestrial boundary time markers. The past 20 years of research also led to the discovery of several major impact events during the late Eocene—if as a result of a comet or an asteroid shower still requires more work—and also that these impacts caused only minor, but distinctly noticeable, disturbances in the global carbon cycle and thus global climate, with severe, but not catastrophic, implications for the earth system at the time.

The Origins of Geology in

ITALY



*edited by Gian Battista Vai
and W. Glen E. Caldwell*

**\$85.00,
member price \$60.00**

This volume includes an eclectic group of papers by authors of varied backgrounds and nationality who describe contributions to natural science and philosophy by Italian or foreign geologists working in Italy between the fourteenth and nineteenth centuries. Each of these scientists contributed to the emergence of modern geology as a distinct scientific discipline, starting with Aldrovandi, who coined the term *geology* in 1603, and continuing with Agricola, the early gemologists and mineralists, the Florentine artists, Descartes, Gassendi, Kircher, Steno, Marsili, Arduino, Gregory Watt, William Maclure, Brocchi, and Pilla. When Lyell disseminated the Huttonian doctrine in his *Principles*, he fully recognized the legacy of pioneering Italian studies in geology. The aim of the volume is to restore Lyell's insights, which

were not investigated further by Italian geoscientists and historians of science during the nineteenth and twentieth centuries. Rediscovering the roots of modern geology is an invaluable and crucial goal for a sound assessment of long-term perspectives of this science and of science as a whole.

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GSA Committees: Progress through Service

The GSA Committee on Research Grants

Pound for pound, I doubt any group has a greater impact on the course of geological research than GSA's Committee on Research Grants. The beneficial impact of giving budding geoscientists a boost when they need it most cannot be overstated.

Two commitments are needed to keep this good thing going. The more obvious one consists of funds to give to awardees. The less obvious one consists of dedicated GSA Members who are willing to devote a block of time to reading and ranking proposals each spring. The reading and initial ranking are now done online, but half of the committee still travels to Boulder (at GSA's expense) to meet face to face, discuss the proposals, and make the final decisions on which research will be funded.

These activities are necessary for the continued health of the geoscience profession. I sincerely hope you will consider volunteering to be part of them in the near future.

COMMITTEE HISTORY AND ACCOMPLISHMENTS

The Committee on Research Grants has evolved dramatically since its inception in 1932, as a direct result of the Penrose bequest. The early committee had an annual budget of about US\$50,000. Grants were given only to established professionals and were voted on individually by Council, and a detailed quarterly accounting was required (see Eckel, 1982). Ph.D. students started receiving grants in 1955, and grants to master's degree students followed in 1973.

The main emphasis of the research grants program has always been on funding multiple short-term projects, but it also helped support a few larger projects early on, including the *Treatise on Invertebrate Paleontology* series and a Depression-era revision of Dana's *System of Mineralogy*.

From the year 2000 until now, the committee has dispersed more than US\$3,750,000 to some 2,070 graduate students, meaning the average award

was over US\$1,800. The percentage of applicants receiving full or partial support over that time span is an impressive 45%, and the grants are almost equally divided between Ph.D. and master's degree candidates.

GSA has worked hard to sustain this high level of support and has been able to do so by actively seeking funds from multiple sources. These include substantial contributions from the National Science Foundation, generous gifts from individual members, and the active participation of GSA's Divisions. The committee has tinkered with the grant conditions over the years, striving to provide meaningful support to as many projects as possible. For example, in 2005, we reluctantly moved to a policy of only awarding one grant per student per graduate degree, but that helped put us in position to increase maximum awards from US\$3,500 to US\$4,000 this year.

SIGNIFICANCE AND IMPACT OF GSA RESEARCH GRANTS

Support for geological research, defined broadly, is what the committee is all about, and this is the primary motivator of those who agree to serve on this committee. The grants are a thing of beauty in many ways—they go directly to students, all of the money is used in direct support of research, and many give the recipient their first taste of success in the all-important grant game. Recipients are justifiably proud when they receive a GSA research grant, and they feature it on their curriculum vitae.

Many GSA-funded projects serve as springboards toward opening broad vistas. An informal canvas of 17 colleagues confirmed what I suspected—most of us received GSA grants-in-aid as graduate students. The grant I received in the 1970s made it possible for me to study Precambrian iron formations in North America.

Since then, I have studied them on three other continents. You can help ensure that the next generation of geoscientists has comparable opportunities by serving on the Committee on Research Grants and/or contributing to its funding.

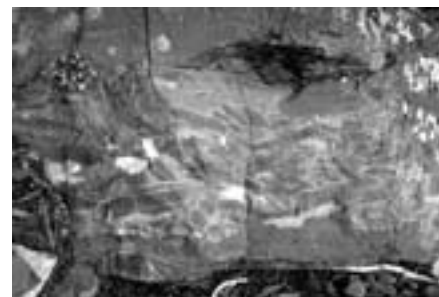
Bruce Simonson, Oberlin College, bsimonso@oberlin.edu
Past Chair, Committee on Research Grants

REFERENCE CITED

Eckel, E.B., 1982, The Geological Society of America—Life History of a Learned Society: Geological Society of America Memoir 155, 167 p.



Two-billion year-old Negaunee banded iron formation (BIF) on Jasper Knob, Ishpeming, Michigan, USA, in the 1970s (rock hammer for scale).



Intraformational conglomerate of jasper pebbles in two-billion year-old Sokoman granular iron formation (GIF) near Schefferville, Quebec, Canada, in the 1970s (penny in upper right for scale).

Note: For more information on GSA committees, go to www.geosociety.org/aboutus/committees/

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Continental Intraplate Earthquakes: Science, Hazard, and Policy Issues

Special Paper 425

edited by Seth Stein and Stéphane Mazzotti



This volume brings together a sampling of research addressing issues of continental intraplate earthquakes, including a core of papers from special sessions held at the spring 2004 Joint Assembly of the American and Canadian Geophysical Unions in Montreal. Papers address the broad related topics of the science, hazard, and policy issues of large continental intraplate earthquakes in a worldwide context. One group of papers addresses aspects of the primary scientific issue—where are these earthquakes and what causes them? Answering this question is crucial to determining whether they will continue there or migrate elsewhere. A second group of papers addresses the challenge of assessing the hazard posed by intraplate earthquakes. Although it may be a very long time before the scientific issues are resolved, the progress being made is helping attempts to estimate the probability, size, and shaking of future earthquakes, and the uncertainty of the results. A third group of papers explores the question of how society should mitigate the possible effects of future large continental intraplate earthquakes. Communities around the world face the challenge of deciding how to address this rare, but real, hazard, given the wide range of other societal needs. Continental intraplate earthquakes will remain a challenge to seismologists, earthquake engineers, policy makers, and the public for years to come, but significant progress toward understanding and addressing this challenge is now being made.

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Positions Open

GEOSCIENCE TEACHING FACULTY UNIVERSITY OF NEVADA—LAS VEGAS

The Department of Geoscience (<http://geoscience.unlv.edu/>) at UNLV invites applications for a full time, 9-month, non-tenure track faculty member (Faculty in Residence) to begin Fall 2008. Primary responsibilities are teaching of introductory level courses for non-science majors and potentially one or more upper division courses for undergraduate majors. The successful applicant will have the opportunity to develop and implement innovative geoscience courses and to seek external funding for educational activities and research in geoscience and geoscience education. Additional responsibilities include education and outreach to the community. The Department seeks a dynamic and enthusiastic individual with a commitment to undergraduate education. A minimum requirement is a Ph.D. degree in geoscience or subdiscipline of geoscience. Salary is commensurate with qualifications and experience. Please submit curriculum vitae and statement of teaching interests/philosophy, and contact information for five referees to Dr. David K. Kreamer (kreamer@nevada.edu), Chair, Faculty in Residence Search Committee, via on-line application at <https://hrsearch.unlv.edu/>. For assistance with UNLV's on-line applicant portal, contact Jen Feldmann at +1-702-895-3886 or hrsearch@unlv.edu. Application review will begin on January 22, 2008 and will continue until the position is filled. UNLV is an Affirmative Action/Equal Opportunity educator and employer committed to excellence through diversity; women and minorities are encouraged to apply.

SEARCH EXTENDED VISITING ASSISTANT PROFESSOR ENVIRONMENTAL GEOSCIENCES UNIVERSITY OF DAYTON

The University of Dayton's Geology Department invites applications for a Visiting Assistant Professor position beginning in August 2008, with anticipated renewal for the following year. Candidates should be field-oriented and possess a strong background in the Environmental Geosciences. Teaching responsibilities will reflect the scientific expertise of the individual but could include: Introductory and Advanced Environmental Geology/Instrumentation; Surface and Groundwater Hydrology; Environmental Geophysics, Environmental Geochemistry; and/or Climate Science. The successful candidate will have the opportunity to participate in issues of community-building, environmental justice, and urban outreach through the University of Dayton Rivers Institute and the development of new, interdisciplinary university-wide environmental programs.

This appointment will complement a department of seven full-time faculty committed to integrating teaching with undergraduate research. Demonstrated achievement and experience in teaching at the undergraduate level would be advantageous. Experiential learning in the context of strong mentoring relationships is the centerpiece of our program, and the successful applicant will be encouraged and supported in pursuing an externally funded research program that includes undergraduates. The Geology Department is located in the new Science Center, which contains state of the art laboratory and classroom facilities including the Keck Environmental Laboratory. Further information on current faculty and

activities can be found at: <http://artssciences.udayton.edu/geology/>.

Applicants are expected to hold a Ph.D. by August 2008. Please send a vita, statement of teaching and research interests, and three letters of reference to: Dr. Allen J. McGrew, Chairperson, Department of Geology, University of Dayton, Dayton, OH 45469-2364. Submissions and informal inquiries are welcome via e-mail: Allen.McGrew@notes.udayton.edu.

Review of applicants will begin February 15, 2008, but the position will remain open until filled.

The University of Dayton is a comprehensive Catholic university founded by the Society of Mary in 1850 and is an affirmative-action/equal opportunity employer. Women, minorities, individuals with disabilities and veterans are encouraged to apply. The University of Dayton is firmly committed to the principle of diversity.

ASSISTANT OR ASSOCIATE PROFESSOR GEOLOGICAL ENGINEERING/GEOPHYSICS

The Department of Geology and Geological Engineering at South Dakota School of Mines and Technology invites applications for a nine-month term position at the Assistant or Associate Professor level. The appointment is expected to continue for two academic years, with potential for extension dependent on need and funding. Duties will include teaching undergraduate and graduate courses in engineering geophysics, petroleum production, computer applications and/or other courses as needed, including courses in the applicant's specialty. We seek applicants dedicated to quality instruction and research. The ability to advise and fund graduate students is encouraged. A Ph.D. in Geological Engineering or related engineering discipline is required. Nine-month salary range is \$60,000–\$75,000 commensurate with background and experience. This is a benefited position.

To apply for this position, applicants must apply on-line <http://sdmines.sdsmt.edu/sdsmt/employment>. If you need an accommodation to the on-line application process, please contact Human Resources +1-605-394-1203. It is anticipated the appointment will begin in August 2008. Review of applications will begin on February 1, 2008, and will continue until the position is filled. For more information regarding the university, visit www.sdsmt.edu.

SDSMT is an EEO/AA/ADA employer & provider.

GROUNDWATER HYDROLOGIST NATIONAL PARK SERVICE

The United States Department of the Interior, National Park Service (NPS) invites applications for a full-time position as a Hydrologist with the NPS Pacific West Region, stationed at Lake Mead National Recreation Area, Boulder City, Nevada. The successful candidate will serve as a technical advisor on issues related to ground-water hydrology and water rights for park units in the NPS Pacific West Region, with specific focus on park units within arid lands of the Mojave Desert and Great Basin ecosystems. Specifically, the incumbent will provide technical assistance to NPS natural-resource managers on issues related to the effects of ground-water development activities adjacent to National Park units on springs and surface-water resources within parks.

The ideal candidate will need to demonstrate: (1) groundwater field experience; (2) ability to apply geologic knowledge to the analysis and solution of complex water-resource problems; (3) ability to apply quantitative techniques to investigations of groundwater hydrology and hydraulics including analytical and numerical models; (4) experience working in a regulatory or water-rights framework; and (5) ability to represent the NPS on an independent basis in interactions and sensitive negotiations with other public agencies and/or private water resources firms. Experience in water-quality analyses would also be helpful.

For more information, please see the complete vacancy announcement on the U.S. Office of Personnel Management's USAJOBS Web site at www.usajobs.opm.gov.

FACULTY POSITION IN SCIENCE EDUCATION CENTRAL MICHIGAN UNIVERSITY

The College of Science and Technology at Central Michigan University seeks an exemplary teacher and scholar to fill a tenure-track position at the Assistant Professor level in Science Education beginning Fall 2008. Applicants with a Ph.D. degree in one of the natural sciences or closely related areas and a demonstrated scholarly record in science education are encouraged to apply.

We seek a person who will teach relevant courses in his/her professional field of expertise and who is expected to develop an externally funded research program in science education. Excellent communication

skills and a commitment to supervision of both undergraduate and graduate research students are required. The successful candidate should display the potential for outstanding teaching, scholarship and for working with others across disciplinary boundaries. For tenure purposes, the person will be housed in one of the academic departments located in the College of Science and Technology.

Candidates who will conduct research within the broad K–16 educational framework are preferred, although outstanding candidates whose focus is on improved student learning and teaching effectiveness only at the collegiate level will be considered. We expect all candidates to be well grounded in teaching pedagogies, active learning, assessment strategies and national imperatives in science education. Proposed research collaborations with other faculty and/or with public school districts are desirable.

The College of Science and Technology is looking to develop a broad-based externally funded center in science education and the successful candidate should be well situated to provide a leadership role in its formation. It is expected that he/she will enhance the public visibility of the role of the scientific education programs in the college.

Established in 1892, Central Michigan University has an enrollment of 27,000 students, including approximately 20,000 students on the university's main campus. Classified by the Carnegie Foundation as a doctoral research university, CMU is recognized for strong undergraduate education and a range of focused graduate and research programs. M.A. degrees with specialties in science education are housed in several departments and the college is also developing a M.S. or M.A.T. program in integrated science. There is a doctoral program in Mathematics and an additional doctoral program is being planned in the Science of Advanced Materials. There are presently over 130 regular faculty members located in eight departments (Biology, Chemistry, Computer Science, Engineering and Technology, Geography, Geology, Mathematics and Physics), in the College of Science and Technology at CMU.

Please send a letter of application, curriculum vita, transcripts, a statement of teaching philosophy and a proposed research agenda along with three letters of reference to: Dr. Jane Matty, Associate Dean, College of Science and Technology, Central Michigan University, Mount Pleasant, MI 48859, USA, phone: +1-989-774-1870; fax: +1-989-774-1874; e-mail: j.matty@cmich.edu; Web site: www.cst.cmich.edu.

Review of applications will begin on 7 January and will continue until the position is filled.

CMU, an AA/EO institution, strongly and actively strives to maintain diversity within its community (see www.cmich.edu/aaeo).

The College of Science and Technology is supportive of the needs of dual career couples.

ASSISTANT PROFESSOR MINERALOGY/PETROLOGY OR ENVIRONMENTAL GEOPHYSICS ILLINOIS STATE UNIVERSITY

Illinois State University, Department of Geography-Geology invites applications for a tenure-track position in either (1) *Mineralogy and Petrology* or (2) *Environmental Geophysics* at the rank of assistant professor with a preferred start date of Aug. 17, 2008. A Ph.D. in geology or a related field is required at the time of appointment. Potential for a significant start-up package exists. Teaching expectations include general education courses, intermediate and advanced undergraduate courses, and graduate courses in his/her area of interest. For the *Mineralogy/Petrology* position, the sub-specialty of the successful candidate is open. For the *Environmental Geophysics* position, preference will be given to candidates with research interests in shallow geophysics applied to environmental problems. The successful candidate is expected to develop an externally funded research program.

Illinois State University is a research-intensive university enrolling approximately 20,000 students. Our department offers a B.S. in Geology, a M.S. in Hydrogeology, and a B.S. in Geography. Illinois State University and the department place strong emphasis on undergraduate and Masters-level education.

A cover letter, a curriculum vita, research and teaching statements, three letters of reference, and all transcripts must be received by January 15, 2008 to ensure full consideration.

Apply: Dr. David Malone, Department of Geography-Geology, Campus Box 4400, Normal, Illinois 61790-4400. Telephone: +1-309-438-2692, Fax: +1-309-438-5310, E-mail: dhmalon@ilstu.edu. Additional information about our department, university, and community is available at www.geo.ilstu.edu.

**INSTRUCTOR, DEPARTMENT OF GEOSCIENCE
UNIVERSITY OF CALGARY**

The Department of Geoscience at the University of Calgary invites applications for a tenure-track Instructor position, commencing July 1, 2008.

Candidates require a Ph.D. in Geoscience or related discipline and a strong record demonstrating teaching excellence, scholarship in teaching, and a student-centered approach. Responsibilities include teaching a variety of undergraduate geology courses (including field courses) with utilization of effective and innovative teaching practices. Course assignments will depend on the area of expertise and will be designated by the Department Head. The average teaching load for an Instructor is the equivalent of 3-5 half-courses spread over the Fall and Winter sessions. Scholarly activities in teaching and education, professional development in the area of teaching and research in the area of expertise are encouraged and supported by the department and the Faculty of Science.

The Department of Geoscience is going through a period of significant expansion and is one of the largest Geoscience Departments in North America, with over 400 majors. Additional information about the Department of Geoscience is available on our Website (www.ucalgary.ca/geoscience).

The city of Calgary is one of the fastest growing cities in Canada and is widely recognized for its excellent quality of life. The University of Calgary is situated on a park-like campus in northwest Calgary, within an hour of the Canadian Rocky Mountains.

Qualified applicants should submit a curriculum vitae, statement of teaching philosophy, and a teaching portfolio (including teaching evaluations, if available) to the address below prior to the closing date of **March 1, 2008**. Applicants are also asked to arrange to have three confidential letters of reference sent directly to: Instructor Search Committee, Department of Geoscience, University of Calgary, 2500 University Drive NW, Calgary, Alberta, T2N 1N4, Canada; fax: 403-284-0074, E-mail: geojobs@ucalgary.ca.

All qualified candidates are encouraged to apply; especially Canadians and permanent residents. The University of Calgary respects, appreciates and encourages diversity.

**DIVISION OF EARTH SCIENCES
NATIONAL SCIENCE FOUNDATION, ARLINGTON**

NSF's Division of Earth Sciences (EAR) seeks candidates for the position of Assistant/Associate/Program Director in the Deep Earth Processes Section. The Deep Earth Processes Section includes the programs of Tectonics, Petrology and Geochemistry, Geophysics, Continental Dynamics, Instrumentation and Facilities, and EarthScope. Information about EAR and their programs can be found at www.nsf.gov/div/index.jsp?div=EAR.

Appointment to this position may be on a one or two year Visiting Scientist appointment or a Federal Temporary appointment, with a salary range of \$55,706 to \$146,213. Alternatively, positions may be filled under the terms of the Intergovernmental Personnel Act. Applicants must have a Ph.D. or equivalent experience in Earth Sciences or a closely related field, plus six or more years of successful research, research administration, and/or graduate administration experience (**for Program Director**), four or more years of experience (**for Associate Program Director**) and two or more years of experience (**for Assistant Program Director**) beyond the Ph.D. is required.

Announcement E20080015-Rotator, with position requirements and application procedures, is located on the NSF Home Page at http://www.nsf.gov/about/career_opps. Applicants may also obtain the announcement by contacting the Executive and Visiting Personnel Branch at +1-703-292-8755 (Hearing impaired individuals may call TDD +703-292-8044). Applications must be received by January 21, 2008

NSF is an Equal Opportunity Employer.

**WHITTIER COLLEGE
ENVIRONMENTAL SCIENCE/STUDIES PROGRAM**

Whittier College invites applications for a tenure track position at the rank of Assistant Professor in the Environmental Science/Studies Program, an interdisciplinary major. Applicants need a PhD with a specialization in one of the physical sciences (environmental science, geology, geophysics, physical geography) with an emphasis on surficial processes.

The ideal candidate will be comfortable teaching introductory environmental science courses as well as upper-division courses in their field of expertise. He/she is also expected to participate in our Liberal Education Program, such as teaching First-year Writing Seminar, courses in quantitative literacy, "paired" courses, and/



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FACULTY POSITIONS

Department of Earth & Environmental Sciences

Rensselaer Polytechnic Institute is initiating a program of substantial growth in the Earth Sciences, with emphasis on Earth systems strategies and linkages to existing campus strengths in computation, nanoscience, multi-scale modeling and energy- and environment-related research. The planned expansion will involve at least five new faculty appointments. Significant enhancement of research facilities adjoining the present Jonsson-Rowland Science Center is anticipated within a five-year time frame. The small but dynamic E&ES department includes individuals having expertise in solid-Earth geophysics and several areas of geochemistry, including organic, stable-isotope, aqueous, and experimental geochemistry.

The Department of Earth and Environmental Sciences at Rensselaer seeks exceptionally qualified individuals for tenured and tenure-track faculty positions at all levels (assistant, associate, and full professor) to complement and extend the expertise of current department members. Areas of specific interest include hydrologic science, climate change research, solid-Earth and theoretical geophysics, geodynamics, remote sensing, environmental geoscience, biogeochemistry, and experimental, theoretical and analytical geochemistry. The starting salary will depend upon qualifications and level of the appointment.

Applicants should have a Ph.D. or other doctoral degree in a field of geosciences. To apply, applicants should submit a curriculum vitae, a brief outline of career plans, a statement of research and teaching interests, copies of select publications, and a list of four professional references to: **E&ES Faculty Search, Department of Earth and Environmental Sciences, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY 12180-3590, Email: kellek@rpi.edu** (electronic submissions are preferred). Consideration of candidates will begin upon receipt of applications; recruiting will continue until the positions are filled. Rensselaer is located in the Capital Region of New York State, with easy access to world-class cultural and recreational activities.



Rensselaer

We welcome candidates who will bring diverse intellectual, geographical, gender and ethnic perspectives to Rensselaer's work and campus communities. Rensselaer Polytechnic Institute is an Affirmative Action/Equal Opportunity Employer.

or science and society courses. In addition to teaching, the successful candidate will be expected to remain an active scholar in their field of expertise and involve undergraduates in their research program.

Whittier College is a small private liberal arts college located 18 miles southeast of Los Angeles, with a highly diverse student population. The college is committed to increasing opportunities for collaborative student research and internships. Please direct a letter of interest, a curriculum vitae, a statement of teaching philosophy, and three letters of reference to: Cheryl Swift, Coordinator of Environmental Science, Whittier College, P.O. Box 634, Whittier, CA 90608 (e-mail: cswift@whittier.edu).

Review of applications will begin February 5, 2008, and will continue until the position is filled (pending final approval). We seek to attract and retain a highly qualified and diverse faculty (AA/EO).

**ASSISTANT PROFESSOR, STRUCTURAL GEOLOGY
SAM HOUSTON STATE UNIVERSITY**

The Department of Geography and Geology at Sam Houston State University invites applications for a tenure-track position at the rank of Assistant Professor in structural geology beginning August, 2008. Candidates must be dedicated to excellence in undergraduate teaching and to an active research program that engages undergraduates. Teaching responsibilities will include introductory geology courses and advanced undergraduate courses in structural geology, plate tectonics, and the geology of North America. Undergraduate teaching experience is preferred. Candidates are expected to be actively involved in the development and participate in the teaching of a modular field course being proposed by the Geology Program.

Applicants should hold a Ph.D. at the time of appointment. Applications must include a letter of application, a statement of teaching philosophy, a research agenda covering the next five years, curriculum vita, and 3 letters of reference. To ensure full consideration, applications should be submitted by January 31st, 2008, to Dr. Chris Baldwin, Chair, Department of Geography and Geology, Box 2148, Sam Houston State University, Huntsville, Texas 77341-2148. Sam Houston State University is an affirmative action/equal opportunity employer.

**ASSISTANT PROFESSOR
LOW-TEMPERATURE GEOMICROBIOLOGY
MONTANA STATE UNIVERSITY**

Montana State University Earth Sciences Department seeks a low-temperature geomicrobiologist with a special focus on cold terrestrial environments. Ph.D. required; postdoctoral experience in biogeochemistry, microbiological techniques, and cryospheric processes required. For a complete job description and application requirements see www.montana.edu/msuinfo/jobs/faculty/; look for earth sciences or call +1-406-994-3331. Deadline for application is 18 January 2008. ADA/EO/AA/VETERAN'S PREFERENCE.

**CALIFORNIA INSTITUTE OF TECHNOLOGY
ASSISTANT PROFESSOR OF GEOBIOLOGY**

Catech is seeking qualified candidates for a tenure-track position in the area of geobiology at the Assistant Professor level. Completion of the Ph.D. is required. The initial appointment is for four years. It is possible that a candidate with exceptional qualifications may be considered for a position at a higher level. Candidates of extraordinary ability and potential for innovation and leadership in teaching and research in any area of geobiology, including modern or ancient systems, are encouraged to apply. We shall be especially drawn to individuals whose intellectual interests are engaged over broad, interdisciplinary areas of knowledge, and whose research uses the tools of organic biology, molecular biology or biochemistry with those necessary for an understanding of the major geobiological innovations in the history of the Earth. Examples (not inclusive) would be an evolutionary biologist who integrates experimental evidence from developmental biology with evidence from paleontology; a biogeochemist using biomarkers to search for the metabolic signatures of select organisms and their traces preserved in geological or fossil materials; a paleontologist who utilizes sequence relationships, functional morphology, or numerical analysis to illuminate systematic or phylogenetic problems; or a sedimentary geochemist who studies the inorganic composition of geological or fossil materials to elucidate global-scale biogeochemical pathways or organism functions.

CLASSIFIED ADVERTISING

MILLERSVILLE UNIVERSITY

DEPARTMENT OF EARTH SCIENCES Geology and Environmental Geology

Full-time, tenure-track Assistant Professor position beginning August 2008. Teach upper-level and introductory undergraduate courses in the Geology and Environmental Geology Programs. Scholarly growth, including mentoring of undergraduate research. Participate in academic service.

Required: Ph.D. in geological sciences completed by time of appointment. Evidence of ability and desire to: teach upper-level courses in Geology and Environmental Geology Programs, complementing existing strengths within the department; teach introductory geology courses for majors/non-majors; and incorporate field components into upper level courses. Evidence of: expertise in a combination of hydrogeology, geophysics, and/or structural geology; eagerness to serve as research mentor to undergraduates; and effective oral and written communication skills. A successful interview that includes a research presentation that serves as a teaching demonstration.

Preferred: Willingness to operate Millersville's broad band seismometer. Experience applying geophysical techniques to solve environmental problems. Proficiency with groundwater modeling software.

The Department of Earth Sciences, one of seven Departments in the School of Science and Mathematics, offers B.S. degree programs in Geology, Meteorology, Ocean Sciences and Coastal Studies, and Earth Sciences Education and B.A. option in Environmental Geology. There are nine tenure track faculty members (3 Geology, 4 Meteorology, 2 Ocean Sciences and Coastal Studies), and three support staff. Geology has dedicated laboratory facilities and equipment including a digital networked broadband seismic station, 12 channel engineering seismograph, 12 gauge and stamper seismic source, proton precession magnetometer, resistivity meter, and surveying total station. The department has high bandwidth connectivity on Internet 2, Access Grid capabilities, and streaming video and maintains licenses for IDL, Fortran, MatLab, and ArcGIS 9.0. With Meteorology and Oceanography housed in same department, opportunities exist for faculty-student collaboration across these disciplines. Millersville University is a founding member of the Marine Science Consortium at Wallops Island, Va., where it maintains a 46' research vessel, laboratories, dining, and housing facilities. Millersville University is also a founding member of the UCAR Academic Affiliates Program, and an institutional member of the AMS. For more information about the university and department, see www.millersville.edu/~esci

Full consideration given to applications received by **February 15, 2008**. Send letter of application addressing qualifications, curriculum vitae/resume, statement of teaching philosophy and research interests, copies of all transcripts, and three current letters of recommendation addressing qualifications to: **Geology Search, Department of Earth Sciences/GSA0108, Millersville University, P.O. 1002, Millersville, PA 17551-0302.**

An EO/AA Institution

A curriculum vitae including a list of publications, a brief discussion of proposed research activities, and three letters of reference should be sent to Professor Ken Farley MS 170-25, California Institute of Technology, Pasadena, CA 91125.

The California Institute of Technology is an Equal Opportunity/Affirmative Action Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

PETROLEUM RESOURCES DIVISION CSIRO, AUSTRALIA

CSIRO is Australia's national science agency and one of the largest and most diverse research agencies in the world. CSIRO's Petroleum Resources Division provides world-class research and development solutions to the petroleum industry in Australia and the rest of the world. The division has strong applied research groups covering many aspects of the geosciences and geo-engineering, including structural geology, clastic and carbonate sedimentology and stratigraphy, geomechanics, geophysics, rock physics, petrophysics, hydrogeology, organic and inorganic geochemistry, fluid history analysis, petroleum engineering and drilling mechanics. Much of the research involves integration across disciplines and is done in collaboration with industry, universities or other government geoscience agencies. In addition, cross-boundary scientific collaboration is encouraged, with many current projects involving biologists, biochemists, physicists and materials scientists in other divisions of CSIRO. Publication is strongly encouraged, especially with industry collaboration. The Division has offices in Perth, Sydney and Melbourne.

The Petroleum Resources Division is currently looking to expand and seeks enthusiastic and motivated individuals. Positions are available from entry level (minimum bachelor's degree) to senior level. In particular, we are interested in people with expertise in the following areas: (1) Clastic sedimentology (position ref: 2007/1230); (2) Structural geology (position ref: 2007/1231); (3) Reservoir Engineering (2 positions) (position ref: 2007/1236); (4) Fluid inclusions specialist (position ref: 2007/1229); (5) Flow modelling (position ref: 2007/1235); (6) Geophysics/Rock Physics (position ref: 2007/1254).

Successful candidates will work in close cooperation with researchers in their discipline as well as with scientists from other disciplines, but will be encouraged to work or develop into a position of autonomy, innovating and devising their own research plans. Responsibility and remuneration will be based on experience. Training and internal courses will be integral to the development of all applicants.

For selection documentation and details on how to apply visit www.csiro.au/careers or call 1-300-301-509.

ASSISTANT/ASSOCIATE PROFESSOR IN GEOLOGY UNIVERSITY OF TEXAS-PAN AMERICAN

The Department of Physics and Geology at the University of Texas-Pan American invites applications for a tenure track assistant/associate professor position in geology [F07/08-70] beginning in the fall of 2008. The successful candidate will be expected to teach undergraduate lectures and lab courses in geology. The University of Texas-Pan American is a dynamic medium-size university with a primarily Hispanic student population of approximately 18,000 students located in the lower Rio Grande Valley of Texas, a subtropical area that is one of the fastest growing regions of the U.S.

Please note the following criteria apply for each professorial rank and specify in your letter of application the rank you are applying for:

Required Qualification for Assistant Professor: Earned Doctorate in Geological/Earth Sciences, in hand at the time of appointment, and a demonstrated commitment to undergraduate education/research. Evidence of excellence in teaching, a demonstrated record of achievement in research, and a commitment to departmental and public service. The ability to communicate effectively with faculty and students is essential.

Required Qualification for Associate Professor: Earned Doctorate in Geological/Earth Sciences. Proven excellence in teaching, a strong record of achievement in research, and a commitment to departmental and public service. A strong record of achievement in research includes significant publications within the discipline, previous success in developing a research program, and attracting external funding. The ability to communicate effectively with faculty and students is essential.

Desired Qualification for Both Ranks: College-level teaching experience is preferred, as is a broad background in Geology, Geophysics and/or GIS/Remote Sensing. The integration of GIS/Remote Sensing into undergraduate coursework and research is an asset, and assisting with Geology Field trips to Mexico and North Texas is expected. This position would be of special interest to candidates looking to establish a research program and grow with a newly revitalized and rapidly expanding department.

Current Degrees Offered: B.S. Physics, MSIS in Physics Education, minors in physics, physical science, GIS and Earth Science.

To apply for position, send: application form from www.utpa.edu/humanresources/employment/FACULTY.HTML; cover letter indicating: (1) Position, (2) Position number, and (3) Rank applying for; CV; contact information of three references; transcripts; statement of research plan; and teaching philosophy to: Geology Search Committee, Dean's Office, College of Science and Engineering, University of Texas - Pan American, 1201 W University Drive, Edinburg, TX 78541-2999, USA.

Further information links: the department, www.utpa.edu/dept/physci/; UTPA, www.utpa.edu.

Closing Date: The position will remain open until filled, however, for best consideration application materials must be received by **January 14, 2008**.

NOTE: UTPA is an affirmative action/Equal Opportunity Employer. Women, racial/ethnic minorities and persons with disabilities are encouraged to apply. This position is security sensitive as defined by the Texas Education Code §51.215(c) and Texas Government Code §411.094(a)(2). Federal Law requires compliance with the Immigration Reform Control Act of 1986. Texas Law requires faculty members whose primary language is not English to demonstrate proficiency in English as determined by a satisfactory grade on the International Test of English as a Foreign Language (TOEFL).

QUEENS COLLEGE IN NEW YORK CITY TENURE-TRACK ASSISTANT PROFESSOR POSITIONS

Queens College in New York City invites applications for two tenure-track assistant professor positions in the School of Earth and Environmental Sciences to start Fall 2008. A Ph.D. related to environmental mineralogy, ecotoxicology, geomicrobiology, or paleobiology, and achievements in teaching and research, are required. Details of requirements, responsibilities, and salary can be found at <http://qcpages.qc.edu/EES>. Send separate teaching and research statements, CV, and copies of graduate transcripts, and have three current letters of recommendation sent to: hemming@qc.edu by 01/15/08 (PDF preferred). Queens College is an equal opportunity, affirmative action employer.

SOLID EARTH GEOPHYSICIST UNIVERSITY OF NEW HAMPSHIRE

The Department of Earth Sciences at the University of New Hampshire invites applications for a tenure-track position in solid earth geophysics at the assistant professor level starting August 2008 or thereafter. The Department of Earth Sciences (www.unh.edu/esci) conducts research in geology, oceanography, atmospheric sciences, and hydrology, and offers Bachelors, Masters and PhDs in the Earth Sciences. The successful candidate will be expected to teach geophysics, an introductory earth sciences course as part of the core curriculum in geology, and graduate course(s) in his/her specialty, and to develop a strong externally funded research program involving graduate and undergraduate students. Research specialization is open, but applicants with interests in tectonics that complement current departmental efforts are particularly encouraged to apply. The Department has strong ties to the Institute for the Study of Earth, Oceans, and Space (www.eos.sr.unh.edu/) and the Center for Coastal and Ocean Mapping (www.ccom-jhc.unh.edu/). Starting salary will be commensurate with experience and qualifications. A Ph.D. at the time of appointment is expected.

Review of applications begins October 22, 2007, and will continue until the position is filled. Please send complete CV, statement of research and teaching interests, and names and addresses of three references to Geophysics Search Committee, Department of Earth Sciences, University of New Hampshire, 56 College Road, Durham, NH 03824. UNH is committed to excellence through diversity among its faculty and strongly encourages women and minorities to apply.

PALEOCLIMATE/CLIMATE DYNAMICS FACULTY POSITION, DEPT. OF EARTH SCIENCES UNIVERSITY OF SOUTHERN CALIFORNIA

The Department of Earth Sciences at the University of Southern California seeks to appoint an assistant professor

in paleoclimate/climate dynamics whose research focuses on modeling/dynamics of global climate/environmental changes on a variety of time scales. This person would join an active group of existing faculty with interests in climate/environment variability, which extend from the Archean to the present day.

Review of applications will begin in January 2008 and continue until the position is filled. The appointment could begin as early as August 16, 2008. Applications should include a curriculum vitae, statement of research interests, statement of teaching experience and interests, and the names, addresses, and e-mail addresses of at least three referees. Electronic applications are encouraged. USC values diversity and is committed to equal opportunity in employment. Women and men, and members of all racial and ethnic groups are encouraged to apply. All applicants should have their PhD degrees completed before the review process begins.

Applications should be submitted to Steve P. Lund (slund@usc.edu), Chair, Climate Search Committee, Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089-0740.

**MICHAEL L. JOHNSON ENDOWED CHAIR
IN GEOLOGICAL SCIENCES
NEW MEXICO STATE UNIVERSITY**

The Department of Geological Sciences at NMSU invites applicants for a tenure-track faculty position at a rank commensurate with experience and demonstrated research accomplishments in the field of isotope geochemistry other than U-Pb and Ar geochronology. A Ph.D. is required at time of appointment. NMSU has a firm commitment to excellence in both teaching and research (www.nmsu.edu/~geology). We seek applicants who will teach undergraduate courses in physical geology, geochemistry, and isotope geochemistry; develop graduate courses in the applicant's specialty; maintain a strong, externally funded research program; sustain a record of peer-reviewed publication; and advise M.S. thesis projects. The Johnson Endowed Chair includes an annual research stipend of \$20,000.

For more details, see http://hr.nmsu.edu/jobs/posting_2007011274. Applicants should submit a curriculum

vitae, statement of research and teaching interests, and a list of three references including names, phone numbers, e-mail addresses, and complete mailing addresses to Dr. Jeff Amato, Chair of the Search Committee, Department of Geological Sciences-MS 3AB, P.O. Box 30001, New Mexico State University, Las Cruces, NM 88003, or amato@nmsu.edu. Review of applications will begin 3 December 2007 and continue until the position is filled; the position is anticipated to start in August 2008. NMSU is an EEO/AA employer. Offer of employment is contingent upon verification of individual's eligibility for employment in the United States.

**PROCESS CARBONATE SEDIMENTOLOGY
UNIVERSITY OF KANSAS**

The Department of Geology at the University of Kansas seeks applications for an academic year, tenure-track faculty position in the field of process carbonate sedimentology. We seek an outstanding colleague who studies carbonate depositional processes in marine environments to better understand environmental change. We welcome candidates who combine traditional field and laboratory approaches and those that integrate quantitative or modern analytical techniques to the study of carbonate systems. Candidates whose research is applicable to carbon cycling and energy resources are particularly encouraged to apply. The successful candidate will be expected to establish an externally funded research program, direct graduate students, and participate in teaching graduate and undergraduate students. Refer to www.geo.ku.edu and links for additional information about the department and the University of Kansas. The successful candidate for the position should be eligible to work in the U. S. prior to the start date of the position. Appointment is expected to begin August 18, 2008.

Applicants are expected to have a Ph.D. or terminal degree in geology or a related field by the start date of the appointment. For full position announcement, see: www2.ku.edu/~clas/employment/. Applicants should send a statement of research interests, statement of teaching interests, a complete Curriculum Vitae and arrange for at least three letters of recommendation to be

sent directly to Luis A. González, Department of Geology, 1475 Jayhawk Blvd., 120 Lindley Hall, University of Kansas, Lawrence, KS 66045-7613 (tel. +1-785-864-3977, fax +1-785-864-5276, e-mail: lgonzlez@ku.edu). Initial review of completed applications will begin January 9, 2008, and will continue until the position is filled. The University is committed to increasing the ethnic and gender diversity of its faculty, and we strongly encourage women and minority candidates to apply.

Opportunities for Students

Kansas Geological Survey, University of Kansas. Up to four applied hydrogeology summer research assistantships. These are 12-week summer positions open to students at any university. The individuals will participate in a variety of field activities in support of KGS research programs. The themes of the activities in the summer of 2008 will be groundwater consumption by phreatophytes, new direct-push technologies, and stream-aquifer interactions. Start approx. 5/19/08. Salary \$6,250 for 12 week appointment. Required: Relevant coursework in earth sciences or engineering; interest in hydrogeology; clear communication skills; and ability and willingness to participate in moderate physical activity in mid-summer temperatures in Kansas. First consideration given to application material received by 2/24/08. For complete description go to www.kgs.ku.edu/General/jobs.html; to apply go to <https://jobs.ku.edu> (search for position 00066146) or contact Annette Delaney at +1-785-864-2152, hr@kgs.ku.edu. For further technical information contact Jim Butler at jbutler@kgs.ku.edu. EO/AA Employer. Geoscience Student Summer Internships in Public Policy. The American Geological Institute (AGI) seeks outstanding geoscience students with a strong interest in federal science policy for a semester-long internship in geoscience and public policy in Washington DC. Interns will gain a first-hand understanding of the legislative process and the operation of executive branch agencies. They will also hone their writing and Web publishing skills. AGI is planning to accept three interns for the summer at a fixed stipend

FIRE IN THE SOUTHWEST: Integrating Fire into Management of Changing Ecosystems

Tucson, Arizona, USA • 28–31 January 2008



PHOTO: This burn scar near Ringgold, Texas, USA, was captured 8 Jan. 2006 by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite and was enhanced for visibility with sensor observation of near- and shortwave infrared energy and visible light. Ground is tan and brown; vegetation is red. Image created by Jesse Allen, National Aeronautics and Space Administration (NASA) Earth Observatory (http://visibleearth.nasa.gov/view_rec.php?id=20426).

This timely forum for scientific information exchange on the ecology and management of fire-adapted and -affected ecosystems in the southwestern United States under changing climate conditions is being organized by a dozen partners, including GSA. Burned Area Emergency Response (BAER) sessions and a field trip will examine the effectiveness of post-fire emergency stabilization and rehabilitation treatments, including geologic factors. For details and to register at member rates, go to www.humboldt.edu/swfire/. Questions may be directed to Deborah Nelson at dnelson@geosociety.org.

 THE GEOLOGICAL SOCIETY
OF AMERICA®

of \$4,000 apiece for twelve weeks. Deadline for applications is March 15, 2008.

More information is available at www.agiWeb.org/gap/interns/index.html. AGI is an equal opportunity employer.

Environmental Sciences at Arkansas State University. Opportunities for research and teaching assistantships (M.S. and Ph.D.) are available in the Graduate Program in Environmental Sciences at Arkansas State University (<http://evs.astate.edu>; <https://exmail.astate.edu/exchWeb/bin/redir.asp?URL=http://evs.astate.edu>). Potential students are encouraged to contact the Graduate Program in Environmental Sciences (mwolfe@astate.edu) or to contact individual faculty members (see <http://evs.astate.edu/faculty.html>; <https://exmail.astate.edu/exchWeb/bin/redir.asp?URL=http://evs.astate.edu/faculty.html>) and should visit <http://evs.astate.edu> and <https://exmail.astate.edu/exchWeb/bin/redir.asp?URL=http://evs.astate.edu> for additional information and application instructions.

Ph.D. Assistantships: Spatial Ecology & Eco-Hydrology of Streams. Department of Land Resources and Environmental Sciences at Montana State University. Several Ph.D. assistantships are available in the Department of Land Resources and Environmental Sciences at Montana State University, Bozeman, commencing August of 2008.

Students will pursue questions in one of three broad research areas: (1) elucidating geomorphic and hydrologic controls on habitat diversity and biotic processes (e.g., biogeochemistry, productivity, metabolism, greenhouse gas emissions) in floodplain ecosystems; (2) developing novel, agent-based modeling approaches to simulate transport and biotic uptake of solutes from stream channels and hyporheic zones of gravel-bedded streams; and (3) linking geomorphology and hydrology to fish habitat diversity and utilization in mainstem rivers of Montana.

Students will work with Dr. Geoffrey Poole and will apply quantitative research techniques including simulation modeling, GIS analysis, and/or remote sensing, coupled with ample opportunities for field data collection and laboratory experiments and analyses.

Successful applicants will be highly self-motivated and creative problem solvers with excellent writing and com-

puter skills. More information, including application instructions, can be found at www.eco-metrics.com/MSU/.

NASA Planetary Biology Internship Program. The NASA Planetary Biology Internship Program (PBI) provides opportunities to explore scientific questions of global scale about planet Earth. For eight weeks graduate students are granted a one-time opportunity to travel outside their home institutions to participate in research related to NASA's planetary biology objectives. Interns have participated in a wide variety of planetary biological studies including metal precipitating bacteria; microbial ecology of extreme environments; morphological, biochemical, and isotopic analyses of stromatolites and microbial mats; and molecular evolution.

Students should obtain an application brochure by contacting the PBI Administrator, Michael Dolan, Department of Geosciences, University of Massachusetts, Amherst, MA 01003. Telephone +1-413-545-3223, fax: +1-413-545-1200, e-mail pbi@geo.umass.edu or from the Web page, www.mbl.edu/education/courses/other_programs/pbi.html.

Application packages must be received at the MBL Admissions Office by March 3, 2008. Students are admitted without regard to race, age, sex, national origin, or physical handicap.

Interdisciplinary Hydrologic Science Opportunities at New Mexico Tech. New Mexico Tech offers Ph.D. and M.S. Research Assistantships to graduate students interested in topics in hydrologic science ranging from subsurface processes to the atmospheric boundary layer. The interdisciplinary Hydrology Program is one of the largest and strongest in the United States. Seven full-time faculty and ten adjunct faculty in hydrology allow us to offer more than 20 different courses in hydrologic science and conduct research across a broad range of cutting edge topics. Our interdisciplinary curriculum has been revised to provide students with training in the multiple scientific techniques necessary to resolve societally relevant hydrological problems. Recent research efforts are focused on understanding the impacts of vegetation, climate and human-induced changes on water supply and water quality. Students with strong scientific or engineering backgrounds are encouraged to apply. For

more information contact: Dr. Fred Phillips. Additional information and application forms can be found at www.ees.nmt.edu/Hydro/.

Graduate Student Opportunities, Ohio University. The Department of Geological Sciences at Ohio University is seeking qualified students for its graduate program. Positions are available beginning April or September 2008. The department offers a competitive program leading to an MS degree in Geological Sciences with areas of emphasis including hydrogeology, geochemistry, geomorphology, paleontology, stratigraphy/sedimentology, planetary geology, geophysics, and tectonics. Prospective students are encouraged to contact faculty directly to discuss potential research topics. Qualified students are eligible to receive teaching assistantships that carry a tuition waiver and a stipend of \$12,150/year. For program and application information, visit the department Website at www.ohiou.edu/geology/ or contact the graduate chair, Greg Springer, springeg@ohio.edu, for additional information.

Fellowship Opportunities

WILLIAM L. FISHER CONGRESSIONAL GEOSCIENCE FELLOWSHIP

The American Geological Institute is pleased to announce the William L. Fisher Congressional Geoscience Fellowship. The successful candidate will spend 12 months (starting September 2008) in Washington, D.C., working as a staff member for Congress. The fellowship is a unique opportunity to gain first-hand experience with the legislative process and contribute to the effective use of the geosciences to develop environmental, energy, resource, hazards, and/or science policies.

Minimum requirements are a master's degree with at least three years of post-degree work experience or a Ph.D. at the time of appointment. The fellowship carries an annual stipend of up to \$55,000.

All application materials must be transmitted by February 1, 2008.

For more details visit www.agiWeb.org/gap/csf. AGI is an equal opportunity employer.

Journal Highlights



JANUARY/FEBRUARY GSA BULLETIN

- Dust in the wind
- Watershed reconstruction using isotopes
- River deep, mountain high



DECEMBER GEOSPHERE

- **Special themed issue: *Unlocking 3-D earth systems—Harnessing new digital technologies to revolutionize multi-scale geological models***



JANUARY GEOLOGY

- Creeping to the Dinarides to be Born
- Corals and Hurricanes in Hot Water
- Putting Barnes on a Diet
- Blue Diamonds in the Red

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Impacts, mega-tsunami, and other extraordinary claims

Nicholas Pinter* and Scott E. Ishman, Dept. of Geology,
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Recognition of the importance of impact cratering ranks among the most significant advances in earth and planetary sciences of the twentieth century, but recently there has been a proliferation of reports of impact events and sites that eschew simple, less spectacular alternative explanations. Here we focus on (1) Holocene-age ocean impacts and associated “mega-tsunami,” and (2) a catastrophic impact event suggested at 12.9 ka. Carl Sagan once said that “extraordinary claims require extraordinary evidence”; we argue that these impacts do not meet that standard.

In November 2006, the *New York Times* (Blakeslee, 2006) reported the identification of a growing number of impacts and associated mega-tsunamis during the past 10,000 yr by the “Holocene Impact Working Group.” In contrast, using astronomical and planetary data, Bland and Artemieva (2006) calculated that impacts capable of “producing hazardous tsunami” occur only once every ~100,000 yr. Identification of Holocene mega-tsunamis was based largely on “chevrons,” a new term for coastal landforms attributed to mega-tsunami run-up (e.g., Masse et al., 2006). Madagascar chevrons were linked to an Indian Ocean “crater” identified by ocean-floor topography and “splashes of iron, nickel and chrome fused” to foraminiferal tests in nearby ocean cores (Blakeslee, 2006; Abbott et al., 2007). The melting points of iron, nickel, and chrome are >1400 °C, whereas CaCO₃ decomposes at ~500 °C. No studies of the K-T impact have reported foraminifera with fused metals. Identifying impact sites by searching for dimples on Earth’s surface is a dubious proposition. For example, Speranza et al. (2004) documented a sheep watering hole identified as the “Sirente Crater.”

To test the Holocene impact/mega-tsunami story, we collected meteorological data from two “chevron” sites: Montauk, New York, and Faux Cap, Madagascar (Gusiakov, 2006). In both cases, these features were precisely aligned with the dominant wind direction (Fig. DR1 [see the GSA Data Repository¹]) and had been mapped previously as parabolic dunes (LeBigre and Reaud-Thomas, 2001). We suggest that these Holocene features are clearly eolian, and that the term “chevron” should be purged from the impact-related literature.

Just as close scrutiny of the Holocene impacts belies an extraterrestrial source, an impact on the southeastern Laurentide ice sheet at 12.9 ka proposed at the 2007 American Geophysical Union Joint Assembly (Firestone et al., 2007a, 2007b) engenders similar doubts. This purported impact is cited as a trigger for the Younger Dryas climate event, extinction of Pleistocene mega-fauna, demise of the Clovis culture, the dawn of agricul-

ture, and other events (Firestone et al., 2007a, 2007b). Evidence of the 12.9-ka impact includes magnetic grains, microspherules, iridium, glass-like carbon, carbonaceous deposits draped over mammoth bones, fullerenes enriched in ³He (Becker et al., 2007), and micron-scale “nanodiamonds” (Firestone et al., 2007c). We suggest that the data are *not* consistent with the 4–5-km-diameter impactor that has been proposed, but rather with the constant and certainly noncatastrophic rain of sand-sized micrometeorites into Earth’s atmosphere.

The 12.9-ka impact story has struggled to bring its disparate evidence under a single umbrella. The impact story originated in Firestone and Topping (2001) and the Firestone et al. (2006) book, both of which contain observations and claims so wild that other work by these authors invites careful scrutiny. The nature of the 12.9-ka event changes radically with each iteration, from a supernova-generated “cosmic ray jet” (Firestone et al., 2006) to a massive atmospheric airburst (Firestone et al., 2007a, 2007b) to “multiple ET airbursts along with surface impacts” (Firestone et al., 2007c). Airbursts are a convenient explanation, given the lack of an impact crater, tektites, shocked quartz, or high-pressure minerals. Airburst events are associated with small impactors, perhaps <160 m diameter (e.g., Chapman and Morrison, 1994). Furthermore, the 12.9-ka event is identified as an oblique strike with “high-speed projectile material” (Firestone et al., 2007a) creating the elliptical “Carolina Bays” of the southeastern United States. Yet, of all impacts in the solar system, only a handful represent strikes capable of generating visibly elliptical forms (Pierazzo and Melosh, 2000). No meteorite material has ever previously been recovered from the Carolina Bays. Firestone and colleagues return to an impact origin for the Bays, ignoring a half-century of mainstream research focused on geomorphic mechanisms and age control documenting formation over extended time (Grant et al., 1998; Ivester et al., 2007). Similar elliptical depressions in Argentina, once claimed as an oblique impact swarm, were recently debunked and are now recognized as eolian (Bland et al., 2002).

The 12.9-ka impact story also has struggled with the broad range of impact-related materials reported. Firestone and Topping (2001) identified chondrules, suggesting that the impactor was a chondrite. Magnetic grains and spherules (Firestone et al., 2007a, 2007b, 2007c) are consistent with an iron-rich meteoroid, whereas silicate material (Firestone et al., 2007c) suggests a stony meteoroid, and “glass-like carbon” and carbon spherules suggest a carbonaceous source. Firestone et al. (2006, 2007a) suggest geochemical affinities with lunar crustal material. Any one of these might be a credible extraterrestrial source, but together they are a Frankenstein monster, incompatible with any single impactor or any known impact event.

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¹GSA Data Repository item 2008049, Figures DR1 (wind directions at Hither Hills State Park, Montauk, New York, USA, and Faux Cap, Madagascar) and DR2 (five photos of glassy and metallic microspherules and spherular carbon condensates), is available at www.geosociety.org/pubs/ft2008.htm. You can also obtain a copy by writing to editing@geosociety.org.

In actuality, almost all of the material reported at 12.9 ka is ubiquitous throughout the geological record. Glassy and metallic spherules are found in Antarctic ice (e.g., Taylor et al., 1998), in deep-sea sediments (e.g., Petterson and Fredriksson, 1958), and in peat bogs (e.g., Franzén, 2006). This material results from the steady rain of micrometeorites through the atmosphere, the majority ablating and settling to the surface as dust. Glassy spherules also derive from numerous anthropogenic processes and products. In addition, both anthropogenic combustion and natural wildfires produce both glassy and carbon spherular forms (Franzén, 2006) (Fig. DR2 [see text footnote one]).

The suggestion that some of the material identified as 12.9 ka represents extraterrestrial input is consistent with its reported iridium content (Firestone et al., 2007a, 2007c), but we suggest that these levels simply represent the expected composition of micrometeorite ablation fallout. “[F]ullerenes enriched in ^3He ” (Firestone et al., 2007c; Becker et al., 2007) are consistent with micrometeorite ablation fallout, although it must be noted that the fullerene and helium signals have been repeatedly characterized as nonreproducible (e.g., Taylor and Abdul-Sada, 2000; Farley and Mukhopadhyay, 2001; Buseck, 2002; Farley et al., 2005). Nanodiamonds may represent a true extraterrestrial signature, but this material was identified only obliquely and requires rigorous corroboration.

The 12.9-ka impact theory also runs roughshod over a wide range of other evidence. The claim that American megafauna disappeared precisely at 12.9 ka is contrary to broad evidence that these extinctions were diachronous in space, across genera, and dependent on local geographical conditions (Fiedel, 2008). Similarly, the “black mat” horizons characterized by the Firestone group as a single hemisphere-wide impact-induced wildfire are elsewhere reported as multiple horizons of wetland deposits that span the latest Pleistocene-Holocene (Quade et al., 1998). Furthermore, impact-generated wildfire from California to Europe is impossible because thermal radiation is zero below the horizon—>1000 km even for a massive 100-km-high fireball—and ignition by “reentry of high-speed, superheated ejecta” (Firestone et al., 2007c) is inconsistent with an atmospheric airburst (i.e., no impact and no ejecta). By invoking impact ignition, Firestone et al. ignore extensive literature documenting widespread burning at the vanguard of human migration into the Americas (e.g., Moreno, 2000; Pinter and Anderson, 2006).

Both the 12.9-ka impact and the Holocene mega-tsunami appear to be spectacular explanations on long fishing expeditions for shreds of support. Both stories have played out primarily in the popular press, highlighting how successful impact events can be in attracting attention. The desire for such attention is understandable in an environment where science and scientific funding are increasingly competitive. The National Science Foundation now emphasizes “transformative” research, and few events are as transformative as an impact. In an era when evolution, geologic deep time, and global warming are under assault, this type of “science by press release” and spectacular stories to explain unspectacular evidence consume the finite commodity of scientific credibility.

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