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**Cover:** Columnar basalt flows in northeastern Iceland are cut through by glacial outwash streams. Photo taken by Gary B. Lewis at just one of the many places visited by this year's teachers' GeoVentures™ trip to Iceland. See page 34 for more GeoVentures memories.



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# Paleomagnetism, Oroclines, and Growth of the Continental Crust

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Strikingly curved mountain ranges have fascinated geologists as long as maps have been around to portray them. I am no exception—as an undergraduate I often stared at the festoon-shaped structural trends in maps of the Paleozoic uplands of Europe. And then, just as I was contemplating, as a beginning graduate student, what my dissertation should be about, I attended a department-wide seminar at the University of Utrecht given by S.W. Carey. He talked about sphenochasms, rhombochasms, and oroclines and how his mobilistic concepts implied that horizontal movements of the continental crust caused these geometrical patterns (Carey, 1955). While continental drift was a familiar enough theory for us students, endorsed as it was by several of the faculty at Utrecht, plate tectonics had not yet been invented! I found Carey's talk most exciting (he was a very dynamic lecturer), and I began searching for techniques to test his ideas. Soon after, I realized that paleomagnetism was the answer, given that the declination values of ancient magnetizations could reveal relative rotations.

Carey's definition of oroclines implied that these curved orogenic belts were originally straight, or at the very least, straighter. In his talk, he examined curved Alpine belts in the western Mediterranean, but in reading his 1955 paper, I noticed that he also discussed an older (Paleozoic) strongly curved belt, which exists in a so-called Ibero-Armorican Arc that stretches from Portugal and Spain to Brittany and Normandy in western France. Others (e.g., Ries et al., 1980; Perroud, 1986; Hirt et al., 1992) worked on the paleomagnetic signatures of the Cantabrian segment of the Ibero-Armorican Arc in

the following decades. It would take me some three decades and a sabbatical in 1990–1991 in Barcelona before I found an opportunity to collect samples in the core of the arc, where I suspected we might learn something new about possible evidence for oroclinal bending. Here I present a summary of our studies in northern Spain, which provides an opportunity to examine some concepts relevant to oroclinal bending, and then I will summarize recent paleomagnetic work we have been doing in eastern Kazakhstan, where strongly curved structures exist as well. A comparison between the structures of Kazakhstan, as part of the Paleozoic Ural-Mongol orogenic belt, and structures in Hercynian Europe shows similarities on a large scale, and suggests that the deeper parts of the crust and perhaps even the upper mantle have been involved in the bending processes in

these areas. For this to be possible, the continental crust involved in the oroclines must have had “room to maneuver” and this, in turn, seems to imply that this crust consisted of long strips, called ribbon continents. Toward the end, I will speculate about the prevalence of this bending model and draw some analogies with what we infer about the amalgamation of Archean terranes.

The Ibero-Armorican Arc (Fig. 1) reveals a Paleozoic backbone that curves from the Centro-Iberian Zone across the (then-still-closed) Bay of Biscay to the Armorican Massif in western France. Eastward, this zone is mostly covered by Mesozoic and younger rocks of the Paris Basin, but it reemerges in the Saxothuringian and Moldanubian zones of the Germanic subdivisions of Central Europe. The change in trends in France and Germany shows less curvature than that in the Ibero-Armorican Arc, but still amounts to some 60°. Some of the boundaries between the subzones in Hercynian Europe are thought to be suture zones where ancient oceans were subducted—these boundaries are shown by the heavy dashed color lines in Figure 1.

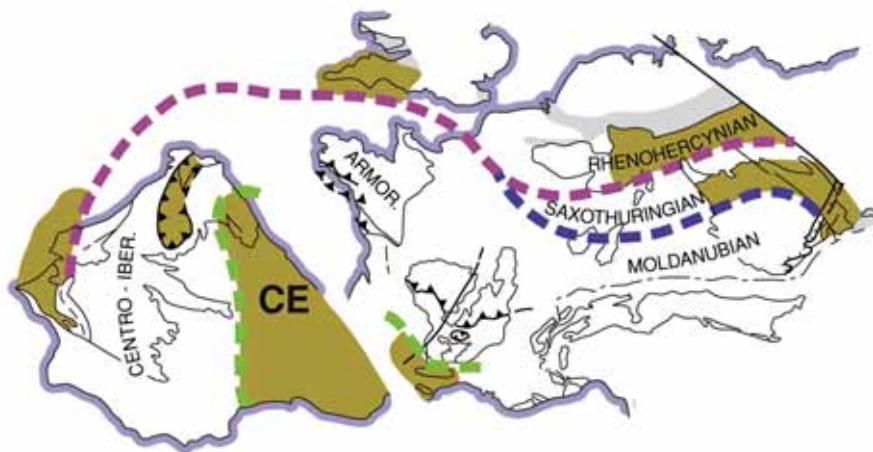


Figure 1. Paleozoic reconstruction, with the Bay of Biscay closed, of Variscan Europe (modified after Franke and Engel, 1982, and used with permission of the authors and the copyright holder, Geosciences Southwest England, as successor to the Ussher Society). Tan represents Carboniferous synorogenic clastic (flysch and Kulm-type) sedimentary rocks. Heavy dashed lines distinguish different structural domains that may have been separate microcontinents or ribbon continents before late Paleozoic amalgamation during the Hercynian orogeny. CE—Cantabria-Ebro block.



In the core of the Ibero-Armorican Arc in northern Spain, the Cantabria-Ebro block (CE in Fig. 1) contains a Carboniferous basin filled with synorogenic clastic and coal-bearing sediments, which at its western apex in Asturias and Cantabria followed the deposition of early Carboniferous and older carbonate sequences. The paleomagnetic signatures of the Devonian carbonates were studied by us (Parés et al., 1994; Van der Voo et al., 1997; Weil et al., 2000, 2001). These rocks turned out to be remagnetized, which at first seemed disappointing but then was used to our advantage when we learned that the magnetizations were acquired precisely during the late Carboniferous–Early Permian deformation phases of this Cantabrian belt. The paleomagnetic declinations are presented here in two fashions: (1) as large-scale averages represented by the large arrows in Figure 2A, and (2) in a diagram where declinations and generalized strike directions are plotted against each other for each site (Fig. 2B).

It is clear from Figure 2A that the averaged declinations track the curving trends of the Cantabrian zone very well. Moreover, in the detailed comparisons of declinations and strikes (Fig. 2B) the aggregate of the site means indeed shows an excellent correlation ( $R^2 = 0.83$ ). The slope of the best-fit correlation line is very close to one, indicating that undoing the oroclinal bending leads to a nearly straight original belt. Previous studies had indicated that a significant original curvature existed before bending, amounting to about 50% of today's structural trends. This turned out to be incorrect, caused by a lack of recognition that the studied rocks were remagnetized during deformation; as a result the application of 100% tilt correction to the paleomagnetic directions overcorrected and produced erroneous results. The other interesting conclusion from our studies is that the oroclinal bending occurred after folding and thrusting had been nearly completed; thus, the initial fold-axes and thrust-traces ran more or less straight and parallel to present-day north-south in the late Carboniferous. In a separate study, we were able to show that stress directions determined from calcite-twinning orientations were everywhere more or

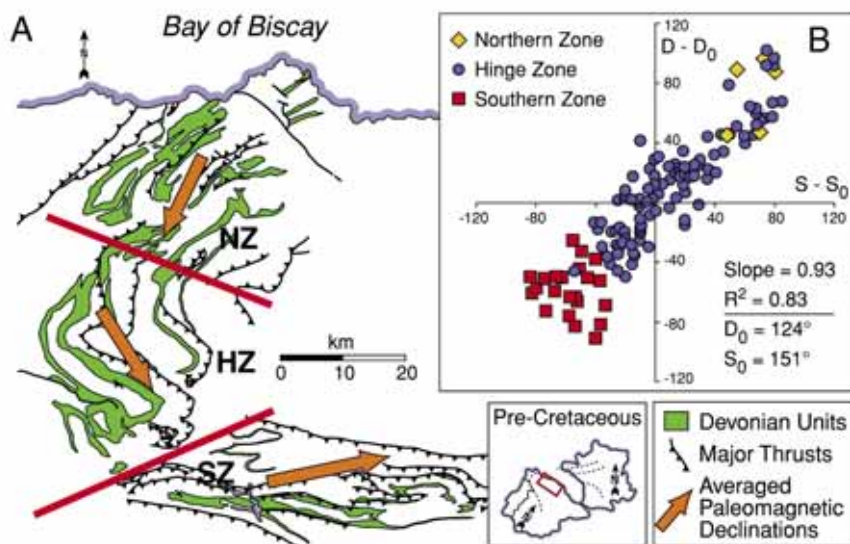


Figure 2. (A) Map of the western end of the Cantabrian orocline, showing thrust sheet traces and outcrop areas (green) of the Devonian rocks studied by Weil et al. (2000, 2001) and Kollmeier et al. (2000). Reproduced with permission of Elsevier, ©2000. Large arrows represent averaged paleomagnetic declinations. NZ, HZ, and SZ are the northern, hinge, and southern zones, respectively. (B) Declinations (D) and strikes (S) plotted against each other for each of the paleomagnetically studied sites, minus reference values where  $D_0$  is the averaged declination for the area and  $S_0$  is the average strike. For a detailed discussion of this type of plot, see Schwartz and Van der Voo (1983). Different colors represent results from NZ, HZ, and SZ areas (from Weil et al., 2001, fig. 5).

less perpendicular to the thrust traces; assuming that these stress directions originally were all parallel, Kollmeier et al. (2000) could confirm that nearly 100% oroclinal bending had to have occurred to produce the present-day fan-shaped pattern of the stress directions.

The calcite-twinning orientations and paleomagnetic directions collectively present a clear picture of an originally straight fold and thrust belt that subsequently was deformed during the Early Permian into the horseshoe-shaped belt it is today. What is intriguing is that this oroclinal bending occurred primarily about near-vertical axes, that is, without much further tilting of the already folded thrust sheets. We can tell that from the paleomagnetic inclinations, which do not need much correction from “untilting” (see discussion in Weil et al., 2000). This implies that, wherever the major décollement planes are to be found, they are more or less horizontal, because movement over inclined surfaces would undoubtedly have caused a detectable tilt. But what we cannot ascertain, of course, is how far the oroclinal rotations perpetuate downward. In other words, at what depth did detach-

ment occur? It is likely that the deformation in the Cantabrian fold and thrust belt is thin-skinned, as seems to be the case for most other relative rotations in fold and thrust belts (e.g., Grubbs and Van der Voo, 1976; Eldredge and Van der Voo, 1988; Kent, 1988; Butler et al., 1995; Collombet et al., 2002; Bayona et al., 2003; Sussman et al., 2004; van der Pluijm and Ong, 2004).

Whereas the kinematic scenario of the Cantabrian oroclinal core of the Ibero-Armorican Arc seems unambiguous enough, it is not at all clear what the dynamics of the bending may have been. For instance, what happened in the backbone of the Ibero-Armorican Arc all around Cantabria (see Fig. 1)? Was the Ebro block an indenter? There are indications of relative rotations in the Carboniferous paleomagnetic data from Brittany and Central Europe (Bachtadse and Van der Voo, 1986; Perroud, 1986), but the distribution of sampling sites for these results is not sufficient to make any arguments for oroclinal bending in Portugal and western Spain. Results from Siluro-Devonian rocks in Hercynian Europe are very scarce—in essence, there are only four

relevant paleomagnetic results (Perroud et al., 1985; Parés and Van der Voo, 1992; Tait et al., 1994; Tait, 1999) and their reliability is low, especially where the ages of magnetization are concerned. The results from Spain, Portugal, and the Czech Republic do show declinations that can be taken as support for oroclinal rotations, but the result from western Brittany (Tait, 1999) does not agree and so, for the time being, one has to allow that any oroclinal bending of the backbone's crust in Hercynian Europe, which of necessity would have been thick-skinned, remains enigmatic.

The geological setting in Kazakhstan has certain similarities to that of Hercynian Europe, but here the evidence for thick-skinned oroclinal bending is emerging more clearly. Figure 3 shows a geological map of Kyrgyzstan and eastern Kazakhstan, in which different colors highlight the three age groups of island-arc magmatism that characterizes the Paleozoic history of this part of the Ural-Mongol orogenic belt. Concentric horseshoe-shaped belts encircle Lake Balkhash, with the youngest of these subduction-related volcanic arcs on the inside. This is intriguing in terms of subduction geometry: how can

it be possible to have outward-directed subduction of oceanic crust under a steadily tightening overriding plate that keeps converging on the vanishing oceanic area? Naturally, the idea that the horseshoe-shaped belts are the result of oroclinal bending has occurred to scientists studying the area and has led to models of complex oroclinal deformation (e.g., Şengör and Natal'in, 2004), whereas others have proposed amalgamation and collision of arc segments without large-scale rotations (Didenko et al., 1994; Filippova et al., 2001).

Our recent paleomagnetic results (Bazhenov et al., 2003; Collins et al., 2003; Levashova et al., 2003) have indicated that rotations in the Kazakh belts are significant, however. In Figure 3, the most illustrative of these results are shown and include declinations from Ordovician and Silurian rocks from two areas, the North Tien Shan and the Chingiz Range. Positive tilt and conglomerate tests for several of these results indicate that the magnetizations are primary or, at the very least, were acquired early; moreover, the directions do not resemble magnetization directions observed in younger, post-Silurian rocks. Because the drift of the two sampling areas must generally have been northward during much of the Paleozoic, in order for them to end up as part of the northern-hemisphere Laurasia assembly by Permian time, the polarity of the two sets of results can reasonably be assumed to have been normal (see discussion in Levashova et al., 2003). Field and laboratory work in progress is designed to test our polarity assignments and to complement the data distribution in a spatial sense with new results from the hinge areas of the arcs. Assuming for the time being that our polarity assignments are correct and that the northern Chingiz area is rotated about 180° with respect to the southern area in the North Tien Shan, we have a ready explanation for the geometrical oddity of the tightening arcs around Lake Balkhash. Late Permian directions on both sides of the orocline appear to be more or less parallel, indicating that the rotations were largely completed by that time. Middle Devonian paleomagnetic directions (Levashova et al., 2003) are in need of confirmation, but suggest that the rotations occurred afterwards.

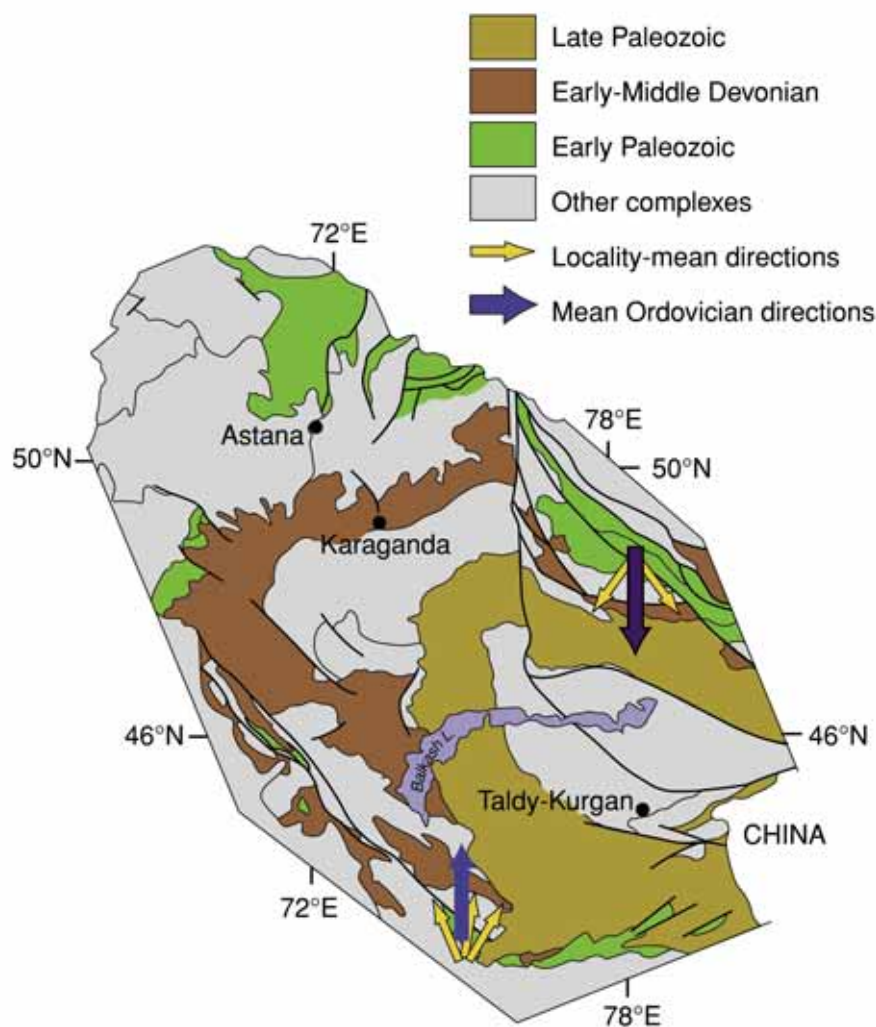


Figure 3. Map of northernmost Kyrgyzstan and eastern Kazakhstan, where subduction-related volcanic arcs of different ages are shown in different colors (reproduced from Levashova et al., 2003, with permission of Elsevier, ©2003). Light-colored smaller arrows represent mean declinations for individual formations of Ordovician and Silurian ages (from Bazhenov et al., 2003; Collins et al., 2003; Levashova et al., 2003) and large dark arrows represent the regionally averaged declinations for this interval. The northern sampling localities (Chingiz Range) have generally southerly declinations, whereas the results from the North Tien Shan are northerly, indicating nearly 180° of relative rotation between these two areas.

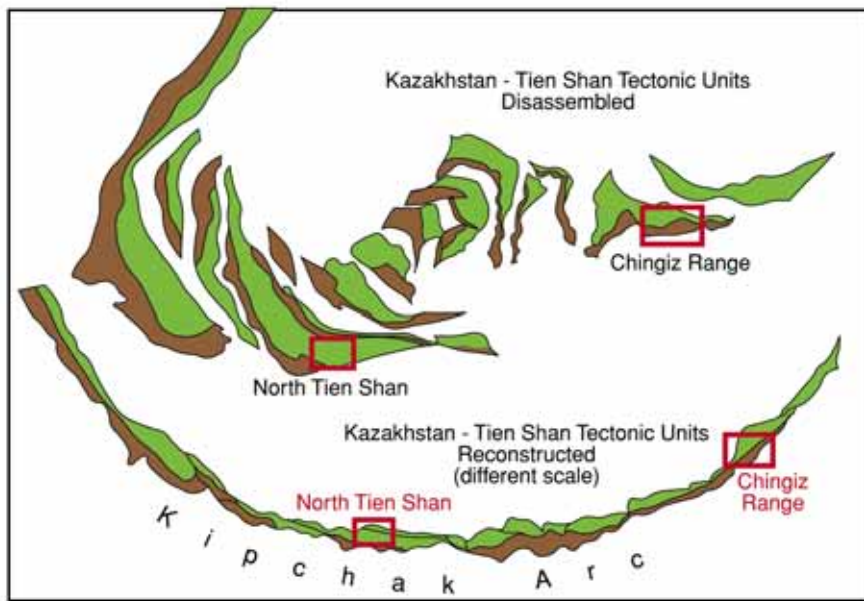


Figure 4. Disassembled tectonic units from the Kazakhstan–Tien Shan orocline and their reconstruction into the early Paleozoic Kipchak Arc according to Şengör and Natal'in (2004; reproduced with permission of the authors and the publisher and copyright holder, W.W. Norton and Co., ©2004). The Kipchak Arc became sheared and buckled during the late Paleozoic into the present-day oroclinal fault-riddled structure. Paleomagnetic sampling areas are labeled and indicated by the red boxes.

The most likely time span for oroclinal bending is late Carboniferous–Early Permian.

It appears that oroclinal bending in this area penetrated deeply, given that we are dealing with thick crustal arc segments with abundant subduction-related plutonic rocks. The arc segments appear to have amalgamated in collisions of crustal dimensions and not within a thin-skinned fold and thrust belt. The model of Şengör and Natal'in (2004) is very interesting in this respect (Fig. 4) and portrays the buckling, shearing and oroclinal bending of an originally very long Kipchak Arc that connected the independently drifting Paleozoic Siberia and Baltica continents in Ordovician times. The areas surrounding the locations of the Chingiz Range and the North Tien Shan evolved into the flanks of the horseshoe-shaped early and middle Paleozoic belts of Figure 3 during the Devonian, Carboniferous, and Early Permian, according to Şengör and Natal'in (2004). Collectively, this allows the interpretation that the rotations of the Kazakhstan Orocline are thick-skinned and involved ribbon continents, which are long strips of continental crust that can bend or

buckle more easily than more equidimensional crustal blocks.

The term *ribbon continent* was used by Johnston (2001) to describe the long, originally fairly linear strip of continental crust that deformed into what he called “the great Alaskan terrane wreck.” A depiction of this deformation can be gleaned from Figure 5. A similar ribbon-shaped continent that accreted to Asia in the Mesozoic is represented by Cimmeria (Şengör, 1987), and one can imagine that Paleozoic microcontinents such as Avalonia and Armorica may have been ribbon continents as well (Tait et al., 1994; Mac Niocaill et al., 1997). Rotations characterize all these accreting microcontinents and island-arc segments.

The amalgamation of the Baltic, Siberian, and Tarim cratons, the West and East Avalonia microcontinents, the Variscan belt in and around the Ibero-Armorican Arc, and the Ural-Mongol Belt (which includes Kazakhstan)

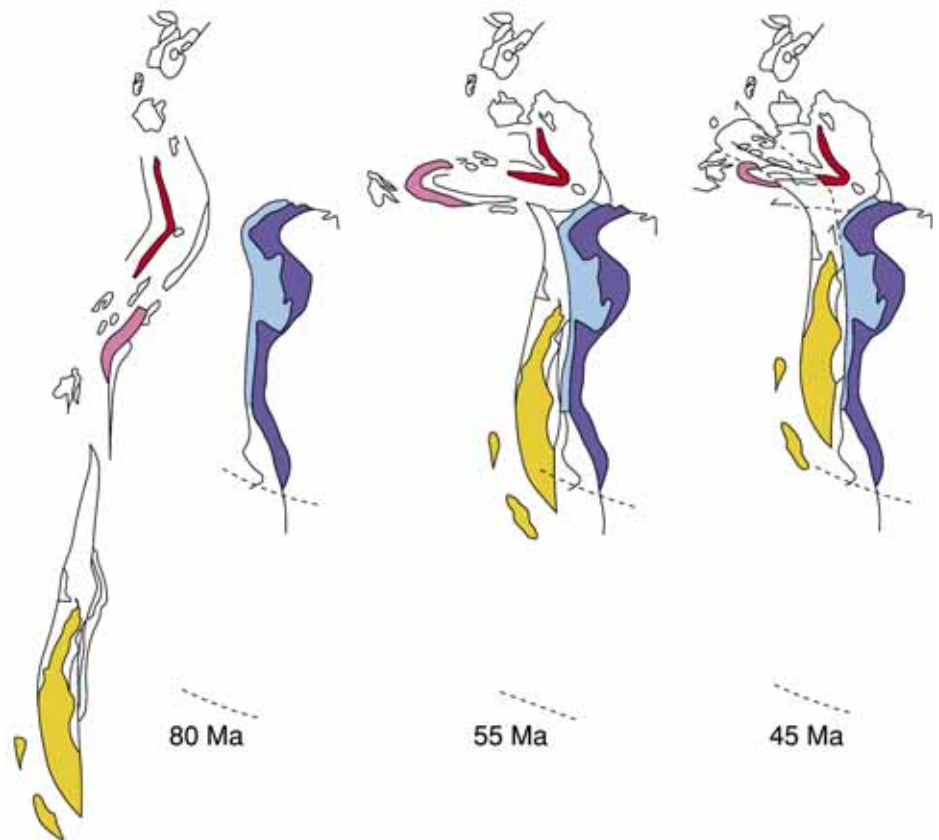


Figure 5. Evolutionary scenario of a ribbon continent that buckled and accreted to the northwest margin of North America during the early Tertiary in what the author called the “Great Alaskan Terrane Wreck” (reproduced with permission of S.T. Johnston, and the publisher and copyright holder, Elsevier, ©2001). The stable (unchanging) North American margin is represented by the different blue colors and the dashed lines represent the future Mexico–United States and United States–Canada borders.



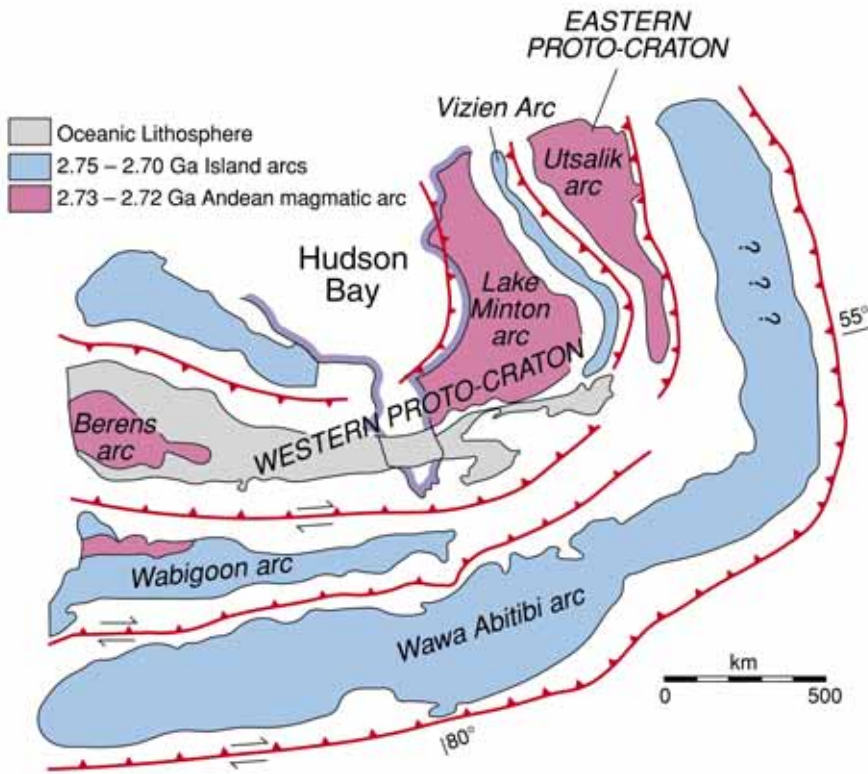


Figure 6. Schematic representation of the Superior Province at ca. 2.7 Ga during continental arc magmatism at the eastern and southern margins and assembly of island arc terranes into the Superior craton in statu nascendi. Modified from Percival et al. (1994) and reproduced with permission of the author.

represents Paleozoic growth of Eurasia. Similar events occurred in the Mesozoic, as the Cimmeria ribbon, and the China and Indochina blocks accreted onto the older nuclei. This pattern of cratonization and continental growth can be recognized in other continental elements as well. A good example exists in north-eastern Africa and Arabia, where multiple island-arc and ophiolitic fragments amalgamated during the Pan-African orogeny (Windley, 1995, p. 244–248).

Models for the genesis and evolution of the Archean greenstone-gneiss belts are probably as numerous as there are authors discussing them, but some suggest that continental growth by accretion of ribbon continents may have already occurred in the Archean (e.g., Percival et al., 1994). Figure 6 displays the island arcs and Andean-type magmatic arcs that are, according to these authors, thought to have developed in a time span of ~50 m.y. The long linear ribbon-like strips were then telescoped in a collision process involving subduction of the intervening oceanic crustal

segments. This, in my opinion, strongly resembles the situation described above for Eurasia in Phanerozoic times. Percival and colleagues (1994) did not discuss oroclinal bending, and there is to my knowledge no discussion of this in the promising paleomagnetic studies of the greenstones either (Tasillo-Hirt et al., 1982; Geissman et al., 1983), so perhaps this is something to be pursued in future paleomagnetic studies.

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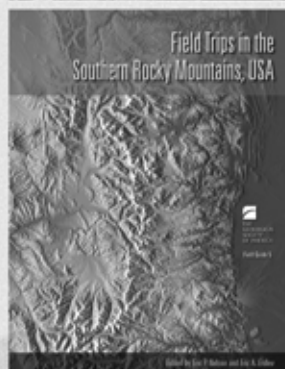
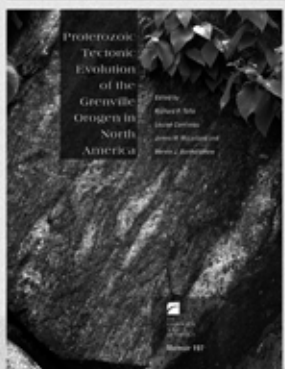
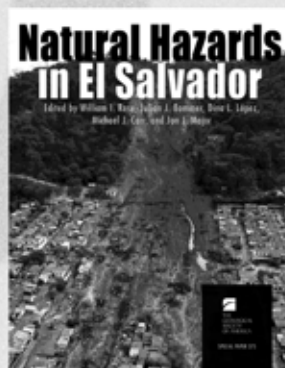
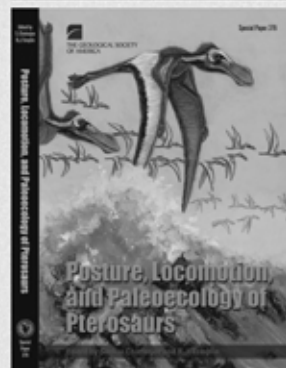
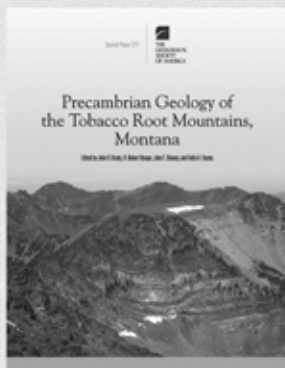
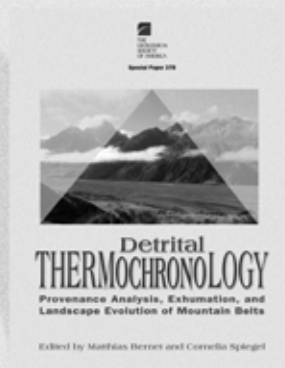
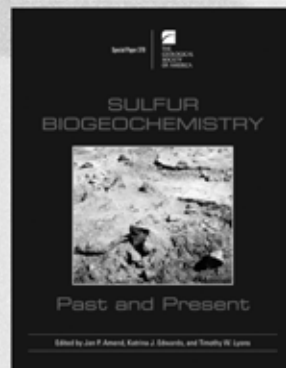
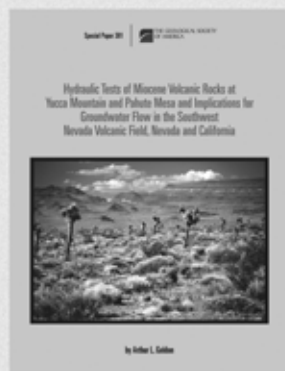
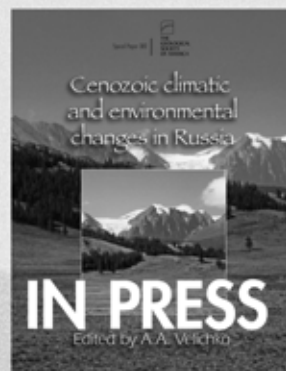
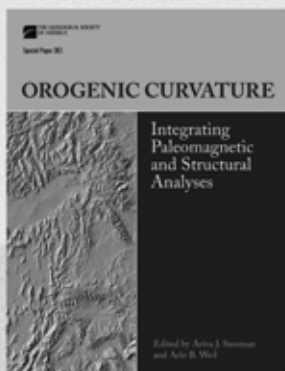
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# UPCOMING DEADLINES

## **Committee Service**

### **Nominations Due January 15, 2005**

Candidates are needed for service on the following GSA committees (service begins July 2005 unless otherwise noted): Annual Program; Arthur L. Day Medal Award; Education; Geology and Public Policy; Honorary Fellows; Membership; Minorities and Women in the Geosciences; Nominations; Penrose Conferences and Field Forums; Penrose Medal Award; Professional Development; Publications; Public Service Award; Research Grants; Young Scientist Award; and Joint Technical Program (service begins Jan. 1, 2006). Candidates are also needed for GSA representatives to the North American Commission on Stratigraphic Nomenclature (service begins Nov. 1, 2005); the AAPG Publication Pipeline Committee; the AGI Environmental Geoscience Advisory Committee (service begins Jan. 1, 2006), and the AAAS Consortium of Affiliates for International Programs.

For complete information on committee service, current vacancies, and required qualifications, see the October 2004 issue of *GSA Today*. Nomination form and instructions are available at [www.geosociety.org/aboutus/committees/](http://www.geosociety.org/aboutus/committees/).

## **Officers and Councilors**

### **Nominations Due August 1, 2005**

The GSA Committee on Nominations requests nominations for officers (vice president and treasurer) and councilors to serve on the GSA Council beginning in 2006. Each nomination should be accompanied by basic data and a description of the qualifications of the individual for the position recommended.

The online nomination form is available at [www.geosociety.org/aboutus/committees/](http://www.geosociety.org/aboutus/committees/), or you may send materials for committee, officer, and councilor nominations to Ruth Harrison, GSA, P.O. Box 9140, Boulder, CO 80301-9140, (303) 357-1000, ext. 0, 1-800-472-1988, ext. 0, [rharrison@geosociety.org](mailto:rharrison@geosociety.org).

## **Medals and Awards**

### **Nominations Due February 1, 2005**

Nominations of candidates are requested for the following medals and awards: Penrose Medal, Day Medal, Honorary Fellows, Young Scientist Award (Donath Medal), GSA Public Service Award, and Distinguished Service Award. For details on the awards and nomination procedures, see the October 2004 issue of *GSA Today*; go to [www.geosociety.org](http://www.geosociety.org), or call (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.

## **National Awards**

### **Nominations Due April 30, 2005**

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 2004 issue of *GSA Today*. Nominations should be sent to Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140.

## **GSA Fellows**

### **Nominations Due January 15, 2005**

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 other supporting signatures are needed, along with a letter stating the member's qualifications to be evaluated on the basis of eight established criteria. For updated information, a list of the criteria, and a new nomination form, please see [www.geosociety.org/members/fellow.htm](http://www.geosociety.org/members/fellow.htm) or contact Diane Lorenz, (303) 357-1028, [awards@geosociety.org](mailto:awards@geosociety.org).

## **2005 Subaru Outstanding Woman in Science Award**

(Sponsored by Subaru of America, Inc.)

### **Nominations Due February 1, 2005**

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 nomination, eligibility, and award details, see the October 2004 issue of *GSA Today*; visit [www.geosociety.org](http://www.geosociety.org), or call (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.

## **John C. Frye Environmental Geology Award**

### **Nominations Due March 31, 2005**

In cooperation with the Association of American State Geologists, GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. This fund managed by GSA Foundation. For details, see the October 2004 issue of *GSA Today*; visit [www.geosociety.org](http://www.geosociety.org), or call (303) 357-1028. Nominations must be sent to Program Officer, Grants, Awards, and Recognition, GSA, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301-9140.

## **Student Research Grants**

### **Online submission must be completed by midnight, February 1, 2005, MST.**

The GSA student research grant application process is now available only online. Although the current forms have not changed significantly, the process for submitting applications and appraisal letters is accessible only online only through GSA's password-protected Web site. No paper applications or letters will be accepted. The site should be live by mid-November. For information on the 2005 Research Grant Program for Students, see the October 2004 issue of *GSA Today*; visit [www.geosociety.org](http://www.geosociety.org), call (303) 357-1028, or e-mail [awards@geosociety.org](mailto:awards@geosociety.org).

## **Congressional Science Fellowship**

### **Applications Due January 21, 2005**

For application information for the 2005–2006 GSA–U.S. Geological Survey Congressional Science Fellowship, visit [www.geosociety.org/science/csf/](http://www.geosociety.org/science/csf/), or contact Ginger Williams, GSA Headquarters, (303) 357-1040, [gwilliams@geosociety.org](mailto:gwilliams@geosociety.org).

# SLC 2005

## Science • Learning • Colleagues

Salt Lake City, Utah

Technical Program: October 16–19, 2005

## Call for Proposals for Keynote Symposia and Topical Sessions

---

The 2005 GSA Annual Meeting returns across the Rockies to Salt Lake City. From Precambrian basement rocks to Quaternary sediments, from nearby Yellowstone to the Wasatch fault zone, from gold mines to water issues, the Salt Lake City area has much to spark our interests. This dynamic geologic setting reminds us of the intricate interplay between Earth and humans, and the value in sharing our *science*, continuing our *learning*, and collaborating with our *colleagues*. We face growing challenges and exciting opportunities, coming at a dizzying pace. How will science help in the understanding of complex earth systems and global change? How will we utilize new technologies and exchange ideas across disciplines? How do we better communicate with policy makers and respond to changing societal needs?

You can play a key role in answering these and many other questions by proposing a topical session or Pardee symposium for the 2005 meeting. Help make this a meeting where we grow by exchanging a wide range of ideas. The GSA annual meeting is what YOU make it.

**Proposal deadline: January 11, 2005**  
**Submit Proposals at [www.geosociety.org](http://www.geosociety.org)**

Have you ever been frustrated to find that none of the topical sessions at a GSA meeting represent your own current area of research and excitement? If so, there is an easy answer: propose a session yourself! The topical sessions and Pardee Symposia at GSA meetings are planned entirely by your friends and colleagues. If these sessions do not adequately reflect your own interests, your voice is needed. Please plan to participate in the design of the meeting by submitting a session proposal. The reward is great: you play a direct role in

attracting key people to the meeting and in formulating part of the program that will be of direct benefit to you. Yours might even be the session that has everyone talking in the corridors and the bars, or even on the evening news! You may also be well on your way to producing the next GSA Special Paper.

### Program Opportunities

We welcome proposals for Pardee Keynote Symposia and topical sessions. Submit proposals electronically on or before **January 11, 2005**, via the link at [www.geosociety.org](http://www.geosociety.org).

The annual meeting program structure offers opportunities for effective and dynamic program building, allowing a mixture of invited and volunteered papers and different session formats. Joint Technical Program Committee (JTPC) representatives from GSA Divisions play a large role in decisions. Please read the various program options and guidelines at [www.geosociety.org](http://www.geosociety.org) carefully before submitting a proposal of one of two types:

**Pardee Keynote Symposia**, made possible by a grant from the Joseph T. Pardee Memorial Fund, are *special events* of broad interest to the geoscience community. Topics appropriate for these symposia are those that are on the leading edge in a scientific discipline or area of public policy; address broad, fundamental problems; are interdisciplinary; or focus on global problems. The primary criterion for selection is excellence, and selection is on a competitive basis. All speakers will be invited; each convener is provided with a budget of \$2,000. We strive for a good mix of Pardee Keynote Symposia of interest to GSA and Associated Society members.

**Topical sessions** promote the exchange of timely or state-of-the-art in-

formation with respect to a focused topic and allow scheduling of interdisciplinary talks that bear on a specific topic. Organizers (advocates) may invite specific papers to ensure a successful and excellent session and are encouraged to solicit volunteered contributions. A maximum of four invited speakers may be allowed. Sessions will include a mixture of invited and volunteered abstracts. All approved topical sessions are solicited in *GSA Today*. Topical sessions must receive a minimum of 12 abstracts to be part of the technical program. Advocates are encouraged to submit their proposals as poster sessions to accommodate the growing technical program. All session proposals are reviewed by the JTPC.

### Oral and Poster General Sessions

Consisting entirely of volunteered papers, these sessions are an important component of the GSA Annual Meeting. The number of abstracts received determines the number of general sessions in each discipline. The goal of the technical program chair and the JTPC representatives is to provide presenters the best possible opportunity for communicating new scientific information rather than to dictate what can or will be presented. To allow for well-attended, dynamic sessions, an effort will be made in scheduling to avoid over-lap of poster and oral sessions in the same discipline.

### Hot Topics

The focus of these popular lunchtime forums, held Sunday through Wednesday, is on discussion—with plenty of audience participation. Depending on the subject, a debate format is recommended, and panels are discouraged. Each session must have a moderator. Titles should be catchy and provocative. If you are interested in organizing a session, contact Nancy Carlson, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### Make Yours the Session Everyone Talks About

Topical session organizers have the ability to ensure a successful, excellent program through topical sessions, with their combination of invited speakers and volunteered papers, and through Pardee Keynote Symposia, which ex-



pand the opportunity for high-profile sessions on important developments that have an impact on our science.

We look forward to working with you to make the GSA Annual Meeting dynamic and stimulating for all GSA and Associated Society members and appealing to a wide audience. If you have any questions or concerns regarding the program, please call or e-mail.

#### 2005 Local Committee Chair

**Adolph Yonkee**

(801) 626-7419

ayonkee@weber.edu

#### Technical Program Chair

**John Geissman**

(505) 277-3433

jgeiss@unm.edu

#### Salt Lake City 2005 Dates and Deadlines

**Jan. 11** Proposals due by midnight, PST. Electronic submission required.

**April 1** Electronic abstract form posted at [www.geosociety.org](http://www.geosociety.org).

**April** 1st announcement in April *GSA Today*.

**June** 2nd announcement in June *GSA Today*.

**July 12** Abstracts due by midnight, PST.

**Aug. 1** Technical program schedule finalized.

Accepted abstracts with links to speakers and titles will be posted at [www.geosociety.org](http://www.geosociety.org) in mid-August.



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## Call for Papers: GSA's *Geosphere*

Submit a paper to *Geosphere*, GSA's new online journal. *Geosphere* is using an online manuscript submission and tracking system accessible through [www.geosociety.org](http://www.geosociety.org) (click on "Publications Services," then "Submit a Manuscript") or [www.gsjournals.org](http://www.gsjournals.org). (If you have submitted papers to *Geology* or to *GSA Bulletin*, you'll find the process familiar.)

### *Geosphere*:

- seeks high-quality papers from a broad spectrum of geoscience disciplines;
- maintains rigorous standards for peer review;
- strives for a high impact factor;
- is entirely electronic, and the format is extremely flexible;
- encourages innovative approaches to scientific publication, extensive use of color, animations, and interactivity;
- welcomes oversize figures (maps, cross sections, seismic sections);
- allows for the presentation and preservation of basic data, images, etc., through linkage to data archives; and
- aims to evolve with technological advances.

*Geosphere* science editor: G. Randy Keller, University of Texas at El Paso. The *Geosphere* Editorial Board is listed at [www.geosociety.org/pubs/geosphere/e\\_board.htm](http://www.geosociety.org/pubs/geosphere/e_board.htm).

## Call for Proposals: Professional Development Short Courses and K-16 Education Workshops for the 2005 GSA Annual Meeting in Salt Lake City

The GSA Committee on Professional Development invites those interested in proposing a short course or workshop to contact GSA headquarters for proposal guidelines. This invitation is also extended to K-12 teachers, teacher trainers, pre-service educators, and undergraduate educators to submit proposals for K-16 education workshops. Committee members are interested in receiving course proposals for the 2005 Salt Lake City Annual Meeting or the 2006 Philadelphia Annual Meeting.

Proposals must be received by January 1, 2005. Selection of courses for 2005 will be made by March 1, 2005.

For those planning ahead, we will also consider courses for 2006 at that time.

#### For proposal guidelines or information, contact

Edna Collis, Program Officer  
GSA Headquarters  
1-800-472-1988, ext. 1034  
[ecollis@geosociety.org](mailto:ecollis@geosociety.org)



## Final Announcement and Call for Papers

# NORTHEASTERN

**40th Annual Meeting  
Northeastern Section, GSA  
Prime Hotel and Conference Center,  
Saratoga Springs, New York**

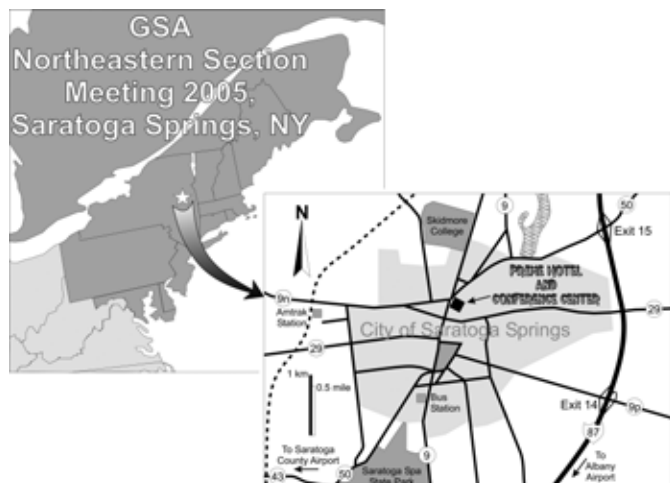
**March 14–16, 2005**

<http://www.geosociety.org/sectdiv/northe/05nemtgt.htm>

The 2005 meeting of the Northeastern Section of the Geological Society of America will be hosted by the Geology Departments of Union College, Schenectady, New York, and Skidmore College, Saratoga Springs, New York. The meeting will be at the Prime Hotel and Conference Center in Saratoga Springs, a small city centrally located for the GSA Northeastern Section in beautiful upstate New York. The hotel is conveniently situated on the edge of the downtown area, and a wide variety of restaurants, pubs, and shops are within easy walking distance.

### DIRECTIONS

The Prime Hotel and Convention Center is located at 534 Broadway, Saratoga Springs, New York, and is easily accessible by car from the north or south via Exit 15 on Interstate 87. Saratoga Springs is served by long distance bus lines (Trailways, Greyhound) and Amtrak rail. Albany International Airport is located 25 miles (40 km) to the south and is accessible by rental car, taxi, and CDTA buses ([www.cdfa.org](http://www.cdfa.org)). Saratoga County Airport is nearby and serves smaller private planes. See map for location details.



### CALL FOR PAPERS

**Abstract deadline: December 14, 2004**

Abstracts are invited for theme and general discipline sessions in both oral and poster format. Volunteered papers will be considered for any general discipline or theme session as listed on the GSA abstracts form. Authors interested in submitting papers for symposia should first contact the appropriate symposium conveners. An individual may be presenter for only one volunteered paper (except for symposia papers and invited papers to theme sessions), but may be co-author on any number of abstracts. Those invited for symposia may present additional papers. For further information, please contact Technical Program Chairs John Garver, [garverj@union.edu](mailto:garverj@union.edu), or Kyle Nichols, [knichols@skidmore.edu](mailto:knichols@skidmore.edu). Abstracts of papers must be submitted using the electronic submissions form at [www.geosociety.org/sectdiv/northe/05nemtgt.htm](http://www.geosociety.org/sectdiv/northe/05nemtgt.htm). If you have questions regarding abstract submission, please contact Nancy Carlson, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### MEETING REGISTRATION

**Standard registration deadline: February 7, 2005**

**Cancellation deadline: February 14, 2005**

GSA Headquarters will handle all registration, which can be done online or by downloading the PDF registration form at [www.geosociety.org/sectdiv/northe/05nemtgt.htm](http://www.geosociety.org/sectdiv/northe/05nemtgt.htm). If you are unable to register this way, please contact GSA Sales and Service at (888) 443-4472, 303-357-1000 option 3, or [gsaservice@geosociety.org](mailto:gsaservice@geosociety.org). On-site registration will be available at the Prime Hotel and Conference Center during the meeting.

### Registration Fees

	Standard		On-site	
	Full meeting	One day	Full meeting	One day
Professional Member	\$100	\$70	\$110	\$80
Professional Member 70 and older	\$60	\$40	\$70	\$45
Professional Nonmember	\$110	\$80	\$120	\$90
Student Member	\$35	\$25	\$40	\$30
Student Nonmember	\$45	\$35	\$50	\$40
K–12 Professional	\$25	\$15	\$30	\$20
Guest or Spouse	\$20	\$15	\$25	\$20

Register early to qualify for lower registration fees. Costs will increase after February 7, 2005. Full payment MUST accompany the registration form. Members of GSA and the GSA Associated Societies listed on the registration form get registration discounts. Registration is required for those attending technical sessions, field trips, short courses, and the exhibits hall. Guest registration is intended for non-geologist spouses or friends and does not include attendance at technical sessions, field trips, or short courses. Students and K–12 teachers must show a current ID at check-in to obtain special rates.

Register only one person per form and retain a copy for your records. GSA will be distributing all badges at the meeting registration desk, so badges will NOT be mailed to you prior to the meeting.



## On-site Registration and Standard Registration Badge Pickup Schedule

### Prime Hotel and Conference Center, Gallery

Sunday, March 13	4–8 p.m.
Monday, March 14	7 a.m.–5 p.m.
Tuesday, March 15	7 a.m.–5 p.m.
Wednesday, March 16	7–11 a.m.

### Accommodations for Registrants with Special Needs

The Northeastern Section of GSA is committed to make every event in the 2005 meeting accessible to all people interested in attending. If you have special requirements, please check the appropriate box on the meeting registration form. If you need more information, please contact Kurt Hollocher, hollochk@union.edu, or the Prime Hotel directly at the phone number and address below. Requests for special accommodations should be received by February 7, 2005.

### CANCELLATIONS, CHANGES, AND REFUNDS

All requests for additions, changes, and cancellations must be made in writing to GSA Headquarters and received by February 14, 2005. There will be no refunds for cancellations received after this date, and no refunds for on-site registration, *Abstracts with Programs*, and on-site ticket sales.

### ROOM REGISTRATION

A large block of rooms at a special base rate of \$99, excluding tax, has been reserved at the Prime Hotel and Conference Center, 534 Broadway, Saratoga Springs, New York 12866. This rate is as low as any Northeastern Section meeting in the United States in recent memory. Also available are mini-suites, one-bedroom suites, and presidential suites that may be suitable for groups (see [www.union.edu/PUBLIC/GEODEPT/hollocher/negsa2005/room\\_options.htm](http://www.union.edu/PUBLIC/GEODEPT/hollocher/negsa2005/room_options.htm)). Attendees are responsible for making their own room reservations. Reservations can be made direct by calling the Prime Hotel at (518) 584-4000 or (888) 999-4711. **You MUST identify yourself as attending the Geological Society of America conference to get the discounted room rates.**

Conference organizers have attempted to keep costs as low as possible. In doing so, we have anticipated filling our reserved room block at the Prime Hotel as a way of minimizing meeting room costs. Please help meet our budget, and make your own stay less hectic, by staying at the Prime Hotel. If you stay at the Prime Hotel, but do not reserve a room through the Prime reservation phone numbers above, please make this known to Kurt Hollocher (hollochk@union.edu) so that we may count your room toward the room quota. Thank you.

### K–12 TEACHERS PROGRAM

The Northeast Section 2005 Meeting is proud to host an assortment of sessions just for K–12 teachers of earth science. Events of interest to K–12 teachers encompass the main conference oral and poster presentations, short courses, and field trips, including theme sessions 5, 6, and 7; short courses 2 and 3, and field trips 3, 6, 8, and 9. Professional development documentation for participation in each activity will be provided (*note*: acceptance by school systems varies).

## TECHNICAL PROGRAM

### Abstracts deadline: December 14, 2004

Papers are invited from students and professionals for presentation in oral and poster general sessions and for presentations that may fit into the symposia and theme sessions listed below. Additional general discipline sessions will be organized to accommodate volunteered abstracts. Abstracts must be submitted online at [www.geosociety.org/sectdiv/northe/05nemtg.htm](http://www.geosociety.org/sectdiv/northe/05nemtg.htm). Presentations for symposia are generally by invitation only, so if you are interested in participating, please contact session coordinators.

### Oral Sessions

One laptop computer (Windows XP), one LCD projector, and one screen will be provided for all oral sessions. All speakers must bring their digital presentations as PowerPoint files on a CD or USB memory stick to the AV technician in the Speaker Ready Room, Prime Hotel and Convention Center, room 506, by 8 p.m. the evening before the scheduled talk time. Speakers may not use their own laptop computers for presentations. Slide projectors, overhead projectors, and multiple screens will not be available. If you have any special requests you MUST contact the AV coordinator, George Shaw, shawg@union.edu, by February 7, 2005.

### Poster Sessions

Poster sessions will allow at least three hours of display time. Presenters must be present for two hours of that time. All posters must fit on a single 8' × 4' display board. Electrical and network connections will not be available. Pins must be used to display posters; no tape or Velcro!

### Symposia

1. **Stromatolites, Biomats, and their Influence on Sedimentation.** *Sponsored by Eastern Section of the Society for Sedimentary Geology (SEPM).* Mark McMenamin, Mount Holyoke College, mmmcmenam@MtHolyoke.edu, (413) 538-2280; Bosiljka Glumac, Smith College, bglumac@email.smith.edu, (413) 585-3680.
2. **Geological Contributions to the Understanding of Late Holocene Human Populations in the Northeast.** Stephen Pollock, University of Maine, pollock@usm.maine.edu, (207) 780-5353.
3. **Geochemistry and Transport of Particles and Particle-Associated Contaminants in Rivers and Estuaries: A Session in Honor of Edward "Ted" Shuster.** T.A. Abrajano Jr., Rensselaer Polytechnic Institute, abrajt@rpi.edu, (518) 276-6036; Richard Bopp, Rensselaer Polytechnic Institute, boppr@rpi.edu, (518) 276-3075; Damon Chaky, LDEO, Columbia University, chakyd@ldeo.columbia.edu, (845) 365-8657.
4. **History of Geology of Northeastern North America.** Gerald M. Friedman, Northeastern Science Foundation/Rensselaer Center of Applied Geology, gmfriedman@juno.com, (518) 273-3247.

### Theme Sessions

1. **Records of Past Monsoon Dynamics and Links Between High and Low Latitude Climatic Processes.**

- Heather Stoll, Williams College, hstoll@williams.edu, (413) 597-4541.
2. **Ecohydrology: Interdisciplinary Ecosystem Research.** David A. Franzi, The State University of New York—Plattsburgh, david.franzi@plattsburgh.edu, (518) 564-4033; Ken Adams, The State University of New York—Plattsburgh, (518) 564-4033.
  3. **Economic Minerals and Rocks of Northeastern North America.** Robert J. Altamura, P.G. Geo-Environmental Consulting, State College, Pennsylvania, altamura@geosc.psu.edu, (814) 234-5011; William M. Kelly, New York State Museum, wkelly@mail.nysed.gov, (518) 474-5816.
  4. **Thermal History and Metamorphism of the Adirondacks in the Context of the Broader Grenville Orogenic Cycle.** Marion “Pat” Bickford, Syracuse University, mebickfo@syr.edu, (315) 443-9290; James McLelland, Colgate University, jmllelland@citlink.net.
  5. **Enhancing Professional Development for K–12 Teachers (Posters).** Michael J. Passow, White Plains, New York, Middle School and Lamont-Doherty Earth Observatory of Columbia University, michael@earth2class.org, (201) 871-0846.
  6. **K–12 Education: Data Collection and Analysis from the Field.** Marna Lehnert, Niskayuna High School, Niskayuna, New York, lehnert.m@nisk.k12.ny.us, (518) 382-2511; Renee Frachioni, Averill Park High School, Averill Park, New York, robidr@alum.rpi.edu, (518) 674-7000.
  7. **Teaching Sedimentology, Stratigraphy, and Paleontology: Using Local Geology and Modern Analogs.** *Cosponsored by National Association of Geoscience Teachers and Eastern Section of the Society for Sedimentary Geology (SEPM).* Bosiljka Glumac, Smith College, bglumac@email.smith.edu, (413) 585-3680.
  8. **Sequence Stratigraphic Approaches to Paleobiologic and Sedimentologic Investigations of Lower Paleozoic Strata of the Northern Appalachians.** *Sponsored by Eastern Section of the Society for Sedimentary Geology (SEPM).* Alex Bartholomew, University of Cincinnati, alexbartholomew\_geo@hotmail.com, (513) 556-3732; Sean Cornell, Juniata College, cornell@juniata.edu, (513) 556-3732.
  9. **Thermochronologic Studies Aimed at Understanding Orogenic Cooling.** Mary Roden-Tice, The State University of New York—Plattsburgh, mary.rodentice@plattsburgh.edu, (518) 564-4032; John I. Garver, Union College, garverj@union.edu, (518) 388-6770; Robert P. Wintsch, University of Indiana, Bloomington, wintsch@indiana.edu, (812) 855-4018.
  10. **New Models of Appalachian Tectonics Inspired by Geochronology: 3rd Annual NETectonics Session.** Paul Karabinos, Williams College, Paul.M.Karabinos@williams.edu, (413) 597-2079; David P. West Jr., Middlebury College, dwest@middlebury.edu, (802) 443-3476; Joe Pyle, Rensselaer Polytechnic Institute, pylej@rpi.edu, (518) 276-4899.
  12. **Late Ordovician Taconic Orogenesis: Structural Evolution and Foreland Basin History.** *Sponsored by Eastern Section of the Society for Sedimentary Geology (SEPM).* Gordon C. Baird, SUNY Fredonia, baird@fredonia.edu, (716) 673-3840; Jean Crespi, University of Connecticut, jean.crespi@uconn.edu, (860) 486-0601; Art Goldstein, Colgate University, agoldstein@mail.colgate.edu, (315) 228-7203; Charles E. Mitchell, The State University of New York—Buffalo, cem@geology.buffalo.edu, (716) 645-6800, ext. 3991.
  13. **Ancient Fault and Fracture-Related Hydrothermal Fluid Flow in Eastern North America: Processes and Products.** Langhorne “Taury” Smith, New York State Museum, lsmith@mail.nysed.gov, (518) 473-6262.
  14. **Applications of Remote Sensing, GIS, and Geodesy.** Joan M. Ramage, Lehigh University, ramage@lehigh.edu, (610) 758-3660; Joanna Reuter, University of Vermont, Joanna.Reuter@uvm.edu, (802) 656-4411.
  15. **New Developments in the Late Quaternary History of the Northeastern United States and Adjacent Canada.** John A. Rayburn, Binghamton University, jrayburn@binghamton.edu, (607) 777-2264; Peter L.K. Knuepfer, Binghamton University, knuepfr@binghamton.edu, (607) 777-2389.
  16. **Isotope Geochemistry in Environmental and Paleoenvironmental Studies.** Andrea Lini, University of Vermont, alini@zoo.uvm.edu, (802) 656-0245; Robert H. Michener, Boston University, michener@bio.bu.edu, (617) 353-6980.
  17. **Lakes and Environmental Change.** John G. Arnason, University at Albany, arnason@atmos.albany.edu, (518) 442-4474; Donald T. Rodbell, Union College, rodbelld@union.edu, (518) 388-6034.
  18. **Rates and Dates of Geomorphic Processes in the Appalachians.** Paul Bierman, University of Vermont, Paul.Bierman@uvm.edu, (802) 656-4411.
  19. **Springs in the Water Cycle: Supply, Water-Rock Interaction, and History.** Don Siegel, Syracuse University, disiegel@syr.edu, (315) 443-3607.
  20. **Careers in Professional Geology: Highlights for Students and Academics.** Skip Delclos, Lansing Hisert Group, Albany, New York, sdelclos@lansinghisert.com, (518) 899-5243, ext. 101.
  21. **Bentonites in the Geologic Record.** *Sponsored by Eastern Section of the Society for Sedimentary Geology (SEPM).* George Shaw, Union College, shawg@union.edu, (518) 388-3770; Charles Ver Straeten, New York State Museum, cverstra@mail.nysed.gov, (518) 486-2004.
  22. **Geologic Hazards in New York and Adjacent Environs.** Donald H. Cadwell, New York State Museum, dcadwell@mail.nysed.gov, (518) 486-2012; Susan D. Halsey, Center for Maritime Systems, Stevens Institute of Technology, Pine Beach, New Jersey, sdhalsey@aol.com, (732) 349-0597.
  23. **Undergraduate Research (Posters).** *Sponsored by Council on Undergraduate Research, Geoscience Division.* David G. Bailey, dbailey@hamilton.edu, Hamilton College, (315) 859-4142.

## SHORT COURSES

Short courses and workshops are listed below. Attendance

is limited, so please register even if the course is free to ensure a space for you and your students. For more information, contact the short course leader or the Short Course Coordinator Kurt Hollocher, hollochk@union.edu.

1. **U-Pb Geochronology: Methodology and Data**

**Interpretation.** Brent V. Miller, Research Scientist, Radiogenic Isotope Geochemistry, Texas A&M University, bvmiller@geo.tamu.edu, (979) 458-3671; Scott Samson, Syracuse University, sdsamson@syr.edu, (315) 443-2672. Sun., March 13, 9 a.m.–5 p.m. This short course will discuss aspects of U-Pb geochronology from sample selection to data acquisition and interpretation. This course is aimed at field geologists and other non-specialists who regularly use geochronology in their research but who wish to understand better the details of methodologies and critical evaluation of geochronologic data. Fee: \$20.

2. **Incorporating GIS in the Earth and Environmental Science Curricula: Software and Teacher Resources (for K–12 Teachers).**

Alex Chaucer, Fulton-Montgomery Community College, Johnstown, New York, achaucer@fmcc.suny.edu, (518) 762-4651, ext. 3486; Renee Frachioni, Averill Park High School, Averill Park, New York, robidr@alum.rpi.edu, (518) 674-7000; Marna Lehnert, Niskayuna High School, Niskayuna, New York, lehnert.m@nisk.k12.ny.us, (518) 382-2511. Sun., March 13, 8:30 a.m.–noon, Skidmore College. Geographic information systems show promise in science education today. The difficulty is in the software learning curve for one to get comfortable with the software. Finding usable data for lessons can also be difficult. Teacher resources are becoming more common, and prepackaged lessons that come with data are becoming more accessible, either in print or via the Internet. Half of this short course will focus on some of these resources, from which teachers can easily find lessons that can be applied to and supplement existing curricula. The second half of this short course will demonstrate how to use GIS in our own science classrooms. In this hands-on course, you will see how your students can use ArcView GIS software to plot earthquakes and relate their depths to plate tectonics, track hurricanes, plot student-collected data on topographic maps, and more. This is intended for earth and environmental science teachers who are interested in updating their current activities with GIS technology. Max.: 30.

3. **Using DLESE in the Classroom (for K–12 Teachers).**

Russanne Low, DLESE Program Center, University Corporation for Atmospheric Research (UCAR), Boulder, Colorado, low@ucar.edu, (303) 497-8354. Sun., March 13, 1:30–5 p.m., Skidmore College. The Digital Library for Earth System Education (DLESE; www.dlese.org) is a free service for finding valuable online resources for teaching and learning about Earth. This short course will show participants how to effectively use DLESE to find innovative and inquiry-based curricular materials tailored to their needs, familiarize users with the variety of resources and services available, and share practices that educators have found effective in improving classroom delivery of geoscience education. Come find out how DLESE can enhance your classroom experience! Max: 30.

## FIELD TRIPS

Premeeting field trips are listed below. All trips will travel via participant vehicles and will depart from and return to the Prime Hotel and Conference Center. All participants should bring their own lunches for full-day trips. All field trip participants should purchase the field trip guidebook, complete with all trips, for \$10. The guidebook is also available to all other conference registrants. For more information, please contact Field Trip Coordinator Don T. Rodbell, rodbell@union.edu, or the individual field trip leaders.

1. **Stratigraphy of the Middle and Upper Ordovician Black River and Trenton Groups in the Mohawk and Black River Valleys.**

Sun., March 13, 9 a.m. (full day). Sean Cornell, Juniata College, cornell@juniata.edu, (513) 556-3732. Although the Upper Ordovician (Mohawkian) Black River and Trenton Limestones have received significant attention lately due to the discovery and development of natural gas reservoirs in southern New York State, these units have been studied for well over a century in their type outcrop belt in the Mohawk to Black River Valleys of central New York State. This field trip will focus on the stratigraphy of the upper Black River to lower Trenton interval in the classic “Mohawkian” region. These stratigraphic units will be considered in both their historical context and in a more recently developed sequence stratigraphic framework. Moreover, as the transition out of the Black River into the lower Trenton marks a significant change in carbonate lithology coincident with the influx of siliciclastic sediments, this field trip will also emphasize the dynamics of initial foreland basin development and the evolution of the passive margin during the onset of the Taconic Orogeny.

2. **Devonian Stratigraphy of Eastern New York State.**

Sun., March 13, 9 a.m. (full day). Alex Bartholomew, University of Cincinnati, alexbartholomew\_geo@hotmail.com, (513) 556-3732; Charles A. Ver Straeten Center for Stratigraphy and Paleontology, New York State Museum, cverstra@mail.nysed.gov; James R. Ebert and Damon Matteson, State University of New York College at Oneonta, EbertJR@oneonta.edu, (607) 436-3065; George H. Shaw, Union College, shawg@union.edu, (518) 388-6770. This excursion will retrace the footsteps of early workers in one of the classic Devonian sections in New York State, the Schoharie Valley. The leaders of this field trip hope to encourage debate amongst current workers in the field at each outcrop, in a traditional “field conference” style. The route of the trip will begin in the Lower Devonian along the Interstate 88 corridor between Schoharie and Cobleskill, and then head south along the Schoharie Valley toward Gilboa, traversing up to near the top of the Middle Devonian.

3. **Geology and History of Howe’s Cavern (especially for K–12 Teachers).**

Sat., March 12, 9 a.m. (full day). George Shaw, Union College, shawg@union.edu, (518) 388-3770; Matt Montario, University at Albany, State University of New York, mjmontario@hotmail.com. This field trip is especially intended for K–12 teachers. Howe Caverns was discovered in the middle of the nineteenth century and has been an important commercialized show



cave since then. Mining of limestone adjacent to the cave led to a change in tourist operations, including the development of a newly drilled entrance and elevator installation. The cave is developed in Devonian limestones, and there are known connections to sinking streams to the north and west. The cave is the downstream end of an extensive cavern system, some unknown fraction of which has not as yet been accessible to exploration. The cave contains both pre-glacial and post-glacial speleothems (or parts thereof), and there are glacial sediments exposed along some of the passages. The cave has a complex geologic history starting with the deposition of the limestones and continuing through the solution of passages, their filling during glacial times, and recent re-excitation by flowing groundwater.

4. **Two Devonian Reefs: Sponges versus Corals.** Sun., March 13, 9 a.m. (full day). Robert Finks, Union College, finksr@union.edu, (518) 943-9746; Michael P. Raffoni, Apex Environmental, Lititz, Pennsylvania. This field trip will visit at least two reefs that were built during a time of faunal change. The earlier (Coeymans) reef fauna was dominated by sponges (stromatoporoids) and possible sponges (tabulates), with few, and mostly solitary, Cnidaria (rugose corals). The later (Onondaga) reef fauna was dominated by large colonial rugose corals, with almost no stromatoporoids and relatively few species of tabulates; it was also richer in species than the earlier reefs. We will look at the distribution of species and growth forms on different parts of the reef (core vs. flank), as well as the ecologic succession as the reef built up. We will discuss the possible reasons (environmental or evolutionary) for the faunal change, discuss how ecological succession may foreshadow faunal succession, consider evidences for paleogeography, discuss controversial theories about sponges, examine evidence for penecontemporaneous subaerial exposure of the reefs, and look at a possible example of intercolony combat.
5. **Structural Geology of Thacher Park, New York.** Sun., March 13, 9 a.m. (half day). Edward Stander, The State University of New York–Cobleskill, standeej@cobleskill.edu, (518) 478-9446; Thomas Engel, New York State Department of Environmental Conservation. Thacher Park is one of the geologic jewels of the Capital Region, and is well known for its scenic beauty and excellent exposures of Helderberg Group limestone, sandstone, and shale. Once described as a complete, structurally unmodified section of the Helderberg Group, recent work has shown that numerous thrusts and splays cross the park, and these locally thicken and repeat some units while removing others entirely. This trip will transect the park and will focus on some of the more spectacular examples of thrusting within its boundaries, some of which are excellent teaching localities.
6. **Saline Springs, Microbial Reefs, and Basalt Pillows: Three Natural Wonders of Saratoga (especially for K–12 teachers).** Sat., March 12, 9 a.m. (full day). Richard H. Lindemann and Kimberly A. Marsella, Skidmore College, kmarsell@skidmore.edu, (518) 580-5195. Within the Saratoga vicinity exists a wealth of field sites applicable to

teaching students of all ages about geologic phenomena, the processes of scientific inquiry, and the influences of bedrock geology on human history. We will visit three outstanding examples: the Saratoga springs, the Upper Cambrian cyanobacterial reefs of Lester Park, and the Late Ordovician submarine lava flow now known as Stark's Knob. The Saratoga springs, and by extension the city of Saratoga Springs itself, owe their existence to a unique concurrence of Paleozoic sedimentary formations, extensional tectonics, and yet undetermined hydrogeologic activities. Interpretation of the depositional environments of Lester Park's reefs and oolitic limestones stand out as a type example of actualistic methodology. Equally so, the history of investigation into the biologic affinities of the reef builder *Cryptozoon proliferum* is paramount in the discovery and study of Precambrian stromatolite fossils. Finally, the pillow basalts of Stark's Knob provide for readily accessible observations of the products of plate tectonic activity and mountain building, in addition to serving a pivotal role in the American victory at the Battle of Saratoga, the turning point of the American Revolution.

7. **Stromatolites of the Petrified Sea Gardens.** Sun., March 13, 9 a.m. (half day). Gerald M. Friedman, Northeastern Science Foundation/Rensselaer Center of Applied Geology, gmfriedman@juno.com, (518) 273-3247. Saratoga Springs, New York, is the site of one of the finest examples of domed stromatolites to be seen anywhere in ancient rocks and is significant in the history of geology as the area where stromatolites were first described and interpreted. These cabbage-head structures, which are part of the Hoyt Limestone of Late Cambrian (late Franconian to early Trempealeuan) age, were described by James Hall as early as 1847. Glaciated surfaces expose horizontal sections of the cabbage-shaped heads composed of vertically stacked, hemispherical stromatolites. The microbial heads are discrete domal structures built of hemispheroidal and bulbostromatolites expanding upward from a base. The heads, many of them compound, are circular in horizontal section, and range in diameter from a few centimeters to a meter. Between the heads are ooids, skeletal fragments of trilobites, brachiopods, pelecypods, and quartz-sand particles. The earliest reference to stromatolites in this area was that of Steele (1825) whose description included the first reported oolitic limestone in North America among which the stromatolites occur. The depositional environment was that of a peritidal setting involving oolite shoals, lagoons, and intertidal flats.
8. **Caves and Karst (especially for K–12 teachers).** Sat., March 12, 9 a.m. (full day). Mike Narducci, Christian Brothers Academy, Albany, New York, nardaccm@cbaalbany.org, (518) 452-9809, ext. 142. This trip is designed for earth science teachers. Participants will visit the impressive McFails Cave karst preserve near Cobleskill and a couple of associated sites to study the landforms of karst areas. A trip through historic Howe Caverns will be followed by a visit to the new Cave House, now under development as a museum of mining, geology, and caves.

9. **Behind-the-Scenes at the New York State Museum (especially for K–12 teachers).** Sun., March 13, 1 p.m. (half day). Ed Landing, Center for Stratigraphy and Paleontology, New York State Museum, Albany, elanding@mail.nysed.gov, (518) 474-5810. Participants will explore the geology and paleontology collections of the New York State Museum, learn about their conservation and use, and find out about the geological research that has been happening at the museum since the 1840s.

## SPECIAL EVENTS

**GSA Northeastern Section Management Board Meeting.** Sun., March 13, 4–6 p.m.

**Opening Reception.** Sun., March 13, 6–8:30 p.m. Prime Hotel Saratoga Ballroom. The welcoming reception and nearby open exhibits will help start off the meeting. Snacks and cash bar. Come and visit with friends and colleagues. Registration desk will be open until 8 p.m.

**Association of Women Geoscientists Career**

**Development Workshop Breakfast.** Tues., March 15, 6:30–8 a.m. Professionals, \$25; students, \$12.

**Society for Sedimentary Geology (SEPM) Northeast Section Business Meeting.** Mon., March 14, 5–6:30 p.m. The National Society for Sedimentary Geology (SEPM) President Elect William A. Morgan, stratigrapher for ConocoPhillips in Houston, will attend our business meeting and give the keynote address. \$20.

**Public Forum “Dredging PCBs from the Hudson River: Progress and Prospects.”** Mon., March 14, 7–9 p.m. This special public forum will feature speakers Richard Bopp, Department of Earth and Environmental Science at Rensselaer Polytechnic Institute; John G. Haggard, engineering project manager at General Electric; and David H. King, director of the Albany Environmental Protection Agency (EPA) Field Office. The forum will be moderated by Jean Neubeck of Alpha Geoscience. This free public forum will be held in the Ballroom of the Prime Hotel and Conference Center.

**Northeastern Section of GSA Map Blast VII.** Mon., March 14, 7–9:30 p.m. Informal session for display of newly published, unpublished, or in-progress geologic maps of any sort. All attendees are welcome to bring, post, and discuss ancient, recent, or planned mapping efforts. Prime Hotel Gallery, cash bar.

**Conference Banquet.** Tues., March 15, 7–9 p.m., Prime Hotel Saratoga Ballroom. All attendees invited! Cash bar to open at 6 p.m. in the Ballroom Foyer. \$31.

**Paleontological Society Luncheon and Business Meeting.** Wed., March 16, noon–1:30 p.m. \$18.

## STUDENT MENTOR PROGRAMS

**Roy J. Shlemon Mentor Program in Applied Geoscience.** *Sponsored by GSA Foundation.* Mon., March 14, and Tues., March 15, noon–1:30 p.m. Please check the program book for location. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real life issues including professional opportunities and challenges that await students after graduation. Plan to attend both free luncheons to hear different presenters each day. Students will receive **FREE LUNCH** tickets in their

registration packet to attend both Shlemon Programs. However, space is limited: first come, first served. For more information, contact Karlon Blythe, kblythe@geosociety.org.

**The John Mann Mentors in Applied Hydrogeology Program.** *Sponsored by GSA Foundation.* Mon., March 14, 5–6:30 p.m. Please check the program book for location. This event, which takes place right after the technical sessions end, presents mentoring opportunities for undergraduate and graduate students and recent graduates with declared interest in hydrogeology as a career to interact and network with practicing hydrogeology professionals. This program is a focused, small-scale event that features a **FREE light supper** for participants. Participant eligibility is limited to those students who have declared their career interest to be hydrology or hydrogeology on their GSA membership applications and who have registered online for this meeting. An e-mail invitation will be sent to those qualified students. Keep in mind that only a quick response to the invitation will secure you a seat, as attendance at this Mann Mentors event is limited! For more information, contact Karlon Blythe, kblythe@geosociety.org.

## GUEST ACTIVITIES

The Saratoga Springs area is lively in the areas of history, art, and culture. There are guided tours, museums, parks, mineral water spas, music, unique shops, and many other things to do. Information available at registration will explain activities in more detail, but in the meantime visit [www.saratoga.org](http://www.saratoga.org) or [www.discoversaratoga.org](http://www.discoversaratoga.org) to get an idea of the wide range of activities that are available.

## EXHIBITS

**Reservation deadline: February 7, 2005**

Exhibits will be located in the Prime Hotel and Conference Center Pavilion. This space is centrally located with considerable exposure to meeting crowds. Exhibit rates are \$100 for nonprofit organizations and \$200 for others. Booth space will include 10' × 10' space with draped framing, one table, and electrical access. To reserve booth space and to make other arrangements, contact Exhibits Coordinator George Shaw, [shawg@union.edu](mailto:shawg@union.edu).

## SPONSORSHIP

The organizing committee is actively seeking sponsorship for this conference from government and corporate agencies. Sponsors will be recognized during the meeting and acknowledged in the printed program and on meeting Web sites. Those interested in sponsoring an event, AV equipment, coffee breaks, or making a donation to the general fund of the conference should please contact General Meeting Chair Kurt Hollocher, [hollochk@union.edu](mailto:hollochk@union.edu).

## STUDENT TRAVEL GRANTS

**Application deadline: January 28, 2005**

Travel grants are available from the Northeastern Section of GSA in cooperation with the GSA Foundation. Grants are available to both undergraduate and graduate students who are currently registered GSA members and who are presenting oral or poster papers at this meeting. To apply, contact Stephen Pollock, [pollock@usm.maine.edu](mailto:pollock@usm.maine.edu), Secretary-Treasurer, GSA Northeastern Section.

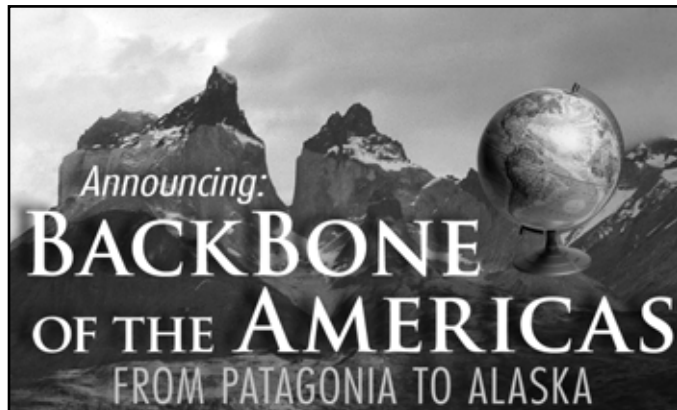
## ACCESSIBILITY

GSA is committed to ensuring full participation for conference attendees with disabilities at all events at the 2005 meeting. Every attempt is made for full compliance with the Americans with Disability Act. You may indicate special requirements on your registration form, and you should inform the local organizing committee of these requirements at least one month prior to the meeting. Specially accessible rooms

are available at the Prime Hotel and can be requested when making your reservation.

## DETAILED INFORMATION

Detailed information is available at the GSA Web site, [www.geosociety.org/sectdiv/northe/05nemtg.htm](http://www.geosociety.org/sectdiv/northe/05nemtg.htm), at the Union College meeting Web site, [www.union.edu/PUBLIC/GEODEPT/hollocher/negsa2005/](http://www.union.edu/PUBLIC/GEODEPT/hollocher/negsa2005/), or by contacting General Meeting Chair Kurt Hollocher, [hollochk@union.edu](mailto:hollochk@union.edu).



3–7 April 2006 • Mendoza, Argentina

*Backbone of the Americas: From Patagonia to Alaska* is a GSA special meeting cosponsored with the Asociación Geológica Argentina. The principal themes are ridge collision, shallow subduction, and plateau uplift along the Americas. Field trips are planned to Patagonia before and the Chilean flat-slab or Central Andean Puna plateau after the meeting. Suzanne Kay and Victor Ramos are serving as meeting co-chairs.

Co-convended by:



See [www.geosociety.org/meetings/06boa/index.htm](http://www.geosociety.org/meetings/06boa/index.htm) for details and to sign up for e-news.

## Call for Field Trip Proposals



*Earth Systems Processes 2* will be an interdisciplinary, integrative, and scientific meeting which will explore the interactions among Earth's lithosphere, atmosphere, hydrosphere, cryosphere, and biota. Featured themes are Ancient Earth Systems, Modern Earth System Processes, and Earth System Futures. We are seeking proposals for premeeting or postmeeting field trips, particularly those involving topics related to the earth systems theme.

Please send proposals or questions to Deborah Nelson at [dnelson@geosociety.org](mailto:dnelson@geosociety.org).



For more information about the conference, or to sign up for e-news, visit [www.geosociety.org/meetings/esp2/](http://www.geosociety.org/meetings/esp2/).





## Final Announcement and Call for Papers

# SOUTHEASTERN

54th Annual Meeting  
Southeastern Section, GSA  
Biloxi, Mississippi

March 17–18, 2005

<http://www.geosociety.org/sectdiv/southe/05semtg.htm>

The 2005 meeting of the Southeastern Section of the Geological Society of America will be held in Biloxi on the Mississippi Gulf Coast, a location with a perhaps unexpected concentration of earth science activity. Stennis Space Center, the National Aeronautics and Space Administration's (NASA) primary location for rocket propulsion testing and the largest naval oceanographic research center in the world, is home to more than 30 resident agencies and numerous technology-based organizations.

The hosts for the 2005 meeting of the Southeastern Section of the Geological Society of America are the University of Southern Mississippi and the National Oceanic and Atmospheric Administration (NOAA) National Coastal Data Development Center, in collaboration with other federal agencies at Stennis Space Center.

Biloxi is situated on a Sangamon beach-dune ridge complex that extends from Bay St. Louis to Belle Fontaine Point east of Ocean Springs. The complex makes up the Gulfport Formation, and consists mostly of clean quartz sand that was deposited during a transgression over older Pleistocene sediments. Subsequent lowering of sea level segmented the complex by stream incision at what are now St. Louis Bay and Biloxi Bay, and the most recent rise of sea level led to flooding of areas on the mainland side of the complex.

### REGISTRATION

**Standard registration deadline: February 14, 2005**

**Cancellation deadline: February 21, 2005**

GSA Headquarters will handle registration. Please register online or download the registration form PDF at [www.geosociety.org/sectdiv/southe/05semtg.htm](http://www.geosociety.org/sectdiv/southe/05semtg.htm). If you are unable to register by these methods, please contact GSA Sales and Service at (888) 443-4472, (303) 357-1000 option 3, or [gsaservice@geosociety.org](mailto:gsaservice@geosociety.org).

### Registration Fees

	Standard	On-site	One day
Professional Member	\$120	\$150	\$80
Professional Nonmember	\$140	\$170	\$85
Student Member	\$40	\$55	\$30
Student Nonmember	\$50	\$65	\$35
K–14 Professional	\$25	\$25	\$15
Guest or Spouse	\$25	\$25	\$15

Register early to qualify for lower registration fees. Costs will increase after February 14, 2005. Full payment MUST accompany the registration form. Members of GSA and the GSA Associated Societies listed on the registration form receive registration discounts. Registration is required for those attending technical sessions, field trips, short courses, workshops, and the exhibit hall. Guest registration is intended for non-geologist spouses or friends, and does not include attendance at technical sessions. Students, K–12 teachers, and community college instructors must send a copy of or show a current ID at check-in to obtain special rates.

Registration forms must be received at GSA no later than February 14, 2005. Register only one professional or student per form and retain a copy for your records. For the standard registration attendees, GSA will be distributing your badges on-site at the registration desk. Your badges will NOT be mailed to you prior to the meeting. For detailed registration information, visit the Web site, [www.geosociety.org/sectdiv/southe/05semtg.htm](http://www.geosociety.org/sectdiv/southe/05semtg.htm).

### CANCELLATIONS, CHANGES, AND REFUNDS

All requests for additions, changes, and cancellations must be made in writing and received by February 21, 2005. There will be no refunds for cancellations received after this date, and no refunds for on-site registration, *Abstracts with Programs*, and on-site ticket sales.

### On-site Registration and Standard Registration Badge Pickup Schedule

#### Bayview Hotel, Grand Casino Resort, Ballroom Prefunction Area

Wednesday, March 16	4–8 p.m.
Thursday, March 17	7 a.m.–5 p.m.
Friday, March 18	7 a.m.–noon

### LOCATION

Biloxi is located south of Interstate 10 on the eastern Mississippi Gulf Coast, ~60 miles west of Mobile and 90 miles east of New Orleans. The Gulfport-Biloxi International Airport is served by AirTran, ASA Delta, Continental, Northwest, and Southeast Airlines. The Casino Airport Shuttle (228-396-3636) provides 24-hour roundtrip transportation to the Grand Casino Resort for \$17. Rental cars are also available.

Driving Directions: From Interstate 10, exit south on Interstate 110 and drive 3.6 miles, then merge onto U.S. Highway 90 via exit number 1A toward Ocean Springs. Go 2.4 miles east on U.S. Highway 90 (Beach Boulevard). The Grand Casino Resort is at 265 Beach Boulevard, and the Bayview Hotel, the convention site, is on the north side of the highway.

### ROOM REGISTRATION

**Hotel registration deadline: February 13, 2005**

A block of rooms in the Bayview Hotel at the Grand Casino Resort has been reserved at \$115 per night for two people, with a \$10 per night charge for each additional person. The

reservation number is (800) 354-2450. **It is important to identify yourself as a Geological Society of America attendee to receive the discounted rate.** There is no extra charge for self-parking. Valet parking is also available. The Grand Casino Resort includes nine restaurants, a variety of entertainment, water sports, golf, and child care facilities.

### Accommodations for Registrants with Special Needs

The Southeastern Section of the Geological Society of America is committed to making every event at the 2005 meeting accessible to all people interested in attending. If you have special requirements, please check the appropriate box on the meeting registration form. If you need more information, please contact Gail Russell, Gail.Russell@usm.edu. Requests for special accommodations should be received by February 14, 2005.

## TECHNICAL SESSIONS

### Abstracts deadline: December 14, 2004

Papers are invited from students and professionals for presentation in oral or poster general sessions and for presentations that may fit into the symposia and theme sessions listed below. Symposia and theme sessions are oral presentations unless otherwise specified. Additional general discipline sessions will be scheduled on the basis of submitted abstracts. Abstracts must be submitted online at [www.geosociety.org/sectdiv/southe/05semtg.htm](http://www.geosociety.org/sectdiv/southe/05semtg.htm).

### Oral Sessions

One laptop computer, one LCD computer projector, and one screen per session room will be provided for oral sessions. All speakers must bring their digital presentations as PowerPoint files on a CD, floppy disk, or a USB memory stick. Presentations must be turned in to AV technicians by 9 p.m. the evening before the scheduled talk time. Speakers will not be allowed to use their own laptop computer for their presentations. Speakers requiring the use of a 35 mm slide or overhead projector or who have special requests must contact Gail Russell, Gail.Russell@usm.edu, at least one month prior to the meeting.

### Poster Sessions

Poster sessions will allow at least three hours of display time. Presenters must be present for two hours of that time. Posters must fit on a single 8' × 4' display board.

### Symposia

1. **Exceptional Biotas and Fossil Preservation in the Southeast.** *Sponsored by the Southeastern Section, Paleontological Society.* Michael A. Gibson, The University of Tennessee at Martin, (731) 881-7435, [mgibson@utm.edu](mailto:mgibson@utm.edu); David Schwimmer, Columbus State University, (706) 568-3028, [schwimmer\\_david@colstate.edu](mailto:schwimmer_david@colstate.edu).

Oral papers on fossil occurrences, principally in the southeastern United States, that exhibit exceptional fossil preservation or biotic composition (or both) are invited. The intent of this session is to highlight biotas (animal and plant) with atypical characteristics of preservation, paleobiological context, or that require innovative methods of investigation. Presentations that span a wide range

of fossil taxa and ages are desired. Preference will be given to southeastern United States occurrences, but exceptional biotas and techniques from other areas, with some application to the southeast, will be considered.

2. **The Use of Geospatial Data in Developing Public Policy.** *Sponsored by the Southeastern Section, GSA Geology and Public Policy Committee.* John Kiefer, Kentucky Geological Survey, (859) 257-5500, [kiefer@kgs.mm.uky.edu](mailto:kiefer@kgs.mm.uky.edu).

### Theme Sessions

1. **Coastal Processes: Naturally and Artificially Impacted.** Ping Wang, University of South Florida, (813) 974-9170, [pwang@cas.usf.edu](mailto:pwang@cas.usf.edu); James Flocks, U.S. Geological Survey Center for Coastal and Watershed Studies, (727) 803-8747, [jflocks@usgs.gov](mailto:jflocks@usgs.gov). This session welcomes research on nearshore sediment transport, coastal morphodynamics, coastal hydrodynamics, and shore protection measures.
2. **Coastal System Databases.** Russell Beard, NOAA National Coastal Data Development Center, (228) 688-3026, [Russ.Beard@noaa.gov](mailto:Russ.Beard@noaa.gov); Chris Jenkins, University of Colorado, (303) 735-5250, [chris.jenkins@colorado.edu](mailto:chris.jenkins@colorado.edu). Coastal system databases support the ecosystem-based management being adopted by government, academic, and private institutions. They are also allowing a range of research and operational projects to properly address wider spatial and time scales of environmental change given sea-level rise and other variables; for example, the proposed statewide beach-nourishment projects. Ecosystem-based management reflects the relationship between physical, biological, chemical, and geological processes along with the socioeconomic and cultural (i.e., human) activities and the effect these processes have on U.S. watershed, coastal, and ocean resources. Effective management of the coasts and their watersheds will require coastal databases that provide ease of discovery, access, display, and delivery for relevant information sets. Providing Federal Geospatial Data Committee (FGDC) metadata documentation and cataloging aids in the discovery process. Inventing new forms of integration for disparate datasets and more effective forms of information visualization are important activities in technical advancement. The databases can greatly assist modelers, with initial conditions and validations. Geospatially enabling data via mapping services with public internet display greatly improves the quality of communication between all those concerned with coastal systems.
3. **Digital Geologic Maps (Posters).** Michael W. Higgins, The Geologic Mapping Institute, (770) 641-1268, [mhiggins@mindspring.com](mailto:mhiggins@mindspring.com); Ralph F. Crawford, The Geologic Mapping Institute, [Crawford@sprintmail.com](mailto:Crawford@sprintmail.com). Geologic maps are the basic foundation upon which almost all geologic research must be built. Digitization of geologic maps is beginning to make them more available and more useful to researchers in many fields and to the public. This poster session will feature maps from many different geologic provinces in the Southern

- Appalachians and the Coastal Plain.
4. **Exotic Terranes in the Southern Appalachians: Evidence from Igneous, Sedimentary, and Metamorphic Rocks.** Paul A. Mueller, University of Florida, (352) 392-2231, mueller@geology.ufl.edu; William A. Thomas, University of Kentucky and the Alabama Geological Survey, (205) 349-2852, geowat@uky.edu; Allen J. Dennis, University of South Carolina at Aiken, (803) 641-3396, dennis@sc.edu. The internides of the Appalachian orogen include several distinct terranes that have been interpreted to be exotic; these terranes were accreted at various times and with various tectonic consequences. Identifying the terranes as exotic, as well as determining the time of accretion, commonly rests on the ages of igneous rocks, the paleobiogeography and provenance of sedimentary rocks, the times and styles of metamorphic and structural events, and/or responses in the foreland. This theme session seeks to integrate a variety of approaches to understanding the accretion history (including the provenance) of Southern Appalachian accreted terranes.
  5. **K–16 Earth Science Education: Teaching Geology in a Shifting Socioenvironmental Environment.** *Sponsored by the Southeastern Section, National Association of Geoscience Teachers.* Douglas W. Haywick, University of South Alabama, (251) 460-7569, dhaywick@jaguar1.usouthal.edu.
  6. **Past and Present Episodic Events in the Gulf of Mexico.** Charlotte Brunner, University of Southern Mississippi, (228) 688-3402, Charlotte.Brunner@usm.edu; Paul R. Aharon, University of Alabama, (205) 348-5095, aharon@wgs.geo.ua.edu. Recurring episodic events leave distinctive imprints in the geologic record that reveal the underlying processes at work. Such events in the Gulf of Mexico encompass hypoxia, superfloods, megastorms, turbidity flows, slumping, gas hydrate formation, and sublimation events. Papers are invited that address such events and their preservation in the records preserved in the Gulf of Mexico sediments on time scales ranging from seasonal to decadal to millennial.
  7. **Processes Affecting Shoreline Erosion, Wetland Loss, and Coastal Evolution in the Southeastern United States.** Shea Penland, University of New Orleans, (504) 280-3119, spenland@uno.edu; Mark Kulp, University of New Orleans, (504) 280-6325, mkulp@uno.edu. Papers are invited concerning the broad areas of land loss, coastal plain responses to changes in sediment supply, sea-level rise, subsidence, and the stratigraphic patterns and processes of subsidence.
  8. **Tropical Cyclone Impacts on Coastal Zones.** Gregory W. Stone, Louisiana State University, (225) 578-2395, gagreg@lsu.edu. This session will be devoted to studies concerning meteorological influences on coasts and the impacts of cyclogenesis and storms on coastal morpho-sedimentary dynamics, land loss, and wave and surge processes.
  9. **Sea Level Changes and Coastal Evolution: Holocene and Modern.** Mike Blum, Louisiana State University, (225) 578-5735, mike@geol.lsu.edu. This session will center on topics concerning the responses of fluvial, bay and barrier island systems to Holocene climate and sea-level change.
  10. **Undergraduate Research Poster Session.** *Sponsored by the Council for Undergraduate Research, Geosciences Division.* Brannon Anderson, Furman University, (864) 294-9889, brannon.anderson@furman.edu; Jeffrey G. Ryan, National Science Foundation, (703) 292-5323, jryan@nsf.gov. The Council for Undergraduate Research is sponsoring a poster session highlighting research performed by undergraduates in all areas of the earth sciences. The first authors must be undergraduate students, and students must be responsible for the bulk of the research, preparation of posters, and presentation of results.
  11. **Undercover Connections: Linkages between Stratigraphy and Groundwater Resources.** Daniel Larsen, University of Memphis, (901) 678-4358, dlarsen@memphis.edu. With increasing population and economic growth, even the relatively wet southeastern United States is experiencing limitations in potable water resources. Limitations in groundwater resources are locally due to limited resource quantity, contamination, or both. Stratigraphic relationships in sedimentary aquifer systems are essential to understanding recharge processes, aquifer connections, and contamination pathways. This session seeks presentations that highlight the many ways in which stratigraphic relationships control groundwater recharge, flow paths, and contamination. An emphasis is placed on coastal plain stratigraphy, but karst and fractured sedimentary rock aquifer systems will also be considered.
  12. **Water/Rock Interactions in Carbonate Rock Systems: Karst, Paleokarst, and Other Implications.** Chris Groves, Western Kentucky University, (270) 745-4555, chris.groves@wku.edu; John Mylroie, Mississippi State University, (662) 325-8774, mylroie@geosci.msstate.edu. A fundamental feature of carbonate rocks is that they are relatively soluble in natural carbonic acid solutions. Features resulting from these water-rock interactions (both dissolution and precipitation) have profound implications in the geomorphology, hydrogeology, and mineralogy of modern landscapes and aquifers, as well as deeper porosity development by ancient dissolution that influences the behaviors and movement of both water and petroleum. This symposium solicits papers (oral and poster) on the development and use of field, laboratory, and analytical methods in the study of carbonate rock–fluid interactions, as well as studies highlighting geologically significant features and processes that result from, or are influenced by, these interactions.

#### FIELD TRIPS

All field trips are listed below. Unless otherwise stated, all trips will depart from and return to the Bayview Hotel at the Grand Casino Resort. Additional trip details are posted on the meeting Web site. For more information, please contact the field trip leader.



## Premeeting

1. **Geological Influence of the Mississippi River Alluvial Valley and the Interior Plains and Loess Hills of Mississippi on the Vicksburg Civil War Campaign and Siege of Vicksburg.** 7 a.m., Tues., March 15, to 6 p.m., Wed., March 16. Danny W. Harrelson, U.S. Army Engineer Research and Development Center (ERDC), (601) 634-3215, danny.w.harrelson@erd.usace.army.mil; Robert J. Larson, ERDC; William M. Myers, ERDC; David M. Patrick, University of Southern Mississippi. Cost: \$120, includes guidebook, transportation, lunches, and breaks. Lodging in Vicksburg Tuesday night is NOT included. Min.: 8; max.: 20. The trip will explain the influence of alluvial valley morphology, interior plains geology, and loess hills topography on troop maneuvers and battles, including the famous siege of Vicksburg. Attendees will understand the Vicksburg Campaign of the American Civil War, commanders' decisions, and the significance of geological parameters on selecting routes of advance, supply train logistics, and construction of defense fortifications. Discussions on the battlegrounds of the Vicksburg National Military Park, alluvial valley overlooks, and on the Civil War gunboat *Cairo* will give trip attendees an understanding and appreciation of the geological influences on the Federal campaign to capture and Confederate efforts to defend the "Gibraltar of the Mississippi."

## During the Meeting

2. **On the Beach—Geology and Ecology of a Barrier Island System.** *Sponsored by the Southeastern Section, National Association of Geoscience Teachers.* Thurs., March 17, afternoon. Douglas W. Haywick, University of South Alabama, (251) 460-7569, dhaywick@jaguar1.usouthal.edu. K-14 teachers, students, professionals, and guests are invited to participate in this informal field trip to a barrier island, followed by a crawfish boil. The trip will depart mid-afternoon and return after dinner. Please check the Web site for details and cost.

## Postmeeting

3. **Eocene-Oligocene Marine Units of Mississippi's Gulf Coastal Plain.** *Sponsored by the Southeastern Section, Paleontological Society.* Sat., March 19, 7 a.m.–6 p.m. David T. Dockery III, Mississippi Office of Geology, (601) 961-5544, David\_Dockery@deq.state.ms.us. Cost: \$70, includes guidebook, transportation, and lunch. Min.: 8, max.: 20. Mississippi's Gulf Coastal Plain contains North America's best-preserved and most diverse middle-late Eocene and early Oligocene marine faunas. A day field trip to some classic localities will begin in Biloxi and will include the late Oligocene Paynes Hammock and Chickasawhay formations south of Waynesboro, Mississippi; the Glendon and Marianna limestones north of Waynesboro; the Eocene-Oligocene boundary at the Yazoo Clay–Red Bluff Formation contact at Hiwannee, Mississippi; and the middle Eocene Kosciusko–Cook Mountain contact at Quitman, Mississippi, before returning to Biloxi. Alternate stops may be selected if river

stages are too high. With the exception of the Glendon and Marianna outcrops, the localities visited will contain marine faunas with both calcitic and aragonitic shells preserved. The Hiwannee locality for the Eocene-Oligocene boundary has been the subject of many scientific papers, including papers in the volume *From Greenhouse to Icehouse: The Marine Eocene-Oligocene Transition* by Columbia University Press (2003).

4. **Fluctuating Sea Levels, Marine Highstands and Lowstands, Ice Age Droughts, and Coastal Barrier Evolution: A Quick Look at Pliocene and Quaternary Formations and Landforms along the Mississippi-Alabama Shore.** Sat., March 19, 7 a.m.–6 p.m. Ervin Otvos, University of Southern Mississippi, (228) 872-4235, Ervin.Otvos@usm.edu. Cost: \$70, includes guidebook, transportation, and lunch. Min.: 8; max.: 20. This one-day field trip starts at one of the longest artificially maintained beaches, the Harrison County sand beach along the central Mississippi coast. Traversing the Sangamon Interglacial strand plain (Gulfport Formation) and its alluvial correlative (Prairie Formation), we cross the Back Bay of Biloxi, a drowned Wisconsin river valley, to reach an older Pleistocene alluvial terrace unit on the inland side of the Big Ridge fault-line scarp. We return to a highly eroded shore sector east of Ocean Springs to observe numerically dated Gulfport dunes with humus-rich sandstone outcrops and inter/subtidal ghost shrimp fossils, indicative of late Pleistocene raised sea level. Crossing the wide Pascagoula Estuary, we reach the southern spur of the extensive late Pliocene Citronelle Formation, often of orange-red coloration. Its summit is dotted by relict wind-excavated oval to round depressions. After observing alluvial facies of the Citronelle in a sand pit, we travel to historic Dauphin Island, the longest island and eastern "anchor" of the middle to late Holocene Alabama-Louisiana barrier chain. We will observe recent shore erosion and overwash that resulted from Hurricane Ivan ("the Terrible") on September 14–15, 2004. After passing through Mobile, we cross Pensacola Bay and observe dated Wisconsin glacial age dune deposits at Gulf Breeze. Our final stop is Pensacola Beach on narrow, storm-ravaged Santa Rosa Island.
5. **Terranes in Alabama.** 7:30 a.m., Sat., March 19, to 3 p.m., Sun., March 20. Mark Steltenpohl, Auburn University, (334) 844-4893, steltmg@mail.auburn.edu; Wes Sterling, Auburn University; Tom Hanley, Columbus State University; Paul Mueller, University of Florida. Cost: \$150, includes guidebook, transportation (from Auburn), lodging, and lunches. The trip will originate and terminate in Auburn, Alabama. Min.: 8, max.: 20. On this two-day field excursion, we will explore rocks and structures in terranes comprising the Alabama and west Georgia Piedmont. Exciting new developments along our west to east transect include (1) ideas on what to do with the Hillabee Greenstone terrane; (2) new findings on lithologies and contact relations of the Jacksons Gap Group, a package of poorly known siliciclastics defining the Brevard zone in Alabama; and (3) implications of new U-Pb zircon data from the Pine Mountain and Uchee

terrane that help differentiate Laurentian from Gondwanan (i.e., Pan-African and/or Trans-Brasiliano) elements and document the importance of middle to upper amphibolite facies Alleghanian tectonometamorphic development. Outcrops have been selected to illustrate terrane lithologies and boundaries in the context of new whole rock geochemical and isotopic ( $^{40}\text{Ar}/^{39}\text{Ar}$  and U-Pb zircon) data.

## SHORT COURSE

**Introduction to Geospatial Metadata.** *Sponsored by the National Oceanic and Atmospheric Administration (NOAA) National Coastal Data Development Center (NCDDC).* Wed., March 16, 9 a.m.–5 p.m., Gulf Coast Research Lab, Ocean Springs. Julie Bosch, NCDDC, (228) 688-3841, julie.bosch@noaa.gov. This course presents the concepts, principles, and value of metadata. The content and structure of the Federal Geographic Data Committee content standard for digital spatial metadata are provided in detail along with methods for writing quality metadata. Students receive hands-on metadata record creation and validation training with a variety of available software tools including the NCDDC's Metadata Enterprise Resource Management Aid (MERMAid) system. Cost: \$25, includes transportation, lunch, and breaks. Instruction and class materials are provided by the NCDDC. Attendance max.: 20.

## SPECIAL EVENTS

**Geology Day at Grand Bear Golf Course.** Wed., March 16. Join your golfing friends for an informal golf tournament at Grand Casino's Grand Bear Golf Course, an 18-hole, Jack Nicklaus Signature course. Transportation from the hotel to the golf course will be provided. Greens fees are \$92 plus tax and will be billed directly to your hotel room at the Grand Casino Resort. Restricted to guests at the Grand Casino Resort or residents of counties in south Mississippi. For additional information, contact Gail.Russell@usm.edu. Preregistration requested.

**Stennis City and Opening Reception.** Wed., March 16, 6–9 p.m., Bayview Grand Ballroom. Special exhibits by federal agencies at Stennis Space Center and elsewhere will highlight the variety and scope of earth science activity in southern Mississippi, in addition to the opening of the regular exhibits.

**Ocean Springs Art Tour.** Thurs., March 17, 10 a.m.–2 p.m. This guest activity will feature a tour of the Walter Anderson Museum of Art in nearby Ocean Springs, with time for lunch and shopping at the many galleries and antique shops in this historic town. Cost: \$10, includes transportation and museum fee. Lunch not included.

**On the Beach—Geology and Ecology of a Barrier Island System.** *Sponsored by the Southeastern Section, National Association of Geoscience Teachers.* Thurs., March 17, afternoon. Douglas W. Haywick, University of South Alabama, (251) 460-7569, dhaywick@jaguar1.usouthal.edu. See description for Field Trip no. 2.

## STUDENT MENTOR PROGRAMS

**Roy J. Shlemon Mentor Program in Applied Geoscience.** *Sponsored by GSA Foundation.* Thurs., March 17, and Fri.,

March 18, 11:30 a.m.–1 p.m. Please check the program book for location. Karlon Blythe, kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real life issues including professional opportunities and challenges that await students after graduation. Plan to attend both free luncheons to hear different presenters each day. Students will receive **FREE LUNCH** tickets in their registration packet to attend both Shlemon programs. However, space is limited: first come, first served.

**The John Mann Mentors in Applied Hydrogeology Program.** *Sponsored by GSA Foundation.* Thurs., March 17, 5–6:30 p.m. Please check the program book for location. Karlon Blythe, kblythe@geosociety.org. This event, which takes place right after the technical sessions end, presents mentoring opportunities for undergraduate and graduate students and recent graduates with declared interest in applied hydrogeology as a career to interact and network with practicing hydrogeology professionals. This program is a focused, small-scale event that features a **FREE light supper** for participants. Participant eligibility is limited to those students who have declared their career interest to be hydrology or hydrogeology on their GSA membership applications and who have registered online for this meeting. An e-mail invitation will be sent to those qualified students. Keep in mind that only a quick response to the invitation will secure you a seat, as attendance at this Mann Mentors event is limited!

## EXHIBITOR INFORMATION

Exhibit space will be available in a centrally located exhibit hall, shared with poster sessions. For more information on exhibit rates and space reservations, contact Lin Pope, Lin.Pope@usm.edu.

## SUPPORT FOR STUDENTS

Travel grants are available from the Southeastern Section in cooperation with the GSA Foundation to both undergraduate and graduate students who are presenting papers or poster sessions and are student members of GSA. Information and applications are available at <http://core.ecu.edu/geology/neal/segsta/travel.html>. Student members of the Southeastern Section may contact Secretary-Treasurer, GSA Southeastern Section, Donald Neal, neald@mail.ecu.edu, with specific questions.

We are seeking students to assist at the meeting. Student assistants will have their registration fees reimbursed. For more information, contact Gail Russell, Gail.Russell@usm.edu.

## DETAILED INFORMATION

For further information, please contact Meeting Chair Gail Russell, at Gail.Russell@usm.edu. Additional meeting information is available at [www.geosociety.org/sectdiv/southe/05semtg.htm](http://www.geosociety.org/sectdiv/southe/05semtg.htm).

## JOINT MEETING

**39th Annual Meeting of the South-Central Section, GSA; Annual Spring Meeting of the Pander Society; and Annual Spring Meeting of the Texas Section, Association of Engineering Geologists  
Trinity University, San Antonio, Texas**

**April 1–2, 2005**

<http://www.geosociety.org/sectdiv/southc/05scmtg.htm>

Trinity University is a private, predominantly undergraduate institution that offers degrees in more than 25 departments and programs. In 2003, the institution was ranked number one among comprehensive universities in the West by *U.S. News and World Report* for the twelfth consecutive year.

San Antonio, now the eighth largest city in the United States, has retained its sense of history and tradition while combining a multicultural heritage with cosmopolitan progress. The city is positioned within and south of the Balcones Fault Zone, which separates the Edwards Plateau (Texas “hill country”) and Gulf Coastal Plain.

### TRAVEL AND TRANSPORTATION

Most major airlines serve the San Antonio International Airport. Trinity is centrally located, ~6 miles south of the airport and 3 miles north of the renowned downtown Riverwalk area. Many rental car agencies are located on or near the airport property. Driving time from Houston (197 mi) is about 3.3 hours; from Austin (79 mi), 1.3 hours; from Dallas (275 mi), 4.5 hours.

Parking will be available in the Alamo Stadium parking lot, conveniently located across the street from buildings where sessions will be held. *Note:* Shuttle service will NOT be provided between local hotels and the university campus.

### ACCOMMODATIONS

Tourism is a major industry in San Antonio, and late March/early April is a very popular time for tourists. Meeting participants are responsible for making their own housing arrangements and are strongly encouraged to book their rooms as early as possible.

A block of rooms has been reserved at the Doubletree Inn (37 N.E. Loop 410). Rooms (singles or doubles) will cost \$89 per room per night plus tax (16.75%). To obtain this rate, you must phone the hotel (800-535-1980 or 210-366-2424) and state that you are affiliated with the Trinity University/GSA meeting. The deadline for reserving rooms at this rate is March 1, 2005.

Other hotels close to Trinity (~10 to 15 minutes driving time) include:

AmeriSuites–Airport	7615 Jones Maltsberger	(210) 930-2333
Holiday Inn Select	77 NE Loop 410	(210) 349-9900
Holiday Inn Express	91 NE Loop 410	(210) 308-6700
Drury Inn & Suites	95 NE Loop 410	(210) 308-8100

### REGISTRATION

**Standard registration deadline: February 28, 2005**

**Cancellation deadline: March 7, 2005**

GSA Headquarters will handle meeting registration. On-site registration will be available on the campus of Trinity University during the meeting.

### Registration Fees

	Standard		On-site	
	Full meeting	One day	Full meeting	One day
Professional Member	\$90	\$50	\$100	\$60
Professional Nonmember	\$95	\$55	\$105	\$65
Student Member	\$35	\$35	\$45	\$45
Student Nonmember	\$40	\$40	\$50	\$50
K–12 Professional	\$30	\$30	\$40	\$40
Guest or Spouse	\$25	\$20	\$35	\$30

### Accommodations for Registrants with Special Needs

GSA is committed to making all events at the 2005 meeting accessible to all people interested in attending. Special requirements (wheelchair accessibility, dietary concerns, etc.) can be indicated on the registration form.

### On-site Registration Hours

Thursday, March 31	3:30–7 p.m.
Friday, April 1	7:30 a.m.–4:30 p.m.
Saturday, April 2	7:30 a.m.–noon

### CALL FOR PAPERS

**Abstract deadline: December 17, 2004**

Papers are invited for symposia, theme sessions, and general sessions in both oral and poster formats. Abstracts not included in symposia will be scheduled for theme or general session, as appropriate. All abstracts must be submitted online at [www.geosociety.org/sectdiv/southc/05scmtg.htm](http://www.geosociety.org/sectdiv/southc/05scmtg.htm). An abstract submission fee of \$10 will be charged. Only one volunteered paper may be presented by an individual; however, a person may be a co-author on other papers. Also, those invited for symposia may present other papers.

### SYMPOSIA AND THEME SESSIONS

#### Symposia

1. **Mapping Active Surface Faults and Areas of Coastal Subsidence along the Northern Edge of the Gulf of Mexico: Technologies New and Old.** Robert Traylor, [Rtraylor@tceq.state.tx.us](mailto:Rtraylor@tceq.state.tx.us), (512) 239-0520; Roy Dokka, [rkdokka@c4g.lsu.edu](mailto:rkdokka@c4g.lsu.edu), (225) 578-2975. This one day session will focus on subsurface data, light detection and ranging (LIDAR), geographic information systems (GIS), geophysics, geodetics, and other mapping tools and their

availability, quality, and effectiveness in fault and subsidence studies. Presentations and open discussion will involve the most controversial questions and issues regarding the evaluation of active surface faults and coastal subsidence. **Both oral and poster presentations are encouraged.**

2. **Pander Society Conodont Symposium.** Lance Lambert, Llambert@utsa.edu, (210) 458-5447. The North American 2005 meeting of the Pander Society affiliated with the GSA South-Central Section meeting. Abstracts are solicited on any topic related to conodont research, including biostratigraphy, systematics, paleoecology, biochemistry, color alteration indices, or other areas of interest to conodont specialists. Both poster and oral presentations are encouraged. This session will be paired with a multi-focus field trip to the Upper Cambrian–Lower Ordovician Wilberns and Tanyard formations in the southern Llano region.

### Theme Sessions

1. **Proterozoic Growth and Evolution of Southern Laurentia.** Calvin Barnes, cal.barnes@ttu.edu, (806) 742-3106; Melanie Barnes, Melanie.Barnes@ttu.edu, (806) 742-3204. This session will focus on the tectonic, magmatic, geophysical, and sedimentologic aspects of southern Laurentia. We particularly encourage emphasis on (1) the relationships between tectonic setting and processes of crust formation and modification, and (2) similarities and differences between the exposed Proterozoic crust in the region and geophysical, lithologic, and petrologic connections that may be made with the subsurface. Both oral and poster presentations are planned. This session will be paired with a postmeeting field trip to excellent, well-documented exposures of Precambrian crust in the nearby Llano Uplift.
2. **Faulting and Related Deformation in the Balcones Fault System and Influence on the Edwards and Trinity Aquifers.** David A. Ferrill, dferrill@swri.edu, (210) 522-6082; Alan P. Morris, alanm52@flash.net. Faulting is a major influence on structural architecture, permeability, and hydrologic framework and flow paths in the Edwards and Trinity Aquifers of south-central Texas. These aquifers can serve as analogs for carbonate aquifers and reservoirs around the world. Carbonate rocks are hosts to a large percentage of the world's hydrocarbon and underground water resources, and their hydrologic characteristics are often largely defined by faults and fractures. A fundamental understanding of fault zone evolution in carbonate rocks is critical for effective use of these resources. This session is intended to bring together scientists exploring the deformation behavior (especially normal faulting and fracturing) in carbonate rocks and the related influences on permeability and flow communication) pathways in carbonate strata.
3. **Geology of Bays, Estuaries, Barrier Islands, and Inner Shelf of the Northern Gulf of Mexico.** William Sager, wsager@ocean.tamu.edu, (979) 845-9828; Tim Dellapenna, dellapet@tamug.tamu.edu, (409) 749-4952. Bays, estuaries, and their associated features in the north-

ern Gulf of Mexico formed in a dynamic environment that has responded to changes in climate and sea level as well as anthropogenic modification. These systems therefore contain records of past environments and responses to change in their sediments. In addition, these features are often locations of prime fisheries, industry, and recreational areas. An understanding of coastal zone features is important for deciphering feedbacks and controls on coastal feature development and evolution as well as for management of existing resources in these areas. Poster and oral presentations on coastal zone geology, especially related to the understanding of sediments in and around bays, estuaries, barrier islands, and the inner shelf, are encouraged.

4. **Undergraduate Research Poster Session.** *Sponsored by the Council on Undergraduate Research, Geosciences Division.* Wendi J.W. Williams, wjwilliams@ualr.edu, (501) 569-3542. Undergraduate students are invited to submit abstracts for a special poster session sponsored by the Council on Undergraduate Research (www.cur.org), Geosciences Division, highlighting activities by undergraduate researchers. Undergraduate students involved in independent, team, or class-related research are highly encouraged to submit abstracts regarding their research projects, activities, techniques, internship experiences, and/or preliminary results for this session. The presenter and first author must be an undergraduate student, but co-authors may include faculty sponsors and/or graduate students and/or high school students.
5. **Professional Licensure and National Academic Accreditation: Opportunities and Constraints for Geology Practice in the Millennium.** Lou Gilpin, lgilpin@gilpingeosciences.com, (415) 383-8543; Melanie Barnes, Melanie.Barnes@ttu.edu, (806) 742-3204. Professional geologists play a vital role in the dissemination of basic research for public good, as well as the employment and career growth of the students emerging from geology departments across the country. Licensure and accreditation present opportunities for professional geologists to have a broader influence in the public arena and thereby accelerate the dissemination of some of the basic geologic research. Licensure and accreditation programs would also certainly influence future career paths, but at the same time they pose some severe constraints on the flexibility of the university system and potentially fuel a bureaucratic agenda. The purpose of this session is to engage in a discussion regarding the future of nationwide geology practice and the role GSA should play in the support and advancement of professional geologists.
6. **Challenges and Opportunities in Groundwater Modeling.** Robert Mace, robert.mace@twdb.state.tx.us, (512) 936-0861. Numerical groundwater flow models are important tools for assessing the effects of pumping and drought on aquifers. Texas recently completed the development of groundwater availability models (GAMs) for the major aquifers of Texas and continues work to develop GAMs for the minor aquifers and to improve existing models. The development, use, and improvement of GAMs and groundwater models in general offer a



number of challenges and opportunities. This session will focus on these challenges and opportunities to improve groundwater modeling.

## WORKSHOPS

### Registration in workshops is free, but space is limited.

1. **Geologic Issues and YOUR Legislators.** Thurs., March 31, 2005. Austin, Texas. Melanie Barnes, Melanie. Barnes@ttu.edu, (806) 742-3204. This workshop will present the nuts and bolts of how to approach Congress and state legislatures about geologic public policy. This pre-meeting workshop will be held in Austin. The how-tos will be addressed in the morning by experienced members of the geologic community. In the afternoon, there will be a practical application of what we have learned by visiting our Texas state legislators. It is not a requirement to be from Texas to participate in this workshop; the same approaches and procedures apply no matter who you are approaching in the public policy arena.
2. **K-12 Earth Science Education and the National Science Education Standards.** Sat., April 2, 2005. Edward C. Roy Jr.,eroy@trinity.edu, (210) 999-7609; David J. Fitzgerald,dfitzgerald@stmarytx.edu, (210) 436-3235; Joel Stevens,joel.stevens@mail.utexas.edu, (512) 736-3688. This workshop will investigate earth science education and its relationship to the National Science Education Standards in a number of states, with emphasis on the recent activity in Texas. Experts in elementary, middle, and high school earth science education will lead interactive discussions dealing with content, concepts, laboratories, and field trips. Participants will be encouraged to share their experiences as well as to gain from the experiences of others. It is hoped that a continuing dialogue among the participants will result from the workshop. (See related article on p. 36.)

## FIELD TRIPS

Both premeeting and postmeeting field trips are planned. Registration for some trips is limited.

### Premeeting

1. **Structure of the Balcones Fault System and Influence on the Edwards and Trinity Aquifers, South-Central Texas.** Thurs., March 31; one-day trip. David A. Ferrill,dferrill@swri.edu, (210) 522-6082; Alan P. Morris,alanm52@flash.net, (210) 458-5450; Deborah J. Waiting,dwaiting@swri.edu, (210) 522-5502. The Edwards and Trinity Aquifers are the primary sources of water for many communities in south-central Texas. San Antonio is almost entirely dependent on the Edwards Aquifer for its water. The structural framework of the Edwards Aquifer is controlled by the Balcones fault system, an en echelon system of normal faults that cuts the aquifer and aquitard strata and displaces the aquifers from their outcrop belts in and on the margin of the Edwards Plateau into the subsurface south and east of the Balcones escarpment. This field trip will explore faulting at all scales in the Balcones fault zone and will provide an overview of the architecture of the Edwards Aquifer system. The trip will work

stratigraphically downward from the upper confining layer of the Edwards Aquifer, through the Edwards itself, and into its lower confining unit and the Trinity Aquifer strata. Field stops will explore the structural style of and relationships between each of these units and discuss the relevance of the mechanical stratigraphy to the permeability architecture of the aquifer. Min.: 10; max.: 40. Cost: \$75, includes bus transportation, guidebook, snacks, water, and soft drinks. Lunch will be at a restaurant; participants are responsible for their own lunch expenses.

2. **Volcanic rocks of the Balcones Igneous Province.** Thurs., March 31; one-day trip. William R. Griffin,griffin@utdallas.edu, (972) 883-2401; Tom Ewing,tewing@satx.rr.com, (210) 493-1626; Matt Leybourne,mleybo@utdallas.edu, (972) 883-2403; Steve Bergman,bergman@utdallas.edu, (972) 883-4365. The Balcones Igneous Province is a Late Cretaceous alkalic undersaturated zone of intraplate intrusions and volcanics paralleling the Balcones fault zone of south Texas. The field trip will visit outcrops in and near the town of Uvalde, where most of the surface exposures exist. We'll discuss various mechanisms capable of producing intraplate igneous provinces and new geochemical and geochronologic research being conducted in the Balcones Igneous Province to understand its emplacement mechanism. The igneous bodies of the province are important subjects of study that provide a geochemical window into the upper mantle, thus allowing the investigation of igneous processes along passive margins and the degree of geochemical heterogeneity in the upper mantle. Min.: 16; max.: 36. Cost: \$70, includes lunch, transportation, soft drinks, and a field guide.

### Postmeeting

3. **Precambrian Geology of the Western and Central Llano Uplift, Texas.** Sun.-Mon., April 3-4; two-day trip. Mark Helper,helper@mail.utexas.edu, (512) 471-1009; Sharon Mosher,mosher@mail.utexas.edu, (512) 471-4135. The Llano Uplift of central Texas records the effects of Grenville orogenesis along the southern margin of Laurentia. This trip examines newly mapped and studied regions in the western and central Llano Uplift that show polyphase deformation at uppermost amphibolite facies, remnants of medium temperature eclogites, the interplay between partial melting and deformation, and syn- to post-tectonic granite plutonism. Participants will travel from San Antonio to Llano at the conclusion of the meeting on Saturday (April 2) and spend the night in Llano. The trip will leave from Llano early Sunday morning; participants will be returned to San Antonio in the late afternoon/early evening on Monday (April 4). Min.: 18, max.: 25. Cost: \$175, includes transportation, guidebook, lodging for Sat. and Sun. nights (double occupancy), breakfasts, lunches, and snacks. Participants are responsible for their own dinner expenses.
4. **Cambro-Ordovician of the Southern Llano Uplift Region, Central Texas: Conodont Biostratigraphy, Sequence Stratigraphy, and Biogeochemistry.** Sun., April 3; one-day trip. James F. Miller,jfm845f@smsu.edu,

(417) 836-5447; Damon Bassett, dbassett77@yahoo.com; Robert Ripperdan, ripperdan@eas.slu.edu. The Pander Society field trip will examine the Upper Cambrian–Lower Ordovician Wilberns and Tanyard formations along Threadgill Creek in the southwest part of the Llano Uplift, central Texas. The trip will integrate conodont and trilobite biostratigraphy, sequence stratigraphy, and carbon-isotope stratigraphy in a cratonic setting. The group will leave San Antonio at 7 a.m., Sun., April 3, and return to the San Antonio airport area by 6 p.m. that day. Min.: 10; max.: 24. Cost: \$30, includes transportation, lunch, and water.

5. **Geologic and Historical Bike Tour of the San Antonio River Watershed.** Sun., April 3; half-day trip. Chris Beal, bealc@campstanley.net, (210) 336-1171. The bike tour will depart at 9 a.m. from the Alamo Stadium parking lot (directly across the street from Trinity University). We will visit Olmos Dam, several local springs, the San Antonio River tunnel, and the Alamo. Discussions will center on headwater issues, recent renovations and floods, and the importance of this system to the early development of San Antonio. The trip will end around noon at the Blue Star Art Complex, where we will have lunch (participants are responsible for their own lunch expenses). Participants will be returned to the Trinity campus by van from the last stop. Min.: 10; max.: 24. Cost: \$35, includes bike rental, tour handout, and map. Participants who bring their own bike will be charged only \$10. Required items: signed waiver, bike helmet, and physical stamina to bike up a few good hills and a total distance of ~11 miles. Trip will be cancelled if wet roads or other inclement conditions prevail.

6. **The San Antonio River: History, Hydraulics, and Urban Geology.** Sun., April 3; half-day trip. Christopher C. Mathewson, mathewson@geo.tamu.edu, (979) 845-2488. The history of the city of San Antonio and its interaction with

# Call for Geological Papers: 2005 GSA Section Meetings

## NORTHEASTERN SECTION

March 14–16, 2005

Prime Hotel and Conference Center, Saratoga Springs, New York

**Abstract Deadline: December 14, 2004**

**Information:** Kurt Hollocher, Union College, Department of Geology, Olin Building, Nott Street, Schenectady, NY 12308-3107, (518) 388-6518, hollochk@union.edu

## SOUTHEASTERN SECTION

March 17–18, 2005

Grand Casino Biloxi, Biloxi, Mississippi

**Abstract Deadline: December 14, 2004**

**Information:** Gail Russell, University of Southern Mississippi, Department of Geology, Box 5044, Hattiesburg, MS 39406-2000, (601) 266-4077, Gail.Russell@usm.edu

## SOUTH-CENTRAL SECTION

April 1–2, 2005

Trinity University, San Antonio, Texas

**Abstract Deadline: December 17, 2004**

**Information:** Diane Smith, Trinity University, Department of Geosciences, #45, One Trinity Place, San Antonio, TX 78212-4674, (210) 999-7656, dsmith@trinity.edu

## CORDILLERAN SECTION

*(Joint meeting with American Association of Petroleum Geologists)*

April 29–May 1, 2005

Fairmont Hotel, San José, California

**Abstract Deadline: February 1, 2005**

**Information:** Jonathan Miller, San José State University, Department of Geology, 1 Washington Square, San José, CA 95192-0102, (408) 924-5015, jsmliller@email.sjsu.edu

## NORTH-CENTRAL SECTION

May 19–20, 2005

University of Minnesota, Minneapolis, Minnesota

**Abstract Deadline: February 22, 2005**

**Information:** Carrie Jennings Patterson, University of Minnesota, Minnesota Geological Survey, 2642 University Ave. W., St. Paul, MN 55114-1032, (612) 627-4780, ext. 220, carrie@umn.edu, or Barbara Lusardi, University of Minnesota, Minnesota Geological Survey, 2642 University Ave. W., St. Paul, MN 55114-1032, (612) 627-4780, ext. 212, lusar001@umn.edu

## ROCKY MOUNTAIN SECTION

May 23–25, 2005

Mesa State College, Grand Junction, Colorado

**Abstract Deadline: February 22, 2005**

**Information:** Rex Cole, Mesa State College, Department of Physical & Environmental Science, 1100 North Ave., Grand Junction, CO 81501-3122, (970) 248-1599, rcole@mesastate.edu

[www.geosociety.org/sectdiv/sections.htm](http://www.geosociety.org/sectdiv/sections.htm)

the San Antonio River provides an excellent illustration of the practice and principles of urban geology. The history of the city is closely entwined with that of the river because of the availability of a dependable supply of water in a semi-arid grassland region, which made the river valley an ideal location for early civilizations. This half-day field trip will start at Olmos Dam and the San Antonio Spring and end at Mission San Francisco de la Espada. Min.: 30. Cost: \$50, includes bus tour, boat tour on river, and guidebook.

7. **Hydrogeology of Deep Phreatic Karst in Sistema Zacatón, Northeastern México.** Sun.–Wed., April 3–6; four-day trip; John M. Sharp Jr., jmsharp@mail.utexas.edu, (512) 471-3317; Marcus Gary, marcusgary@mail.utexas.edu, (512) 470-8029. Sistema Zacatón is a deep underwater cave system with sinkholes extending at least 330 m below the water table. We will visit this unique karst area in northeastern México and examine the role that volcanic activity plays in the formation of some of the world's largest and deepest cave voids. A variety of geologic and hydrologic settings are found here, including expansive travertine formations, large caves, Pleistocene volcanic rocks, and distinctive geo-microbial habitats. Housing and meals will be provided immediately at the research site. Min.: 6; max.: 12. Cost: \$500. For GSA abstracts on related research, see: [http://gsa.confex.com/gsa/2003AM/finalprogram/abstract\\_62638.htm](http://gsa.confex.com/gsa/2003AM/finalprogram/abstract_62638.htm) and [http://gsa.confex.com/gsa/2004AM/finalprogram/abstract\\_80848.htm](http://gsa.confex.com/gsa/2004AM/finalprogram/abstract_80848.htm).

## STUDENT MENTOR PROGRAMS

1. **Roy J. Shlemon Mentor Program in Applied Geoscience.** *Sponsored by GSA Foundation.* 11:30 a.m.–1 p.m., Fri., April 1, The Holt Center (106 Oakmont Court). Karlon Blythe, kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real life issues including professional opportunities and challenges that await students after graduation. Students will receive **FREE LUNCH** tickets in their badge packet to attend the Shlemon Program. However, space is limited: first come, first served.
2. **The John Mann Mentors in Applied Hydrogeology Program.** *Sponsored by GSA Foundation.* 5–6:30 p.m., Fri., April 1, The Holt Center (106 Oakmont Court). Karlon Blythe, kblythe@geosociety.org. This event, which takes place right after the technical sessions end, presents mentoring opportunities for students with declared interest in hydrogeology as a career to interact and network with practicing hydrogeology professionals. It is a fo-

cused, small-scale event that features a **FREE light supper** for participants. Participant eligibility is limited to those students who have previously indicated an interest in hydrology or hydrogeology on their GSA membership applications and who have registered online for this meeting. An e-mail invitation will be sent to those qualified students. Keep in mind that only a quick response to the invitation will secure you a seat, as attendance at this Mann Mentors event is limited.

## STUDENT SUPPORT

In cooperation with the GSA Foundation, travel grants are available for GSA Student Associates who are presenting oral or poster papers. Students must be currently registered as GSA members to be eligible. Please visit [www.geosociety.org/sectdiv/southc/05scmtg.htm](http://www.geosociety.org/sectdiv/southc/05scmtg.htm) for details regarding application instructions. For more information, contact Elizabeth Y. Anthony, eanthony@geo.utep.edu.

## SOCIAL ACTIVITIES

**Welcoming Party.** Thurs., March 31, 5–7 p.m., 151 Oakmont Court, Trinity University campus. A free shuttle bus will make trips between the Doubletree Hotel and the party between 4:45 and 7 p.m. This event is hosted by the vice president for academic affairs of Trinity University, Michael Fischer and his wife, Kim Fischer. All meeting registrants are welcome.

**Deli Lunch.** Fri., April 1, Laurie Art Gallery. Provided for all meeting registrants.

**Banquet.** Fri., April 1, 6 p.m., Great Hall, Chapman Graduate Center. The keynote speaker will be Scott W. Tinker, director of the Bureau of Economic Geology, state geologist of Texas, and the Allday Chair in Subsurface Geology at the University of Texas–Austin. This is a ticketed event with limited seating. Cost: \$28 per person.

**Mexican Buffet Lunch.** Sat., April 2, noon–1:30 p.m., Skyline Room, Coates University Center. This is a ticketed event with limited seating. Cost: \$11 per person.

## BUSINESS MEETINGS:

**South-Central Section Management Board Meeting.** Fri., April 1, 4 p.m., Northrup Hall, 410B.

**South-Central Section GSA Business Meeting.** Fri., April 1, 5:30 p.m., Great Hall, Chapman Graduate Center.

**Texas Section Association of Engineering Geologists Business Meeting.** Time and location will be available at the registration desk.

## CONTACT INFORMATION

Local Organizing Committee Chair: Diane Smith, [dsmith@trinity.edu](mailto:dsmith@trinity.edu), (210) 999-7656.

# STUDENTS—Mark Your Calendars!

**Students:** Plan now to attend a Shlemon Mentor Program and/or a Mann Mentor Program in Applied Hydrogeology at your 2005 Section Meeting to chat one-on-one with practicing geoscientists. These volunteers will answer your questions and share insights on how to get a job after graduation. When programs are scheduled for multiple days, each day's program will offer a different set of mentors.

**FREE LUNCHES** will be served (students only) at the Shlemon Mentor Programs. Students will receive a **FREE LUNCH** ticket, along with their registration badge, to attend

each Shlemon Program. However, space is limited. First come, first served.

And, it gets better: **FREE light suppers** will be served (students only) at the Mann Mentor Programs. The **Mann Programs** are specific to careers in hydrogeology; if you're interested in receiving an invitation to attend the Mann Program for a **FREE light supper** after the tech sessions end, contact Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org). Be sure to indicate which Section Meeting you plan to attend.

## Mentor Programs for 2005 Section Meetings

FOR LOCATIONS OF PROGRAMS, ASK AT THE GSA REGISTRATION DESK.

### NORTHEASTERN SECTION MEETING

Saratoga Springs, New York  
SHLEMON MENTOR LUNCHEON PROGRAMS:  
Mon. and Tues., March 14–15, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Mon., March 14, 5–6:30 p.m.

### CORDILLERAN SECTION MEETING

San José, California  
SHLEMON MENTOR LUNCHEON PROGRAMS:  
Fri. and Sat., April 29–30, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Fri., April 29, 5–6:30 p.m.

### SOUTHEASTERN SECTION MEETING

Biloxi, Mississippi  
SHLEMON MENTOR LUNCHEON PROGRAMS:  
Thurs. and Fri., March 17–18, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Thurs., March 17, 5–6:30 p.m.

### NORTH-CENTRAL SECTION MEETING

Minneapolis, Minnesota  
SHLEMON MENTOR LUNCHEON PROGRAMS:  
Thurs. and Fri., May 19–20, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Thurs., May 19, 5–6:30 p.m.

### SOUTH-CENTRAL SECTION MEETING

San Antonio, Texas  
SHLEMON MENTOR LUNCHEON PROGRAM:  
Fri., April 1, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Fri., April 1, 5–6:30 p.m.

### ROCKY MOUNTAIN SECTION MEETING

Grand Junction, Colorado  
SHLEMON MENTOR LUNCHEON PROGRAMS:  
Mon. and Tues., May 23–24, 11:30 a.m.–1 p.m.

MANN MENTORS IN APPLIED  
HYDROGEOLOGY PROGRAM:  
(by invitation; contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org))  
Mon., May 23, 5–6:30 p.m.

For more information contact [kblythe@geosociety.org](mailto:kblythe@geosociety.org)





# PENROSE CONFERENCE REPORT

SEPTEMBER 6–12, 2004

## Mass Redistribution in Continental Magmatic-Hydrothermal Systems

Yellowstone National Park and the Fairmont Hot Springs  
resort near Butte, Montana

### Conveners:

**John H. Dilles**, *Department of Geosciences, Oregon State University,  
Corvallis, Oregon, USA*

**Greg B. Aреhart**, *Department of Geological Sciences, University of Nevada,  
Reno, Nevada, USA*

**Peter I. Nabelek**, *Department of Geological Sciences, University of Missouri,  
Columbia, Missouri, USA*

**Todd C. Feeley**, *Department of Earth Sciences, Montana State University,  
Bozeman, Montana, USA*

The conference served as a forum for discussion of how large-scale magmatic-hydrothermal systems that operate in the continental crust produce enormous geochemical redistributions of elements that sometimes result in economic mineral deposits. The goal was to identify the key parameters of these systems so that realistic models can be built for how they form in time and space. The venues served to focus discussion on active shallow parts of hydrothermal systems and deep parts of exhumed fossil systems. The conference brought together 60 researchers from academia, industry, and the U.S. Geological Survey, post-docs and students, many of whom came from distant parts of the world. The participants represented different subdisciplines of geology that are used to study magmatic-hydrothermal systems, including geochemistry, geophysics, ore-deposits research, and igneous and metamorphic petrology.

The Old Faithful geyser provided an ideal backdrop for the first part of the conference in Yellowstone. The conference began with an evening overview of the Yellowstone system by Robert Smith of the University of Utah. Smith has spent much of his career studying the relationship between magmatism and

hydrothermal activity in Yellowstone using geophysical methods. He highlighted how earthquake activity relates to faults and fracture systems that serve to focus flow of hydrothermal fluids. He also discussed the history of volcanism in Yellowstone and the shape of the mantle plume that provides the ultimate heat source for this magmatic-hydrothermal system. The first full day of the conference was dedicated to field examination of the volcanic and hydrothermal features of Yellowstone. The field trip was led by Smith, Hank Heasler and Cheryl Jaworoski, both national park rangers and active researchers of the Yellowstone geology, and Jacob Lowenstern, director of the USGS Yellowstone Volcano Observatory. Participants were awed by the active hydrothermal system, which led to lively discussions around geysers and lava flows.

The first day of technical sessions began with several talks discussing current research on the Yellowstone system. Anahita Tikku talked about gravity fluctuations that may be related to hydrothermal activity, Guillaume Girard presented analogue modeling of magma mixing, and Lowenstern discussed the mass balance of volatiles as deduced from measurements in the system. David

Hill's presentation on the current state of knowledge of the Long Valley caldera gave a comparison with the Yellowstone system. Before lunch, Lang Farmer covered the use of radiogenic isotopes in dating fluid flow through rocks and determining fluid sources, Steve Ingebritsen gave an overview of the crustal permeability structure, and Jeffrey Mauk discussed the use of remote sensing methods to determine the extent and type of alteration related to hydrothermal activity in mineral deposits. In the afternoon, Jim Webster presented a talk on experimental studies of melt-fluid-brine partitioning of CO<sub>2</sub> and halogens, Martin Streck discussed the use of apatite as a monitor of the behavior of sulfur in magmas, Wendy Bohrsen presented an energy conservation approach to quantification of open-system processes in magma chambers, and Werner Halter summarized the use of laser ablation inductively coupled plasma–mass spectrometry (ICP-MS) of fluid and melt inclusions in porphyry systems to evaluate mass-transfer processes. After the coffee break, Todd Feeley covered oxygen isotope evidence for modification of Lassen volcano magmas by the crust and vice-versa, Alan Matthews discussed potential isotopic exchange between pegmatitic dikes and host rocks on Naxos, Greece, Alan Whittington presented results of experiments on the influence of volatiles on viscosity of magmas and their eruptibility, and Margaret Baker presented a reconnaissance study of pyroxene chemistry to establish the source and modification of platinum reef pyroxenites in the Bushveld intrusion.

In the evening, John Dilles and Mark Reed gave presentations on the Butte porphyry Cu-Mo deposit. Dilles gave a regional overview of Butte and its tectonic context, and he summarized ages of the various stages in the evolution of the Butte magmatic-hydrothermal system. Reed gave a detailed accounting of its petrologic structure, including its stages of mineralization, veining, and the extent and sequence of alteration zones. These overview talks were followed the next day by relocation to the area of Butte. In the afternoon, participants looked at veining in the porphyry system and examined the various lithologies that make up the mining district. In the evening, participants were lodged in the Fairmont Hot Springs resort, where many enjoyed the hot springs during the rest of the conference.

The first three speakers on Friday morning presented metamorphic viewpoints on hydrodynamic systems in contact aureoles.



Continental porphyry Cu-Mo mine pit, Butte.

John Bowman discussed the effects of reaction kinetics on distribution of mineral assemblages, Peter Nabelek presented results of 2-D numerical simulations of metamorphic reaction progress and oxygen isotope exchange, and Barb Dutrow showed 3-D simulations of the effects of heat and fluid flow on mineral growth. Mona-Liza Sirbescu examined the causes of very low crystallization conditions of Li-rich pegmatites and Larry Cathles discussed influences on the distribution of individual deposits within porphyry copper regions. Two talks previewed the afternoon trip back to Butte. Brian Rusk discussed fluid inclusion evidence for transition from lithostatic to hydrostatic conditions and Reed presented a model for the possibility that a single fluid could have produced observed mineralization and alteration patterns as it cooled and reacted along a flow-path. During the afternoon trip, participants examined a collection of drill core with Dilles and rocks along the rim of the Continental Pit with Steve Czehura of Montana Resources.

The evening was dedicated to presentation of posters. Greg Arehart presented a work on thermochemical profiling of fluids in Carlin-type deposits, Tucker Barrie showed finite element heat and fluid flow modeling of deep sill-driven hydrothermal systems, Byron Berger showed evidence for effects of external stresses on magma emplacement in the Boulder batholith, Clara Buckroyd showed results of laser ablation ICP-MS analysis of fluid inclusions from the pre-main stage at Butte, Dilles presented oxygen and hydrogen isotope evidence for magmatic-hydrothermal fluids at Butte, Abraham Escalante discussed distal alteration around the Antamina skarn deposit, Peru, Cy Field talked about implications of sulfur isotopes for the Butte hydrothermal system, Randy Griffin showed an edge convection model for magmatic emplacement process, Matthew Harper presented a poster on platinum group element mineralization in the Stillwater complex, and Emily Hartwick presented fluid inclusion evidence for fluid evolution and emplacement conditions of a pegmatite dike in Wisconsin. A poster by Shaul Hurwitz presented evidence for cycling of halogens through the Cascadia subduction zone and its volcanic arc, David Johnson discussed scales of mass transfer in igneous-related hydrothermal systems, Ellie Leavitt presented a study of the Midas epithermal gold deposit, Nori Tsuchiya discussed water-rock interaction in the Shuteen Complex, Mongolia, Sandy Underwood presented oxygen isotope evidence for subducted H<sub>2</sub>O in the source of primitive calc-alkaline mafic lavas in the southernmost Cascades, and Ian Warren presented implications of potassium metasomatism for Au-Ag mineralization.

On Saturday morning, there were talks on fluid-rock interactions and geochemistry of fluids, including a talk by John Ferry on the application of reaction-transport theory for modeling dolomitization of limestones, a talk by Jamie Wilkinson on the potential of Zn and Cu isotopes as tracers of metal transport in ore systems, and a talk by John Porter on the temporal and spatial variations of sulfur isotopes in the Ertsberg mining district, Indonesia. Kinetics of feldspar alteration were used by Peter Larson to estimate the duration of the hydrodynamic system at Rico, Colorado, and chemical and fluid inclusion arguments were made by Ed van Hees for a magmatic source of the Au mesothermal deposits at Yellowknife, Canada. There were several experimental talks in this session, including a summary by Scott Wood of experiments on rare earth element (REE) fractionation between minerals and liquids and solubilities of REE containing minerals, a presentation by John Kaszuba on chemical fractionation between CO<sub>2</sub>-H<sub>2</sub>O fluids and brines, a discussion by Craig Manning of the application of experimental results on mineral solubilities in fluids to crustal-scales mass-transfer processes, a talk by Phil Piccoli on application of halogen partitioning into apatite to determine their transfer from magmas to hydrothermal fluids and brines, and a presentation by Adam Simon of his work on Cu, Au, and As partitioning in sulfur-bearing systems.



Norris Basin, Yellowstone National Park.

In the final afternoon session, Stephen Kesler presented arguments that sulfide enclaves in Cu-rich felsic magmas may have been derived from source regions that contained copper sulfides. David John described hydrothermal alteration related to recent activities of several Cascade volcanoes. Additional speakers presented case studies of several mineral deposits. Shane Ebert talked about the Donlin Creek deposit in Alaska, Marcos Zentilli about the Chuquicamata porphyry in Chile, and Frank Dudas about the Lone Star porphyry in Arizona. The last talk of the meeting, by Stuart Simmons, was a summary of the characteristics and processes in epithermal ore deposits. A session in the evening was dedicated to presentation of ideas for future collaborative studies involving multiple subdisciplines that can be applied to studies of mass-redistribution in the continental crust.

On Sunday, 24 participants traveled to Butte, where Rob Cronoble of the Underground Miner Training Program led them to underground workings in the Lexington Mine, and visited the Geologic Research Lab rock sample collection of the Anaconda Company archived by the Montana Bureau of Mines and Geology.

Registration and logistics at the conference venues were handled by Dianna Gury of Quality Business Services. The conference costs were partially underwritten by the society's Penrose Fund as well as the National Science Foundation and the Society of Economic Geologists. The conveners thank all the attendees, the people and organizations noted above, for a successful meeting focused on scientific presentations, discussions, and planning.

Participants were Greg Arehart, Margaret Baker, Tucker Barrie, Byron Berger, Wendy Bohrson, John Bowman, Clara Buckroyd,

# GeoVentures™ 2004 *Memories*

## Dillon, Montana GeoHostel



Dillon group at Cone Hill in the Ruby Valley. Photo by Sheila Roberts.

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Larry Cathles, John Dilles, Frank Dudas, Barb Dutrow, Shane Ebert, Abraham Escalante, Lang Farmer, Todd Feeley, John Ferry, Cyrus Field, Guillaume Girard, Randy Griffin, Dianna Gury, Lew Gustafson, Werner Halter, Matthew Harper, Emily Hartwick, David Hill, Shaul Hurwitz, Steve Ingebritsen, David John, David Johnson, John Kaszuba, Stephen Kesler, Peter Larson, Ellie Leavitt, Jacob

Lowenstern, Craig Manning, Alan Matthews, Jeffrey L. Mauk, Peter Nabelek, Phil Piccoli, John Porter, Mark Reed, Brian Rusk, Adam Simon, Stuart Simmons, Mona-Liza Sirbescu, Robert Smith, Martin Streck, Anahita Tikku, Nori Tsuchiya, Sandy Underwood, Ed van Hees, Ian Warren, Jim Webster, Alan Whittington, Jennifer Whittington, Jamie Wilkinson, Scott Wood, and Marcos Zentilli.



Conference participants.



## Don't Forget—December 31 is Coming Up

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- ✿ Gifts to fund the future
- ✿ Tips on the timing of your charitable gifts

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If you have a tale or two you would like to share for volume 2, please send it via e-mail to drussell@geosociety.org. Volume 2 is scheduled to be completed by late January 2005.



### Most memorable early geologic experience:

Ojo Caliente, New Mexico, 1947. Mapping with Dick Jahns and Clay Smith (pros), both Gene Shoemaker and I (undergrads) broke our barometers by the fourth day. Elevation control degraded to vertical angles with our Bruntons. Not cool!

—William R. Muehlberger



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## EARTH SCIENCE IN TEXAS: A PRIMER ON PETTY POLITICS

David E. Dunn and Edward C. Roy Jr.

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In 1999, the Texas Legislature passed SB 103, which requires that every high school student pass an exit science examination (TAKS) in the eleventh grade covering "...at least biology and integrated physics and chemistry" in order to graduate. The State Board of Education (SBOE), an elected board consisting of 15 members representing geographic districts, responded by eliminating earth science from the list of courses accepted for high school core science graduation credit. In January 2002, 74 Texas earth scientists representing the oil and gas, mining, groundwater, environmental, public and higher education sectors, and state and federal agencies urged the SBOE to reinstate earth science as a course carrying core science credit for high school graduation. The SBOE Committee on Instruction responded by authorizing the appointment of an Earth Science Task Force (ESTF), charged to recommend ways to restore earth science to the core curriculum.

In June 2002, 12 individuals were appointed to the task force—three from the public education (K–12) sector, three from higher education, two from the for-profit sector, one each from the Bureau of Economic Geology and the Science Teachers Association of Texas and two from the Texas Education Agency (TEA). Edward C. Roy Jr. was appointed chair and David E. Dunn was appointed vice-chair of the task force.

From July 2002 through June 2003, the ESTF held seven meetings at locations throughout the state, and at five of those meetings, public comment was solicited and received. Additionally, members of the task force made presentations to various groups and solicited public comments at the State Governors Conference, Texas Earth Science Teachers Association,

Texas Science Education Leadership Association, Texas Science Summit, Geological Society of America, and American Association of Petroleum Geologists. Summaries of the mission and work of the ESTF were published in *Geotimes*, *AAPG Explorer*, and *GSA Today*.

The ESTF submitted its final report in June 2003. The report made eight recommendations, three of which could have been implemented in the fall of 2005, and five of which required substantially longer lead times for implementation. Recommendation number I would have allowed two courses, either Advanced Placement environmental science or geology, meteorology, and oceanography (GMO), to satisfy the third-year science graduation requirement for those high school students in the Recommended or Distinguished Achievement Plans who had previously completed biology and integrated physics and chemistry. Simply put, Recommendation I allowed students the option of choosing either a year of chemistry, a year of physics or a year of earth science to fulfill the third-year science requirement. The TEA determined that the cost of implementing Recommendation I was essentially nil.

Recommendation VII of the task force report would have required four years of science, consisting of a year each of biology, chemistry, physics, and earth science for high school graduation. The task force recognized the sweeping nature of the recommendation and the long lead time required for its implementation. Recommendation VII would have increased the number of high school laboratory science classes in Texas by 33%, raising issues of teacher availability, laboratory space, additional supply expenses, etc. In the judgment

of the task force, addressing those issues could not be done precipitously.

In September 2003, the ESTF presented its report to the SBOE Committee on Instruction (COI). After minimal discussion, the COI instructed ESTF to prepare an implementation timetable for all eight recommendations. At the November meeting, the COI, after substantial discussion, accepted the timetable presented by ESTF and unanimously agreed to present the report and timetable to the SBOE at its meeting in February 2004.

When the SBOE meets, it first convenes as a Committee of the Whole. At that time, it hears public testimony on agenda items and may engage in extensive discussion. The Committee of the Whole does not take action; it merely makes recommendations to the SBOE, even though the membership of the two bodies is identical. Any action item must be approved by the SBOE, sitting as the board, on two separate readings at two separate bimonthly meetings.

The ESTF presented its report to the Committee of the Whole on February 26, 2004, seeking approval of Recommendation I effective in the fall of 2005. The ESTF also suggested that approval of the other recommendations be deferred until the effects of Recommendation I could be assessed. The committee heard testimony from 24 Texas earth scientists and received supporting letters from another 46. During the discussion after testimony ended, it became obvious that there was substantial opposition to Recommendation I. Led by board member Pat Hardy, opponents raised a number of questions that had been addressed in the ESTF report, making it obvious that many board

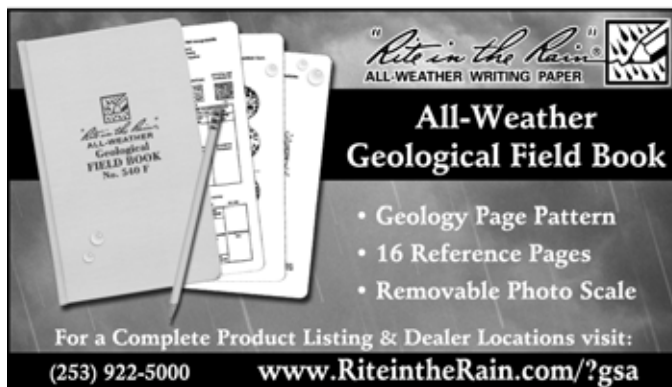
members had never read the report or understood its recommendations. Interestingly, Hardy, a member of the COI, had acquiesced in the committee decision to seek approval of Recommendation I in the first place. After lengthy discussion, the Committee of the Whole rejected Recommendation I by a vote of eight to seven. Joe Bernal, Chair of the COI, and Geraldine Miller, Chair of SBOE, made it clear that they intended to revisit the issue the next day.

When the SBOE convened on February 27, 2004, Bernal moved to approve Recommendation I. With almost no discussion, the board ignored the Committee of the Whole vote and approved Recommendation I on first reading by a vote of nine to six. Later, it was revealed that Don McLeroy and David Bradley had reversed their Committee of the Whole votes in deference to Chairwoman Miller. Second reading was scheduled for May 6 and 7, 2004.

At the Committee of the Whole meeting on May 6, 2004, public testimony in opposition to Recommendation I was orchestrated by John Stevens, executive director of the Texas Education and Business Coalition (TBEC). ESTF testimony focused on correcting misinformation about, and misinterpretation of, Recommendation I. It was emphasized that the TBEC position was directly contrary to the National Science Education Standards developed by the National Academy of Science/National Research Council. Also, it was emphasized that earth science courses being recommended address two thirds of the chemistry and physics concepts necessary for the high school science exit test in Texas (TAKS); therefore, the earth science courses were excellent preparation for that test. Nevertheless, the Committee of the Whole rejected Recommendation I by a vote of eight to seven. Two board members who had voted for Recommendation I on February 27, Cynthia Thornton and David Bradley, reversed their votes on May 6.

At the SBOE meeting on May 7, 2004, Recommendation I was introduced once again for approval on second and final reading. Pat Hardy moved to amend Recommendation I by deleting the original language and substituting the motion that all students be required to have four years of science for high school graduation. Her amendment was similar to the ESTF Recommendation VII, but without the stipulation that one of the four years must be earth science. Gail Lowe introduced language clarifying which courses would satisfy the fourth year requirement. Earth science classes constituted six of the fourteen courses on the final list. The Hardy-Lowe amendment was approved by a vote of thirteen to two and the motion as amended was approved by a vote of fourteen to one. Four years of science had received approval on first reading without *any* consideration of the personnel and cost issues that had made the ESTF seek step by step implementation of its Recommendation VII. Second and final reading of the amended motion was scheduled for July 15 and 16.

The task force now faced a real quandary. Some members believed that the Hardy-Lowe amendment was simply a cynical ploy to defeat Recommendation I, and that costs and other issues would not permit its passage on second reading. Other task force members saw the amendment



as too important to oppose, arguing that most students would choose earth science as the fourth-year option if four years of science were required. The ESTF did not adopt an official position, but some individual task force members did attempt to marshal support for the four-year requirement.

When the Committee of the Whole met on July 15, 2004, Bob Craig moved to amend the Hardy-Lowe amendment by returning to ESTF Recommendation I and to refer the four years of science issue to the COI for detailed analysis. Craig and others supporting his motion argued that it was the only way to gain a thorough understanding of the cost, space, and personnel implications of the Hardy-Lowe amendment. After substantial debate, the Craig motion was defeated by a vote of eight to seven.

Pat Hardy then moved to amend the Hardy-Lowe amendment by inserting two key provisions: (1) the four years of science requirement would take effect with students entering the ninth grade in 2007–2008; (2) on or before September 1, 2007, the SBOE would have to determine that the Texas Legislature had provided “adequate” funding to support four years of science. Opponents, especially Dan Montgomery, argued that such a determination was impossible because the Legislature appropriates lump sum funding without earmarking funds for specific programs. Since the sum appropriated is always less than the sum requested, how could the SBOE determine that “adequate” funds had been provided? Nevertheless, the Hardy amendment to the Hardy-Lowe amendment carried eight to seven, and then the Hardy-Lowe amendment as amended carried by the same eight to seven tally.

On July 16, 2004, the SBOE received the recommendations from the Committee of the Whole. By identical eight to seven votes the SBOE (1) approved the Hardy amendment to the Hardy-Lowe amendment; and (2) defeated an attempt by Bob Craig to return to the original Recommendation I. Finally, the Board approved the Hardy-Lowe amendment as amended on second and final reading by a vote of eight to seven (the vote as cast was nine to six but one member withdrew an affirmative vote before the minutes of the

meeting were prepared). If the Hardy-Lowe amendment is ever implemented, Texas will join Alabama, Illinois, Indiana, Nebraska, South Dakota, and Virginia as the only states requiring four years of science for high school graduation. The specific language of the requirement follows.

#### **74.61. High School Graduation Requirements.**

Sections (a) through (h) describe non-science requirements. Courses designated by an asterisk are classified as earth science by TEA.

(i) In addition to the requirements of this subchapter, a student entering Grade 9 in the 2007–2008 school year is required to demonstrate proficiency in science by earning four science credits to complete the recommended high school program or the distinguished achievement program, as specified in this subsection.

(1) One credit must be a biology credit (Biology, Advanced Placement [AP] Biology, or International Baccalaureate [IB] Biology). Students must choose two credits from subparagraph (A) and one credit from subparagraph (B) of this paragraph to complete the four-year science requirement.

(A) In addition to a biology course, a student must select two credits from the following areas. Not more than one credit may be chosen from each of the areas to satisfy this requirement.

- (i) Integrated Physics and Chemistry (IPC);
- (ii) Chemistry, AP Chemistry, or IB Chemistry; and
- (iii) Physics, Principles of Technology I, AP Physics or IB Physics.

(B) After successful completion of a biology course and two credits from IPC, a chemistry course, and/or a physics course, a student may select the fourth required credit from any of the following courses.

- (i) Geology, Meteorology, and Oceanography (GMO)\*;
- (ii) Environmental Systems\*;
- (iii) Aquatic Science\*;
- (iv) Astronomy\*;
- (v) Anatomy and Physiology of Human Systems;
- (vi) AP/IB Biology;
- (vii) Chemistry;
- (viii) AP/IB Chemistry;
- (ix) Physics;
- (x) AP/IB Physics;
- (xi) AP Environmental Science\*;
- (xii) IB Environmental Systems\*;
- (xiii) Scientific Research and Design; and
- (xiv) Principles of Technology I.

On seven separate recorded votes, the SBOE rejected the advice of the ESTF by a vote of eight to seven. The eight consistent naysayers were Rene Nunez (District 1), Mary Helen Berlanga (District 2), Terri Leo (District 6),

David Bradley (District 7), Linda Bauer (District 8), Cynthia Thornton (District 10), Pat Hardy (District 11) and Gail Lowe (District 14). Hardy and Thornton were clearly the leaders of this anti–earth science coalition. Texas voters will find their SBOE district listed on the back of their voter registration cards.

Linda Bauer was defeated in her reelection bid and will be leaving the board next year. Leo, Bradley, and Lowe are avowed creationists who have voted to include intelligent design creationism in biology textbooks. Their opposition to earth science was not unexpected, and probably will continue as long as they remain on the board. Their present terms expire on January 1, 2005, and all ran for reelection in November 2004. Nunez and Berlanga appear to have voted from a sincere, if misguided, conviction that Recommendation I would not serve the best interest of Hispanic students in Texas. Thornton’s change of position from early support of Recommendation I to consistent opposition is particularly vexing because of her family’s involvement in oil and gas production! Her present term does not expire until January 1, 2007. Pat Hardy’s consistent and skillful opposition made her the most effective opponent, and it is fair to say that if she were not a member of SBOE, Recommendation I would have been adopted. Hardy ran for reelection in November 2004.

If the SBOE determines that adequate funding has not been appropriated by the Legislature, the four-year requirement will not take effect and there will be no earth science in the core curriculum. If the state does fund the fourth-year requirement, it will not be until 2010–2011 that earth science courses will count toward core science credit for graduation. In that case, earth science courses will remain electives for the next seven years. Given the major decline in enrollments since earth science was removed from the core curriculum in 1999, it is likely that only a tiny fraction of Texas high school students will be exposed to earth science in the foreseeable future. For more than a decade, Texas will have failed to provide for the scientific literacy of its students.

The members of the Earth Science Task Force and others have devoted an enormous amount of time to the Texas earth science issue since the fall of 2001, but our efforts have not been successful. We believe that ultimate success requires new leadership at the state level, and we take this opportunity to urge that earth scientists across the state of Texas give public science education a high priority for their time, resources, and influence.

# COAL DIVISION

## Offers Medlin Award

GSA's Coal Geology Division announces the availability of the Antoinette Lierman Medlin Scholarship in Coal Geology for the 2005–2006 academic year. The scholarships provide full-time students who are involved in research in coal geology (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. Approximately \$2,000 will be available for the 2005–2006 scholarship award. In addition, the recipient of the scholarship may be provided with a stipend to present results of the research at the 2006 GSA Annual Meeting. For the academic year 2005–2006, the Coal Geology Division is also offering a field study award of approximately \$1,500. The recipient of this award will also be eligible to receive travel funds to present results of their study at the 2006 GSA Annual Meeting.

A panel of coal geoscientists will evaluate proposals for the scholarship and the field study award. Applicants 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 in length, including references); and (3) a letter of recommendation from the student's immediate advisor which includes a statement of financial need and the amount and nature of other available funding for the research project.

Send the material to: Romeo Flores, U.S. Geological Survey, Box 25046, MS 939, Denver Federal Center, Denver, CO 80225, USA, fax: 303-236-0459, [rflores@dnrcrds.cr.usgs.gov](mailto:rflores@dnrcrds.cr.usgs.gov).

The proposal and letter of recommendation must arrive no later than February 15, 2005. Applicants will be notified of the Scholarship Committee's decision by April 1, 2005.

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

## Positions Open

### ASSISTANT PROFESSOR POSITION 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 professor position in geology [F04/05-27] beginning in the fall of 2005. Required qualifications include a Ph.D. in the Geological/Earth Sciences, in hand at the time of appointment, and a demonstrated commitment to undergraduate education/research. College-level teaching experience is preferred, as is a broad background in Geology, Geophysics and/or Hydrology. 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. To Apply: Send application form (from <http://panam4.panam.edu/www/personnel/Emopp.htm>), cover letter and contact information of three references, CV, transcripts, statement of research interests, and teaching philosophy to: Geology Search, Dept. of Physics and Geology, University of Texas—Pan American, 1201 W University Drive, Edinburg, TX 78541-2999. For best consideration application materials must be received by January 15, 2005, however, applications will be accepted until the position is filled. Further information about the department can be found at <http://www.panam.edu/dept/physci/home.html>. The University is located in the Tropical Lower Rio Grande Valley of South Texas and has 16,900 students, the majority of whom are of Hispanic origin. The University is an EO/AA Employer. Federal Law requires compliance with the Immigration Reform Control Act of 1986. Note: This position is security-sensitive and subject to Texas Education Code 51.215, which authorizes the employer to obtain criminal history record information. Texas law requires faculty members whose primary language is not English to demonstrate proficiency in English.

### BOYCE POSTDOCTORAL FELLOWSHIP IN GEOLOGY COLGATE UNIVERSITY

The Department of Geology at Colgate University invites applications and nominations for the Boyce Postdoctoral Fellowship. The fellowship is awarded for one or two years and includes an annual salary of \$36,000 plus health benefits, moving expenses and funds for travel and research. The Boyce Fellowship is intended to attract scholars who received a Ph.D. four years or less prior to the appointment date. The department wishes to attract candidates whose background will complement, but not overlap, current expertise in the department and whose research could productively use our existing analytical facilities. We are especially interested in geoscientists with experience in new and emerging fields who anticipate a career that would combine undergraduate teaching and research. The appointment will begin their in early summer, 2005 to permit involvement in our summer field program. The teaching load for the Boyce Fellow will be two courses during the regular academic year. Please visit the Department's website <http://departments.colgate.edu/geology/> for information regarding our facilities, programs and faculty expertise.

Applicants should submit a curriculum vita including publications, addresses and email addresses of at least three potential referees and a letter describing plans for teaching and research during the Boyce Fellowship appointment. Application materials should be received by January 15, 2005. Materials should be sent to: Boyce Fellowship, Department of Geology, Colgate University, 13 Oak Drive, Hamilton, NY 13346. Contact Bruce Selleck, Chair, Department of Geology at 315-228-7949 or [bselleck@mail.colgate.edu](mailto:bselleck@mail.colgate.edu). Colgate is an affirmative action employer with a strong commitment to hiring a diverse faculty. Applications from candidates who enhance that diversity are strongly encouraged.

### TENURE TRACK ASSISTANT PROFESSOR HYDROGEOLOGY UNIVERSITY OF NEW MEXICO

The Department of Earth & Planetary Sciences at the University of New Mexico seeks applications for a tenure-track faculty positioning Hydrogeology. The position is anticipated at the Assistant Professor level, to commence Fall 2005. The successful applicant must have a Ph.D. in Geoscience or closely-related discipline, by the time of the appointment. We require a candidate with demonstrated research abilities in quantitative, field-oriented hydrogeology. The successful candidate will be expected to develop an externally funded research program, and be an effective teacher and mentor at the undergraduate and graduate level (MS and Ph.D.). Applicants must demonstrate background and research experience in one of the following areas:

(a) groundwater-surface water interaction; (b) integration of atmospheric, surface, and subsurface hydrologic processes at the watershed scale; (c) groundwater flow and transport. The selected candidate will teach undergraduate and graduate courses in Earth & Planetary Sciences and will have the opportunity to participate in the Environmental Science B.S. degree program. The Hydrogeologist may participate in collaborative research in related areas of strength, including but not restricted to hydrogeology/freshwater sciences, climate dynamics, hillslope and fluvial geomorphology, geochemistry and biogeochemistry, and water resources. There are also possible activities with a UNM-administered Long-Term Ecological Research site in the Water Resources Program which offers a professional Master's degree.

Minimum qualifications include Ph.D. by time of appointment in Geoscience or closely-related area; and demonstrated research abilities in quantitative, field-oriented hydrogeology. Other qualifications include demonstrated potential to develop an externally funded research program; demonstrated potential to be an effective teacher and a mentor of graduate research; and demonstrated background and research experience in one of the following areas: 1) groundwater-surface water interaction, 2) integration of atmospheric, surface, and subsurface hydrologic processes at the watershed scale, and 3) groundwater flow and transport. For more information about our program see our website at URL <http://epswww.unm.edu>. To apply, signed send a letter of interest, current CV, statements of research and teaching goals, and names and addresses of four potential referees, to: Dr. Gary Smith, Chair, Hydrogeology Search Committee, Earth & Planetary Sciences Dept. MSC 03-2040, University of New Mexico, 87131. Deadline for applications is January 14, 2005. The University of New Mexico is an EEO/AA employer & educator.

#### ENVIRONMENTAL GEOSCIENTIST MURRAY STATE UNIVERSITY

Assistant Professor, Department of Geosciences, Murray State University. Full time, tenure track Environmental Geoscientist to begin August 1, 2005. Ph.D. required by date of appointment. For details visit <http://www.mursuky.edu/qacd/cos/geo/ad/>

#### DEPARTMENT OF GEOLOGY AND GEOGRAPHY AUBURN UNIVERSITY

The Department of Geology and Geography, Auburn University, Alabama, invites applications for the position of Chair of the Department of Geology and Geography within the College of Sciences and Mathematics. The initial appointment will be for 4 years beginning Fall Semester 2005 and renewable once for a second 4 year term. The department presently has a faculty of 10 geologists and 5 geographers. The department offers a Masters degree in geology and has about 20 graduate students, at least 14 of which receive teaching or research assistantships. It averages about 20 geology majors and 25 geography majors. Further information on the department can be found at [http://www.auburn.edu/academic/science\\_math/cosam/docs/geo\\_geog.html](http://www.auburn.edu/academic/science_math/cosam/docs/geo_geog.html).

Applicants must have a Ph.D. in geology or geography and a record in research, teaching, and service qualifying for the rank of Full Professor with tenure in the department. The candidate should be a dynamic leader with strong interpersonal skills and have a record of academic excellence; evidence of administrative experience is desirable. The candidate will be expected to provide leadership for programmatic development, expansion of the graduate program, and nurturing existing areas of research and teaching.

The applicant should submit a statement discussing administrative philosophy, departmental vision, and personal teaching and research goals. Send this material along with a curriculum vitae and the names of three references with contact information to Dr. Michel Smith, Chair Geology-Geography Search Committee, Parker Hall, Auburn University, Auburn AL, 36849. Women and Ethnic Minorities are Encouraged to Apply. Review of applications will begin January 16, 2005 and will continue until a candidate is recommended for appointment. The candidate selected for this position must be able to meet eligibility requirements for work in the United States at the time the appointment is scheduled to begin and must be able to communicate in English. **AUBURN UNIVERSITY IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER.**

#### MARINE GEOLOGIST OR A HYDROGEOLOGIST CALIFORNIA STATE UNIVERSITY, STANISLAUS

California State University, Stanislaus seeks to hire a marine geologist or a hydrogeologist at the Assistant Professor level to augment its Geology program. Interested applicants are directed to the full text of this solicitation at

<http://www.csustan.edu/FacultyAffairs/EmploymentOpps.html>. Review of applications will begin on Feb. 1, 2005.

#### CANADA RESEARCH CHAIR TIER 2 GEOCHEMISTRY

The Department of Geological Sciences and Geological Engineering, Queen's University, one of Canada's oldest and best-known earth-science departments, seeks exceptional researchers to apply for a Tier 2 Canada Research Chair in the field of Earth System Science, with a focus on the geochemical processes that take place on or within the Earth. Areas of specific interest are: rock-forming processes in the lithosphere, the origin of mineral deposits, biogeochemistry, sedimentary geochemistry, and the origin/diagenesis of bio-chemical sediments. The successful candidate must be within 10 years of receipt of their Ph.D. and have an outstanding research record in order to fulfill the criteria for Tier 2 Canada Research Chairs (see [www.chairs.gc.ca/web/program/nominate\\_e.asp](http://www.chairs.gc.ca/web/program/nominate_e.asp)). It is expected that the Chair holder will supervise graduate students at the M.Sc. and Ph.D. levels, contribute actively to undergraduate and graduate teaching, undertake vigorous externally funded research, and collaborate with departmental colleagues. The department has faculty with a wide range of expertise and emphasizes the linkage between field and laboratory-based research and teaching. Its labs include state-of-the-art geochemical facilities. For more information about the Department, visit [www.geol.queensu.ca](http://www.geol.queensu.ca).

The University invites applications from all qualified individuals. Queen's is committed to employment equity and diversity in the workplace and welcomes applications from women, visible minorities, aboriginal people, persons with disabilities, and persons of any sexual orientation or gender identity. All qualified candidates are encouraged to apply; however, Canadian citizens and Permanent Residents will be given priority. The academic staff at Queen's University is governed by a collective agreement, the details of which are posted at <http://www.queensu.ca/qufa>. In accordance with the Queen's guidelines for the assignment of Canada Research Chairs, applications from qualified women are particularly encouraged for this position.

Applicants should send a current curriculum vitae, a statement of research interests and future plans, a statement of teaching experience and interests, and samples of research writing to the following address. Individuals who intend to apply should provide to the undersigned, as soon as possible, the names and addresses of five persons of international standing who have agreed to provide letters of reference. Doctoral and/or post-doctoral supervisor(s) may be included. Review of complete applications will begin on January 24, 2005.

Robert W. Dalrymple, Head, Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, ON K7L 3N6, Canada, Telephone: 613-533-2598, Fax: 613-533-6592, E-mail: [zarichny@geol.queensu.ca](mailto:zarichny@geol.queensu.ca).

#### SOIL CHEMISTRY DEPARTMENT OF SOIL AND CROP SCIENCES COLORADO STATE UNIVERSITY

Tenure-track, Assistant Professor, preference in the areas of basic soil chemistry or the application of soil chemistry to understanding environmental problems, biogeochemistry, plant nutrition, or soil processes. The successful applicant will teach at the undergraduate and graduate levels, and develop an externally funded research program. Position description and application procedures can be found on our website: [www.colostate.edu/Depts/SoilCrop/](http://www.colostate.edu/Depts/SoilCrop/). Application deadline is January 15, 2005. Contact: Dr. Gene Kelly, Search Committee Chair, Department of Soil and Crop Sciences, Colorado State University, Ft. Collins, CO 80523-1170, Phone: 970-491-6881, FAX: 970-491-0564. E-mail: [Eugene.Kelly@colostate.edu](mailto:Eugene.Kelly@colostate.edu).

#### ASSISTANT PROFESSOR ENVIRONMENTAL POLICY AND SCIENCE MCDANIEL COLLEGE

McDaniel College invites applications for a tenure track Assistant Professor of Environmental Policy and Science (EPS) beginning Fall 2005. Minimum qualifications include a Ph.D. in Environmental Studies, Environmental Science, or related fields. Preferred areas of expertise include, but are not limited to: environmental geology, hydrology, and geochemistry. Familiarity with GIS is desirable and policy experience is a distinct plus. EPS is a new interdisciplinary academic program anchored equally in the natural and physical sciences and in the social sciences. The successful candidate is expected to advise EPS majors, contribute to the growth of the program, and foster interdisciplinary collaborations on campus. McDaniel College is a selective, private liberal arts college located near Baltimore and Washington, DC.

Interested persons should send a letter of application, CV, a statement of teaching philosophy, a statement of

research interests, list of publications, and three letters of reference to: Dr. Esther Iglich, EPS Search Chair, McDaniel College, 2 College Hill, Westminster, MD 21157-4390. Review of applications will begin on January 3, 2005 and continue until the position is filled. McDaniel College is an AA/EEO and an award-winning ADA employer. Women and minorities are encouraged to apply.

#### SOLID EARTH SCIENCES UNIVERSITY OF FLORIDA

The Department of Geological Sciences, University of Florida, invites applications for a tenure-track assistant professor position in the solid earth sciences to begin in the 2005-2006 academic year. Preference will be given to quantitative, process-oriented scientists who will develop vigorous and innovative research and instructional programs which will complement current strengths of the Department in geochemistry and geophysics (e.g., chemical and physical geodynamics, mineralogy-petrology, crust-mantle evolution, paleoclimatology-paleoceanography, hydrogeology, and paleomagnetism). We are particularly interested in candidates focused on research that integrates with the Department's planned growth into the fields of nanogeoscience, geodynamics, planetary geology, coastal processes, and carbonate sedimentology. See [web.geology.ufl.edu](http://web.geology.ufl.edu) for information concerning departmental research programs, facilities, and affiliations.

Qualified candidates should send a letter of interest, including a statement of research and teaching goals, a CV, and the names and addresses of at least three references by 7 January 2005 to the search committee chair: Dr. David A. Foster ([dfoster@geology.ufl.edu](mailto:dfoster@geology.ufl.edu)), Department of Geological Sciences, Box 112120, 241 Williamson Hall, University of Florida, Gainesville, Florida 32611. Ph. (352) 392-2231/FAX (352)-392-9294.

The University of Florida is an equal opportunity employer; qualified women and minorities are especially encouraged to apply.

#### TWO ASSISTANT PROFESSOR POSITIONS BOONE PICKENS SCHOOL OF GEOLOGY OKLAHOMA STATE UNIVERSITY

The Boone Pickens School of Geology at Oklahoma State University (OSU) seeks applications for two tenure-track faculty positions. The appointments will be at the assistant professor level and are effective August 16, 2005. Applicants are required to have a Ph.D. degree in geological sciences at the time of appointment.

The applicants must show promise of an outstanding research program and be committed to excellence in teaching. Applicants should have demonstrated research capabilities in one of the following disciplines: (1) Petrophysics/Well log Analysis; (2) Contaminant Hydrogeology/Aqueous Geochemistry; (3) Basin Analysis/Sedimentology/Stratigraphy/Clastic and/or Nonclastic Petrology and Petrography; (4) Numerical Modeling of Geological Processes.

Preference will be given to those candidates who have previous undergraduate and/or graduate teaching experience, and have published refereed articles in his or her discipline. The successful candidates will be expected to develop a fundable research program that is discipline specific and/or interdisciplinary, and that involves coordination with other researchers within the School of Geology, other departments at Oklahoma State University, and/or other universities.

The regular teaching load at the School of Geology is two courses per semester. The successful candidates will be expected to supervise M.S. graduate students and develop courses in his or her specialty. In addition they will participate in teaching introductory geology courses.

Candidates should submit a letter of application, including a discussion of research interests and approach to teaching, along with a curriculum vitae; academic transcripts; and the names, addresses, e-mail addresses, and phone numbers of five references to: Assistant Professor Positions Search, School of Geology, 105 Noble Research Center, Oklahoma State University, Stillwater, Oklahoma 74078-3031. Phone: (405)-744-6358. Fax: (405) 744-7841. Screening of candidates will begin on January 17, 2005, and will continue until the positions are filled.

Oklahoma State University is an Affirmative Action/Equal Opportunity Employer. The positions are subject to availability of funding.

More information on OSU and the Boone Pickens School of Geology can be found on the web <http://www.pio.okstate.edu> and <http://www.okstate.edu/geology> respectively.

#### TENURE-TRACK ASSISTANT PROFESSOR OF GEOLOGY APPALACHIAN STATE UNIVERSITY

The Department of Geology at Appalachian State University invites applications for a 9-month tenure-track position, beginning August 2005. The primary responsibilities are the development and coordination of programs



for the new McKinney Geological Teaching Museum. The candidate must have a Ph.D. and possess experience in and a strong commitment to undergraduate education and public outreach. The successful candidate is expected to seek external funding in support of the museum's programs. The area of specialization within Geology is open and the candidate is expected to show evidence of scholarship within that field. Teaching responsibilities will be primarily introductory geology lectures and laboratories, but may include upper-level courses in the specialty.

Applications must include a letter of interest, vita, a statement of career goals, copies of transcripts of all college and university work (official copies due upon employment), and the names and contact information (including e-mail) of three referees familiar with the applicant's work in museum programming/outreach and teaching. Send applications to Dr. Ellen A. Cowan, Chair of Search Committee, Department of Geology, Appalachian State University, P.O. Box 32067, 195 Rankin Science Bldg., Boone, NC 28608-2067. Review of completed applications will begin January 31, 2005, and will continue until the position is filled. Appalachian State, located in the Blue Ridge of the western North Carolina mountains, is a comprehensive university and a member of the University of North Carolina System. More information about the museum and position responsibilities can be found at [www.geology.appstate.edu](http://www.geology.appstate.edu). Appalachian State University is an Equal Employment Opportunity/Affirmative Action employer.

**ASSISTANT OR ASSOCIATE PROFESSOR  
(2 POSITIONS)  
DEPARTMENT OF GEOLOGICAL SCIENCES  
UNIVERSITY OF TEXAS AT EL PASO**

The Department of Geological Sciences, University of Texas at El Paso, is inviting applications for two full time tenure-track positions, one in hydrology and one in earth system science at either the assistant or associate rank, beginning in September 2005. We are particularly interested in finding candidates with strong interdisciplinary focus who are also intrigued by the prospect of exploring environmental challenges that stem from urban development in a bi-national arid region.

**HYDROLOGY:** All specialties in hydrology are encouraged to apply including groundwater hydrology, surface water hydrology, and surface/groundwater interaction. The region offers many exciting research topics as we rely heavily on groundwater resources, supplemented with limited flows from the Rio Grande.

**EARTH SYSTEM SCIENCE:** We seek applicants with research and teaching interests that include isotope geochemistry, geobiology, soil science, surface processes, and the interactions of lithosphere, hydrosphere, and atmosphere.

The Department of Geological Sciences supports undergraduate, M.S., and Ph.D. degrees in Geological Sciences as well as interdisciplinary undergraduate, M.S., and Ph.D. programs in Environmental Science and Engineering. The candidates are expected to teach introductory classes as well as upper division and graduate classes that serve both the Environmental and Geological Sciences.

The Department is in a spacious building that contains extensive analytical and computing facilities and has excellent capabilities in remote sensing, GIS and environmental geophysics that can be applied to research. In addition, the collaborative research environment on our campus affords easy access to a superb variety of analytical equipment in other departments. For more information about activities and facilities, visit our web site at <http://www.geo.utep.edu>.

**QUALIFICATIONS REQUIRED:** The candidates must have Ph.D. degrees at the time of appointment. We are seeking candidates capable of building active research programs and who enjoy collaborative research.

**APPLICATION PROCEDURE:** Candidates should send a letter of application, curriculum vitae, description of teaching and research interests, and the names of three people willing to provide professional references to: Diane Doser, Chair Department of Geological Sciences, The University of Texas at El Paso, El Paso, Texas 79968, [doser@geo.utep.edu](mailto:doser@geo.utep.edu). Review of applications will begin immediately and continue until positions are filled. The University of Texas at El Paso is an equal opportunity employer committed to excellence through diversity. Underrepresented groups are encouraged to apply. The University is also a recipient of a National Science Foundation ADVANCE Institutional Transformation Award to increase the participation of women in academic science and engineering careers. The ADVANCE initiative includes an active dual career partner program.

**TWO-YEAR POST-DOC IN SEDIMENTARY GEOLOGY  
CENTRAL MICHIGAN UNIVERSITY**

The Department of Geology at Central Michigan University invites applications for a two-year post-doctoral research

**NATIONAL SCIENCE FOUNDATION  
DIRECTORATE OF GEOSCIENCES**

The National Science Foundation's Directorate of Geosciences is seeking a qualified applicant for the position of Program Director for Diversity and Education.

The Diversity and Education Program promotes broadening the participation of groups traditionally underrepresented in the geosciences, including women, minorities, and persons with disabilities. The Program also supports geoscience education activities that integrate geoscience research and education and leads to improvements in the quality of geoscience education at all levels.

Appointment to this position may be made on a permanent or temporary basis. Temporary appointments can be made either as one or two-year Visiting Scientist, or as a Federal Temporary employee, with a salary range of \$85,210 to \$132,791. Alternative temporary appointments may be filled under the terms of the Intergovernmental Personnel Act (IPA). Individuals that wish to be considered for permanent and temporary appointments should apply separately in both categories.

Applicants must possess a Ph.D. or equivalent experience in a field of geosciences research or education. In addition, six or more years of successful research, research administration, and/or managerial experience pertinent to the program is required.

Applicants interested in a permanent position may see announcement E20050009. Applicants interested in a Visiting Scientist, IPA, or Federal Temporary appointment may see announcement E20050008-Rotator. Both announcements, with position requirements and application procedures, are located on the NSF Home Page at [www.nsf.gov/jobs](http://www.nsf.gov/jobs). Applicants may also obtain the announcements by contacting Maria Sutton at 703-292-4364. For technical information, call Ms. Vanessa Richardson at 703-292-8500. Hearing-impaired individuals should call TDD at 703-292-8044. Applications must be received by January 31, 2005.

NSF IS AN EQUAL OPPORTUNITY EMPLOYER COMMITTED TO EMPLOYING A HIGHLY QUALIFIED STAFF THAT REFLECTS THE DIVERSITY OF OUR NATION

associate position in sedimentary geology. Research responsibilities will include two weeks of field work in Australia (studying acid and neutral saline lakes), evaporite and siliciclastic petrography, water analyses, and fluid inclusion studies. Experience and a Ph.D. in Sedimentary Geology is required. Documented experience in evaporite sedimentology and geochemistry is preferred, but not required.

Salary is \$36,000/year with a full benefits package. Send vita, a short description of research interests and experience, and contact information for two referees by 1/31/05 to Kathy Benison, Dept. of Geology, 314 Brooks Hall, Mt. Pleasant, MI 48859.

Serving 28,000+ students, CMU is an innovative doctoral/research-intensive institution with strong undergraduate education and focused graduate programs and research. CMU, an AA/EO institution, strongly and actively strives to increase diversity within its community (see <http://www.cmich.edu/aaeo/>).

**FACULTY POSITION, THE COLORADO COLLEGE**

The Department of Geology invites applications for a tenure track position beginning in August 2005. Field and rank are open, but appointment at the rank of Assistant Professor is strongly preferred. A Ph.D. is required. We seek outstanding candidates who will complement but not duplicate existing strengths in geomorphology, glacial geology, sedimentation, stratigraphy, low-temperature geochemistry, petrology, and structural geology.

Teaching responsibilities will include: field-based Introductory Geology; courses in the candidate's areas of expertise; and undergraduate research mentoring. Ability to establish a research program is essential. Interaction with the Environmental Sciences program and participation in the college's interdisciplinary programs is desirable.

Applicants must be committed to high-quality innovative undergraduate teaching, including field-oriented courses. Colorado College is a private liberal arts college distinctive for its modular "Block Plan" calendar, which lends itself to field- and project-based teaching. The academic year is divided into eight 3-1/2 week blocks. Students take and faculty teach one course at a time, with a maximum enrollment of 25 students per class. The College supports faculty research through release time and summer grants. The Department has six tenure-track

faculty and four staff positions, a large group of dedicated majors, and excellent field, laboratory, and computer facilities for teaching and research.

The successful candidate will support and contribute to the goal of achieving greater diversity at Colorado College, and will be able to work effectively with the many constituencies in a college environment. Candidates are encouraged to apply and identify their strengths or experiences in contributing to greater diversity. More information about Colorado College and the Department of Geology is available at <http://www.coloradocollege.edu>

Send statement of teaching and research interests, curriculum vitae, and have three letters of reference sent by February 1, 2005 to: Jeffrey B. Nobelet, Chair, Department of Geology, Colorado College, Colorado Springs, CO 80903.

**EQUAL OPPORTUNITY EMPLOYER** - The Colorado College welcomes members of all groups and reaffirms its commitment not to discriminate on the basis of race, color, age, religion, sex, national origin, disability, or sexual orientation in its educational programs, activities, and employment practices.

**PETROLEUM GEOLOGISTS AND GEOPHYSICISTS  
PETROLEUM INSTITUTE, ABU DHABI**

The Petroleum Geosciences Program of The Petroleum Institute, Abu Dhabi, is seeking outstanding candidates for several possible positions:

**Petrophysics-well-logging.** Ph.D. or M.Sc. in a relevant geoscience is required. Candidates must have expertise in petrophysical laboratory measurements and be skilled at integrating modern log, core, seismic, and fluid and pressure data to interpret the subsurface and to predict reservoir performance. Experience with carbonates is advantageous.

**Reflection seismology.** Ph.D. in relevant area of geoscience required. Candidate must have expertise in seismic processing, with skills in advanced processing, seismic inversion, seismic imaging, and multi-attribute and multi-component analyses, or have expertise in seismic interpretation and experience interpreting seismic attributes. Experience with carbonates is advantageous.

**Geochemistry.** Ph.D. in relevant area of geoscience required. Candidates must have expertise in inorganic geochemistry of carbonate petroleum systems and fluids

and in environmental geochemistry.

**Petroleum Geoscience.** Ph.D. or M.Sc. in relevant area of geoscience required. Candidates must have experience in petroleum exploration, development, and reservoir management, modern geoscience technology and software, and be familiar with modern industry trends.

Faculty in Petroleum Geosciences will teach undergraduate and graduate courses, develop an active research program that impacts the UAE petroleum industry, and engage in institutional service work. Opportunities exist to work with PI industry stakeholders in research. Teaching experience and petroleum industry experience are desirable for all positions. Appointments will be at a rank commensurate with experience.

The Petroleum Institute is a small, highly focused, teaching and research institute that offers educational programs that will lead to B.Sc., M.Sc., and Ph.D. degrees in engineering and petroleum geosciences. Faculty will have the resources to equip laboratories with up-to-date analytical equipment and computer software and hardware to support teaching and research.

The compensation package for staff includes housing, utilities, home furnishings loan, automobile purchase loan, and annual leave travel.

This is an unusual opportunity for self-motivated geoscientists to help build a world-class teaching and research institution. Additional information is at [www.pi.ac.ae/](http://www.pi.ac.ae/). Interested candidates should send an application and their résumé to [rwinn@pi.ac.ae](mailto:rwinn@pi.ac.ae) and to [mkassim@pi.ac.ae](mailto:mkassim@pi.ac.ae). Please submit a hardcopy application only if unable to submit electronically to:

Faculty Recruitment Coordinator-Petroleum Geosciences Program, Petroleum Institute, P.O. Box 2533, Abu Dhabi, United Arab Emirates.

Candidates are encouraged to submit an application as soon as possible and no later than 31 January 2004, although applications will be considered until vacant positions are filled.

#### SEDIMENTARY GEOLOGY AND PALEONTOLOGY UNIVERSITY OF WYOMING

The Department of Geology and Geophysics (<http://home.gg.uwyo.edu>) invites applications for two tenure-track positions—Sedimentary Geology and Paleobiology.

**Sedimentary Geology**—We are seeking an assistant professor (associate professor with appropriate qualifications) in sedimentology/stratigraphy. We seek an individual who shows the potential to develop an internationally recognized, externally funded research program, will be involved in the undergraduate and graduate teaching mission of the department, and will build on departmental strengths in sedimentation, energy research, seismology and structural geology. Specialty is open, but may include such diverse fields as quantitative basin analysis, seismic stratigraphy, carbonate sedimentation, physical sedimentology and sediment transport. Review of completed applications will begin December 15, 2004.

**Paleobiology**—We are seeking an assistant professor in paleobiology. Specialty is open but may include such diverse fields as vertebrate and invertebrate paleontology, paleoecology, paleoclimate reconstruction, and evolutionary biology in a geologic context. Expectations include developing an internationally recognized, externally funded research program and teaching graduate/upper-level courses in the specialty and an introductory level course in paleobiology/paleontology. Review of completed applications will begin November 29, 2004.

The Department is home to the Institute for Energy Research (<http://www.ieronline.org/>) and the University has a strong and long-standing commitment to energy-related research in the geosciences. The Department also has a renowned vertebrate collection, a smaller invertebrate collection, and excellent research facilities. The University is developing strong interdisciplinary programs in Ecology, Molecular and Cellular Life Sciences, Earth System Science, and Environment and Natural Resources.

Ph.D. is required at time of appointment, August 2005. Applicants should include a statement of research and teaching interests and accomplishments, curriculum vitae, and the names and contact information of three references. Send application materials to either: Sedimentary Search Committee or Paleobiology Search Committee, Dept. of Geology & Geophysics, University of Wyoming, 1000 E. University Ave., Dept. 3006, Laramie, WY 82071.

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

#### EAST TENNESSEE STATE UNIVERSITY TENURE TRACK POSITION, DEPARTMENT OF PHYSICS, ASTRONOMY, AND GEOLOGY

Tenure track position beginning August 2005. As part of continuing efforts to expand our geology program, we seek an exceptional individual who combines field based research with theoretical studies. Preference will be given to those individuals who specialize in carbonate geology and/or whose research includes the Appalachians. The

successful applicant will be expected to teach introductory geology (historical and/or physical), petrography and graduate-level courses in his/her specialized topic; establish a rigorous, externally funded research program; advise students; oversee student projects; serve on committees; contribute to curriculum development; and perform departmental duties as assigned. Qualifications: Ph.D. in geology or a related field required; completion at time of appointment. Position will remain open until filled, and is contingent upon state funding. For more information contact [Whitelaw@etsu.edu](mailto:Whitelaw@etsu.edu). Submit a letter of application, statement of teaching philosophy, curriculum vitae, transcripts, and three letters of recommendation to Dr. Michael J. Whitelaw, Geology Search Committee Chair, Department of Physics, Astronomy and Geology, East Tennessee State University, Box 70652, Johnson City, TN 37614.

#### COASTAL GEOLOGY (TEMPORARY POSITION) GEORGIA SOUTHERN UNIVERSITY

**POSITION DESCRIPTION.** The Department of Geology and Geography invites applications for a *temporary position* in coastal geology. Specific areas of expertise might include, but are not limited to, beach and near-shore sedimentation, coastal geomorphology, shallow marine environments, or coastal plain geology. This individual will teach sedimentation and stratigraphy, coastal geology, and will share responsibility for courses in environmental geology and historical geology and associated laboratories. The rank (either Assistant or Associate Professor of Geology) and salary will be commensurate with the applicant's experience and accomplishments. Preference will be given to candidates who have active research projects on the Atlantic Coast of the United States, who apply GIS to their research, and those with prior undergraduate teaching experience. A Ph.D. in geology or a closely related field must be completed by the position starting date of August 1, 2005. The one-year position may be renewable for two additional one-year appointments.

**THE UNIVERSITY AND THE DEPARTMENT.** Georgia Southern University (<http://www.georgiasouthern.edu/>), a unit of the University System of Georgia, is the largest center of higher education in the southern half of Georgia. The Department of Geology and Geography offers courses that lead to the BS and BA degrees with majors in both geography and geology. The Department's web site (<http://cost.georgiasouthern.edu/geol/>) provides an overview of our programs, faculty, and facilities, as well as a more extensive description of this position.

**APPLICATION INFORMATION.** Please direct a letter of application including a statement of research and teaching interests, a curriculum vitae, supporting documentation (such as reprints and evidence of teaching effectiveness), and the names, e-mail addresses, and telephone numbers for three references to: Dr. Charles H. Trupe, Search Committee Chair, Department of Geology and Geography, P.O. Box 8149, Georgia Southern University, Statesboro, GA 30460-8149. Initial review of applications begins on December 15, 2004 and will continue until the position is filled.

The names of applicants and nominees, résumés, and other general non-evaluative information may be subject to public inspection under the Georgia Open Records Act. Persons who need reasonable accommodations under the Americans with Disabilities Act in order to participate in the search process should notify the Search Committee Chair, Georgia Southern University is an Affirmative Action/Equal Opportunity Institution.

#### LOW-TEMPERATURE GEOCHEMIST UNIVERSITY OF COLORADO AT BOULDER

The Department of Geological Sciences, University of Colorado at Boulder, invites applications for a tenure-track position in low-temperature geochemistry. We anticipate hiring at the assistant professor level, but applications at other levels will be considered from those who would strengthen the Department's diversity. We seek applicants with a demonstrated potential for innovative research that is likely to lead to a strong, externally funded research program; postdoctoral experience is beneficial. Any applicant specializing in the study of low temperature geochemical processes operating at and near the Earth's surface will be considered, but candidates working in geomicrobiology; aqueous geochemistry; climate change; sediment-, soil- or rock-water interactions; or the contamination of soil and water are preferred. The successful candidate will be expected to teach an undergraduate course in geochemistry, offer graduate level courses in their specialty, and contribute to the Department's non-major course offerings. Information regarding the Department can be found at <http://www.colorado.edu/GeoSci/>.

Applicants should send a current CV, statements of teaching and research interests, and the names of at least three potential references to: Chair, Geochemist Search, Department of Geological Sciences, University of Colorado, 399 UCB, Boulder, CO 80309-0399.

Inquiries for additional information should be directed

to Dr. David A. Budd ([budd@colorado.edu](mailto:budd@colorado.edu)). Review of applications will begin on January 3, 2005. Applications will be accepted until the position is filled. The University of Colorado at Boulder is committed to diversity and equality in education and employment.

#### ILLINOIS STATE GEOLOGICAL SURVEY TRANSPORTATION & ENVIRONMENT CENTER DIRECTOR

Provide leadership, scientific vision and direction to the Center's staff; encourage multi-disciplinary, service and applied research projects; facilitate coordination, communication and teamwork throughout the Survey. Evaluate Center office staff and managers and review/recommend personnel actions. Respond to queries from other agencies and the private and public sectors. Review proposals, interact with funding agencies, help seek external funds and manage internal funds. Provide expert advice in area of expertise to public, government and industry. Salary range: \$80,000-\$85,000. Closing date 12/31/04. For required application form and more information visit [www.isgs.uiuc.edu](http://www.isgs.uiuc.edu) or contact [walston@isgs.uiuc.edu](mailto:walston@isgs.uiuc.edu) or 217-244-2401, Human Resources, ISGS, 615 East Peabody, Champaign IL 61820. EEO/ADA Employer.

#### GEOCHEMIST SPECIALIZING IN CLIMATE CHANGE AND/OR

#### ENVIRONMENTAL GEOCHEMISTRY RESEARCH

The Department of Geology and Geophysics at Texas A&M University invites applications for a tenure-track faculty position in low-temperature geochemistry exploring the complexity of (bio)geochemical trends, cycles, and feedbacks between marine, terrestrial and atmospheric systems through geologic time. This position is part of the College of Geosciences' new Climate Change initiative, which is in its second year of a four-year plan to add eight positions. This is in addition to 13 new positions in two other signature areas. The position is budgeted at the senior level, but applicants at all levels will be considered. Applicants should possess a Ph.D. in Geosciences or related fields.

We specifically seek applicants specializing in the development and application of multi-collector inductively coupled plasma mass spectrometer (MC-ICP-MS) to the study of climate change, geochemical cycles, and the biogeochemistry of surficial systems. The successful candidate will be expected to develop a vigorous, externally-funded research program and teach at the graduate and undergraduate levels, including the mentoring of graduate students. A new isotope geochemistry facility is being built that will include shared clean laboratory space, a thermal ionization mass spectrometer, and the MC-ICP-MS. The candidate will have the opportunity to contribute to this lab's development.

The Department of Geology and Geophysics (<http://geoweb.tamu.edu>) is part of the College of Geosciences, which also includes the Departments of Geography, Oceanography, and Atmospheric Sciences, Sea Grant, the Geochemical and Environmental Research Group (GERG), and the Integrated Ocean Drilling Program (IODP). Interested candidates should send a current curriculum vitae, statement of teaching and research interests, and the names, postal addresses, and e-mail addresses of four references to Dr. Ethan L. Grossman, Search Committee Chair, Department of Geology & Geophysics, Texas A&M University, College Station, TX, USA 77843-3115. Applications will be reviewed beginning 1 December 2004, with a start date of September 2005. Texas A&M University is an affirmative action/equal opportunity employer committed to excellence through diversity and encourages application from minorities, women, veterans and persons with disabilities.

#### LAURENTIAN UNIVERSITY DEPARTMENT OF EARTH SCIENCES MINERAL EXPLORATION RESEARCH CENTRE METAMORPHIC PETROLOGY AND IGNEOUS PETROLOGY

The Department of Earth Sciences and Mineral Exploration Research Centre at Laurentian University invite applications for two tenure-track faculty positions to be filled in July 2005 in the areas of Metamorphic Petrology and Igneous Petrology. We are particularly interested in candidates who have strong field and theoretical backgrounds in ore deposit geology and Precambrian geology. Additional information and application instructions can be found at [www.laurentian.ca/geology](http://www.laurentian.ca/geology). Screening of applications will begin on 01 January 2005, but applications will be accepted until the positions are filled. Laurentian University is a bilingual institution and an equal opportunity employer. It has a policy of passive bilingualism (English/French) as a condition of tenure. The university is committed to equity in employment and encourages applications from women, aboriginal peoples, members of visible minorities, and persons with disabilities.



**STRUCTURAL GEOLOGY, TENURE-TRACK POSITION  
DEPARTMENT OF GEOLOGY  
APPALACHIAN STATE UNIVERSITY**

The Department of Geology at Appalachian State University invites applications for a tenure-track position at the Assistant Professor level, beginning August 2005. The candidate must have a Ph.D. at the time of appointment and must possess strong commitments to undergraduate education and research. We seek a structural geologist with a field-based research program and an interest in involving undergraduates in that research. Applicants with additional expertise in one or more of the following areas are encouraged to apply: engineering geology, neotectonics and remote sensing, or instruction in field techniques. Candidates are expected to take advantage of the regional geologic setting of the Southern Appalachians in teaching upper-level courses.

Applications must include a letter of interest, vita, a statement of career goals, copies of transcripts of all college and university work (official copies due upon employment), and the names and contact information (including e-mail) of three referees familiar with the applicant's teaching and scholarship. Send applications to Bill Anderson, Chair of Search Committee, Department of Geology, Appalachian State University, P.O. Box 32067, 195 Rankin Science Bldg., Boone, NC 28608-2067. Review of completed applications will begin December 1, 2004, and will continue until the position is filled.

Appalachian State is a comprehensive university located in the Blue Ridge Mountains of western North Carolina and is a member of the University of North Carolina System. The Department of Geology offers several B.A. and B.S. degrees. Appalachian State University is an Equal Employment Opportunity/Affirmative Action employer.

**LAFAYETTE COLLEGE, GLOBAL CHANGE  
GEOLOGIST**

Tenure-track Assistant Professor beginning Fall 2005. We seek a geologist with training and research interests in Global Change, such as earth scientists using geological, chemical, physical, geophysical, biogeological, or isotopic techniques to understand Earth System Science, with a focus on broad questions of importance to humans. Ph.D. required, evidence of high-quality teaching and research preferred.

Individual must have a strong interest in teaching undergraduates and establishing and maintaining an active research program involving undergraduates. Teaching includes an upper-level specialty course, development of an introductory course, and participation in the core curriculum (First-Year Seminar or Values and Science/Technology). Applicants may describe additional courses they may wish to teach.

Lafayette College is a private undergraduate liberal arts college with an engineering division and 2,200 students.

Send cv, separate statements of teaching and research interests, graduate and undergraduate transcripts, and three reference letters to Dru Germanoski, Head, Dept. of Geology and Environmental Geosciences, Lafayette College, Easton, PA 18042-1768. We will interview at the Geological Society of America meeting in Denver; however, applications will be accepted through Jan. 31, 2005, or until position is filled. EEO/women and minorities encouraged to apply.

**MICROBIAL ECOLOGY AND PALEOECOLOGY  
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 microbial ecology and paleoecology. We seek an outstanding colleague who applies quantitative analytical techniques to the characterization of modern and ancient microbial communities and whose research contributes to the understanding of modern microbial systems and the reconstruction and evolution of microbial communities and their activity preserved in the rock record. Priority consideration will be given to individuals with expertise in molecular biology or novel isotopic techniques applied to the study of microbial communities. The successful candidate will be expected to establish an externally funded interdisciplinary research program, direct graduate students, and participate in teaching graduate and undergraduate students. Refer to [www.geo.ku.edu](http://www.geo.ku.edu) and links for additional information about the department and the University of Kansas. Appointment will begin August 18, 2005, or later.

Applicant must have a completed Ph.D. degree by the starting date. Applicants must submit with their letter of application separate statements of teaching and research interests, Curriculum Vitae, and the name and contact information of at least three references. Send all material to Microbial Ecology and Paleoecology Search; Attention: Luis A. González, Department of Geology, 1475 Jayhawk Blvd., 120 Lindley Hall, University of Kansas, Lawrence, KS 66045-7613 (tel. 785-864-2743; fax 785-864-5276,

e-mail [Igonzlez@ku.edu](mailto:Igonzlez@ku.edu)). Review of completed applications will begin November 15, 2004, and will continue until the position is filled. EO/AA Employer. The University of Kansas is committed to increasing the ethnic and gender diversity of its faculty and we strongly encourage applications from underrepresented group members. This position is contingent of final budgetary approval.

**UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL  
EARTH SURFACE CHRONOLOGY**

The Department of Geological Sciences at the University of North Carolina at Chapel Hill invites applications for a tenure-track faculty position at the assistant professor level to begin July 1, 2005.

We seek applicants who pursue research in near-surface processes through low-temperature or cosmogenic chronometry. The successful applicant will use chronologic methods to quantify the timing and rates of tectonic, geomorphologic, sedimentologic, climatic/oceanographic, hydrologic or biologic events and processes. We are interested in candidates who use absolute dating techniques to decipher exhumation history, land-surface evolution, sediment transport and deposition, or high-resolution stratigraphy. Departmental equipment includes a multi-collector thermal ionization mass spectrometer with complete element-separation and clean-lab facilities, an SEM, a DCP, and access to other instruments (ICP-MS w/ laser, electron microprobe, gas source mass spectrometers) in the Marine Sciences Department and at Duke University and N.C. State University.

Applicants must hold a Ph.D. at the time of appointment, and postdoctoral and teaching experience is highly desirable. The successful candidate is expected to establish a vigorous, externally funded research program and to demonstrate excellence in undergraduate and graduate education.

Applicants must submit a letter of application, vita, statements of research and teaching interests, and the names and contact information for four references to Surface Chronology Search, Department of Geological Sciences, CB # 3315 Mitchell Hall, University of North Carolina, Chapel Hill, NC 27599-3315. We will begin reviewing applications December 1, 2004 and continue until the position is filled, and will initiate the interview process by early January of 2005. For more information on the department and the university see [www.geosci.unc.edu](http://www.geosci.unc.edu). Members of the department will be present at the GSA meeting in Denver and AGU meeting in San Francisco.

The University of North Carolina at Chapel Hill is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply.

**TURNER POSTDOCTORAL FELLOWS  
THE UNIVERSITY OF MICHIGAN**

The Department of Geological Sciences invites applications for Turner Postdoctoral Fellows, which are positions of two-year duration that are open to any area in the Geological Sciences. We offer a competitive compensation package that includes benefits and a travel/research fund. Applicants are encouraged to collaborate with existing researcher(s) at the University of Michigan or to propose an independent research project, which cost-share salary with other sources involving research and/or teaching responsibilities. Visit our Department web pages for more information on faculty and research (<http://www.geo.lsa.umich.edu>); contact Profs. Eric Essene ([essene@umich.edu](mailto:essene@umich.edu)), Ben van der Pluijm ([vdpluijm@umich.edu](mailto:vdpluijm@umich.edu)) or Lynn Walter ([lmwalter@umich.edu](mailto:lmwalter@umich.edu)) for additional information. Please submit a curriculum vitae, a brief (3 pages or less) research proposal and names of at least three references by January 7, 2005 to: by email, [turnerpdf@umich.edu](mailto:turnerpdf@umich.edu); by mail, Turner Postdoctoral Committee, Dept. of Geological Sciences, 425 E University Ave., Univ. of Michigan, Ann Arbor, MI 48109-1063.

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

**TENURE TRACK ASSISTANT/ASSOCIATE  
PROFESSOR  
TERRESTRIAL PALEOENVIRONMENTS  
DEPARTMENT OF GEOLOGICAL SCIENCES  
BROWN UNIVERSITY**

The Department of Geological Sciences (<http://www.geo.brown.edu>) invites applications for a tenure-track faculty appointment in Terrestrial Paleoenvironments. We seek a creative scientist addressing fundamental problems in regional-continental scale terrestrial paleoenvironments and climate responses through the use of paleobiological, geochemical, and/or modeling techniques. Themes of interest include the paleo perspective on the terrestrial water cycle, the past cycling of carbon and nutrient elements and implications for land-sea interactions, mechanisms of past abrupt/extreme climate change, and past climate-related changes in ecosystems and diversity. To foster interactions with members of the

Earth System History group (<http://www.geo.brown.edu/research/ESHFrameset.htm>), preference will be given to candidates working on problems of Holocene and/or Cenozoic paleoenvironments. Candidates with interests that bridge to Modern processes will find additional opportunities for collaboration within Brown's new interdisciplinary Environmental Change Initiative (<http://www.brown.edu/Research/ECI/>) and the Brown-Marine Biological Laboratory Joint Graduate Program (<http://www.brown.edu/Research/MBL/index.htm>). The successful candidate will maintain an active, externally-funded research program and enjoy a commitment to teaching at both undergraduate and graduate levels. Appointment is expected at the Assistant Professor level, although exceptional candidates might warrant appointment as Associate Professor.

Applicants should forward a curriculum vita, descriptions of research and teaching interests, and a list of at least three potential referees to Timothy Herbert, Chair, Search Committee, Department of Geological Sciences, Box 1846, Brown University, Providence, RI 02912-1846.

Applications received by December 17, 2004, will receive full consideration, but the search will remain open until the position is closed or filled. The anticipated start date of the position could be as early as July 1, 2005.

Brown University is an equal opportunity/affirmative action employer. We welcome applications from minority or female candidates.

**GEOSCIENCE PROFESSORSHIPS  
UNIVERSITY OF MICHIGAN  
GEOLOGICAL SCIENCES**

The Geological Sciences Department at the University of Michigan is seeking to fill two faculty positions with September 2005 starting dates. The positions may be enhanced by the newly established Henry N. Pollack Professorship Endowment. We are seeking candidates at the Assistant, Associate or Full Professor level.

The department plans to fill positions over the coming years in several areas spanning the general fields of Earth System Science and Geological Hazards. Applicants with strengths in any of the following fields are especially encouraged to apply: physical and chemical processes linking the atmosphere, hydrosphere, and terrestrial surface; interactions between biological and geological processes; neotectonics; processes that occur in coastal environments; and seismology. Priority will be given to applicants that complement existing strengths in the Geological Sciences and/or interactions with other closely related departments at the University of Michigan.

Successful candidates are expected to establish independent research programs and contribute to undergraduate and graduate teaching. Applicants should send curriculum vitae, statement of present and future research plans, statement of teaching experience and interests, and the names of at least four persons who can provide letters of recommendation. Additional information about the department can be found at: [www.geo.lsa.umich.edu](http://www.geo.lsa.umich.edu).

Applications should be sent to: Joel D Blum, Chair, Department of Geological Sciences, 425 E. University Avenue, University of Michigan, Ann Arbor, MI 48109-1063.

For full consideration applications should be received before January 3, 2005. The University of Michigan is a non-discriminatory/affirmative action employer. Women and minorities are encouraged to apply. The University is supportive of the needs of dual career couples.

**SURFACE PROCESSES, BOSTON UNIVERSITY**

The Department of Earth Sciences at Boston University invites applications for a tenure track position at the Assistant Professor level in Surface Processes, starting September 1, 2005. We seek an applicant whose research emphasizes quantitative studies that link landscape evolution, sediment transport, hydrologic processes, tectonics, and/or climatic change. We encourage applications from individuals who apply field-based, theoretical, and/or experimental approaches to Surface Processes.

The successful applicant will be expected to supervise graduate thesis work in M.A. and Ph.D. programs, maintain an externally funded research program, and teach at all levels in the Earth Sciences curriculum. We seek an applicant whose research complements departmental expertise in glacial geomorphology, paleoclimate reconstruction, biogeochemistry, hydrologic processes, lithospheric deformation and tectonics, and/or coastal processes. Interaction is encouraged with various departments including Geography, Chemistry, and Physics, as well as the Center for Remote Sensing and the B.U. Marine Program. For more information about the Department, see <http://www.bu.edu/ES/>. A Ph.D. at the time of appointment is required. Applicants should send a curriculum vitae, a statement of research and teaching interests, and the names and addresses of at least three referees to: Search Committee Chair, Department of Earth Sciences, Boston University, 685 Commonwealth Ave.,



**HARVARD UNIVERSITY**  
DEPARTMENT OF EARTH &  
PLANETARY SCIENCES

The Department of Earth & Planetary Sciences at Harvard University seeks to fill two faculty positions at the Assistant or Associate Professor levels (untenured) in the broadly defined areas of solid earth geophysics and surface processes. These new positions are part of broad initiatives for growth in the Department of Earth and Planetary Sciences and the Division of Engineering and Applied Sciences at Harvard University.

Applicants should send (by mail or email) a statement of research and teaching interests, curriculum vitae, and the names and contact information, including email addresses, of three references to:

Solid Earth Search Committee  
c/o Reyna Truscott

Department of Earth & Planetary Sciences  
Harvard University, 20 Oxford Street  
Cambridge, MA 02138 USA  
Email: truscott@eps.harvard.edu

Applications will be reviewed beginning December 15th, 2004. We particularly encourage applications from women and minorities. Harvard University is an Affirmative Action/Equal Opportunity Employer. For more information about the Department, please visit our web site at [www.eps.harvard.edu](http://www.eps.harvard.edu).

Boston MA 02215 USA; email: [earth@bu.edu](mailto:earth@bu.edu). Review of applications will begin on December 1, 2004. Women and underrepresented minorities are particularly encouraged to apply. Boston University is an equal opportunity/affirmative action employer.

**DIRECTOR WITH FACULTY APPOINTMENT  
ENVIRONMENTAL MANAGEMENT DOCTORAL  
PROGRAM  
EARTH AND ENVIRONMENTAL STUDIES  
MONTCLAIR STATE UNIVERSITY**

Montclair State University invites applications for Director of its interdisciplinary Doctorate in Environmental Management. This position holds faculty appointment within the Department of Earth and Environmental Studies. Duties include recruitment, admissions, and advising, and allows administrative and research release time. The successful candidate is expected to maintain an active, funded research program, and be willing to teach relevant courses within the department and doctoral program.

Rank and field open, with preference for a candidate capable of merging relevant disciplines within environmental management and a research area aligned with one or more of the department's strengths in environmental modeling, urban/metropolitan studies, coastal/marine studies, environmental geology, natural resource management, and global environmental change. Candidates must have a record of excellence in scholarly publications, teaching, and service; academic leadership experience; and doctoral faculty and advisor experience. A complete listing of job requirements, qualifications, and application procedures, as well as information about the Earth & Environmental Studies Department and Environmental Management doctoral program can be found at <http://www.csam.montclair.edu/earth/eesweb/>. Send applications to Dr. Robert Taylor, Search Committee Chair, [taylorr@mail.montclair.edu](mailto:taylorr@mail.montclair.edu), Dept. of Earth & Environmental Studies, Montclair State University, Montclair, NJ 07043. Review of applications will begin immediately and continue until the position is filled, for a potential start as early as January 2005. Montclair State University is an Equal Opportunity/Affirmative Action Employer. Qualified women, minorities, and individuals with disabilities are encouraged to apply.

**SEDIMENTOLOGY/STRATIGRAPHY  
MONTCLAIR STATE UNIVERSITY**

The Department of Earth and Environmental Studies at Montclair State University invites applications for a full-time, tenure-track faculty position in sedimentology and/or stratigraphy at the assistant rank starting September 1, 2005. Applicants who can demonstrate research potential or experience in applied environmental sedimentology/stratigraphy and have a strong field-based approach are strongly encouraged to apply. A Ph.D. is required at the time of appointment. Additional information about the position and the department is available at <http://www.csam.montclair.edu/earth/eesweb>. Applicants should send cover letter, CV, three letters of recommendation,

and a statement of professional goals, research interests, and teaching philosophy to: Dr. Matthew Gorrington ([gorrington@mail.montclair.edu](mailto:gorrington@mail.montclair.edu)), Search Committee Chair (V-F23), Dept. of Earth & Environmental Studies, Montclair State University, Montclair, NJ 07043. Review of applications will begin immediately. Montclair State University is an Equal Opportunity/Affirmative Action Employer. Qualified women, minorities, and individuals with disabilities are encouraged to apply.

**TENURE TRACK POSITION, BOSTON COLLEGE  
STRUCTURAL GEOLOGY/ACTIVE TECTONICS**

The Department of Geology and Geophysics at Boston College anticipates hiring three new Earth Systems Scientists over the next three years. The first position, to begin in fall of 2005, is in the area of Structural Geology/Active Tectonics. The successful candidate will be expected to develop an externally funded research program integrated with excellence in teaching within the geology/geophysics/environmental geoscience curriculum at both the undergraduate and graduate levels. Teaching responsibilities include Structural and Field Geology as well as other courses in the candidate's area of research expertise, which could also include fields such as crustal dynamics, paleoseismology, and/or basin analysis. The appointment is expected to be made at the Assistant Professor level, but outstanding individuals qualified for appointment at higher rank will be considered. Information on the Department, its faculty, and research strengths can be viewed on the Department's web page at [www.bc.edu/geosciences](http://www.bc.edu/geosciences). Applicants should send a curriculum vita, a statement of teaching and research interests, and the names and contact information of at least three references to Professor Alan Kafka, Chair, Department of Geology and Geophysics, Devlin Hall 213, Boston College, Chestnut Hill, MA 02467-3809. Review of applications will begin on December 1, 2004, and applications must be received by January 15, 2005 to receive full attention. Department faculty will be available at the GSA and AGU meetings this fall to interview applicants. Boston College is an academic community whose doors are open to all students and employees without regard to race, religion, age, sex, marital or parental status, national origin, veteran status, or handicap.

**ASSISTANT PROFESSOR OF HYDROGEOLOGY  
HAMPSHIRE COLLEGE**

Hampshire College is seeking an earth scientist for a full-time Assistant Professor position in water geoscience and hydrogeology, with interests in water resource management. A Ph.D. is required.

We seek an accomplished, energetic scientist whose innovative teaching engages undergraduates in genuine research. Candidates' abilities to combine undergraduate teaching and research in exciting ways will be weighed more heavily than their specific disciplines. We seek an active participant in our Women in Science Program and an individual who will take a leadership role in promoting diversity in the sciences. The successful applicant will complement our existing strengths in earth and environmental science, sustainable technology, ecology, and agriculture. See our program description at <http://ns.hampshire.edu/>.

Hampshire College, an independent liberal college, offers a stimulating and supportive environment for interdisciplinary teaching and collaborative research. We emphasize discussion, projects, and written evaluations rather than lectures, exams, and grades. We seek scientists whose innovative teaching engages students in genuine research at the introductory and advanced levels. Applicants should discuss their ideas for integrating research and teaching in their application letter. Hampshire College is a member of the Five College consortium which offers extensive possibilities for research collaboration.

Application review begins September 15, 2004 for a position starting July 1, 2005. Please send a letter of application, vitae, descriptions of courses, ideas for research and interdisciplinary collaboration, and three letters of reference to: Laurie Smith, Assistant Professor of Hydrogeology Search, School of Natural Science, Hampshire College, Amherst MA 01002.

Affirmative Action/Equal Opportunity Employer. [hr.hampshire.edu](http://hr.hampshire.edu).

## Opportunities for Students

**NASA Planetary Biology Internships.** The Marine Biological Laboratory, Woods Hole, Massachusetts, invites applications from graduate students and seniors accepted to graduate programs for rewards of \$2800 plus travel to participate in research in NASA centers and collaborating institutions for approximately 8 weeks. Typical intern programs include: global ecology, remote sensing, microbial ecology, biomineralization, and origin and early evolution of life. Application deadline: March 1, 2005. For infor-

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OF AMERICA

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## Journal Highlights



**IN NOVEMBER/DECEMBER  
BULLETIN**

A Canterbury Dale Tale  
Darien: Collision in Panama  
Akato Tagh, Altyn Tagh x 2

**IN DECEMBER GEOLOGY**

The Day After Tomorrow: fact  
or fiction?

Catastrophic erosion offshore  
New Jersey

Fossil leaves under pressure

Sheer olivine fabrics

Anoxia leaves no trace



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mation/applications, contact: Michael Dolan, Planetary Biology Internship, Department of Geosciences, Box 3-5820, University of Massachusetts, Amherst, MA 01003-5820. E-mail: pbi@geo.umass.edu. Tel (413) 545-3223. An Equal Opportunity/Affirmative Action Employer.

**Opportunities for Graduate Study in Geology at Kent State University.** The Department of Geology at Kent State University, composed of sixteen full-time faculty, seeks motivated students for graduate study in Geology in the general areas of: Earth Evolution, Earth Surface Processes, Engineering Geology, or Tectonics. Interdisciplinary research opportunities are also available through the Kent State University Water Resources Research Institute (<http://dept.kent.edu/wrri/>). Graduate stipends are awarded on a competitive basis with rolling admission. While applications are evaluated continuously, to receive full consideration for financial support, they must be received by February 15 for August admission. Applications may be submitted to Kent State University online at: <http://dept.kent.edu/geology/graduate/gradapp.html>.

For complete information regarding faculty research interests and the graduate program, please see our website (<http://dept.kent.edu/geology/>) or contact the graduate coordinator, Dr. Rodney Feldmann. The Department of Geology offers a comprehensive course of study leading to the M.S. or Ph.D. degree. Emphasis is placed on research designed not only to advance the understanding of the geological sciences, but also to solve societal problems.

**Ph.D. and M.S. Opportunities in Earth and Environmental Sciences—University of Illinois at Chicago.** The Department of Earth and Environmental Sciences, University of Illinois at Chicago, invites applications for graduate admission starting in the Fall 2005 Semester. Financial support through assistantships, including tuition waivers, is available to successful applicants. We offer opportunities to do research in the areas of Hydrology, Lacustrine Processes, Extreme Environments, Paleoclimatology, Geochronology, Quaternary Geology, Clastic Sedimentology, Mineralogy, Organic Geochemistry, Stable Isotope Geochemistry, Hydrogeochemistry, Synchrotron Radiation Studies, Petrology, Geodynamics, Paleontology, Paleoecology, Landscape Statistics, Plate Tectonics and Marine Geophysics. Students have access to state-of-the-art analytical equipment. We are located in a vibrant urban neighborhood, close to mass transit and all that the great city of Chicago has to offer. Application deadline is February 1. For more information (including application procedures), visit our website at <http://www.uic.edu/depts/geos/> or contact Dr. Peter Doran at [pdoran@uic.edu](mailto:pdoran@uic.edu).

**Jonathan O. Davis Scholarship. Division of Earth and Ecosystem Sciences. Desert Research Institute.** The family and friends of Jonathan O. Davis, a prominent U.S. geologist and geochronologist and a DRI faculty member, have established an endowment that provides a yearly national Jonathan O. Davis Scholarship. Jonathan was tragically killed in an automobile accident in December 1990. It is the wish of his family and friends to support graduate students working on the Quaternary geology of the Great Basin and surrounding areas, research areas close to Jonathan's heart. The national scholarship is \$4,000.00.

Administered by the Division of Earth and Ecosystem Sciences of the Desert Research Institute, it is open to graduate students enrolled in an M.S. or Ph.D. program at any university in the United States. Quaternary geology, as used here, encompasses a wide range of topics normally considered as part of the Quaternary sciences. The research, however, must have a substantial geologic component or demonstrate a strong reliance on geological techniques and must be focused on the Great Basin and immediately adjacent areas.

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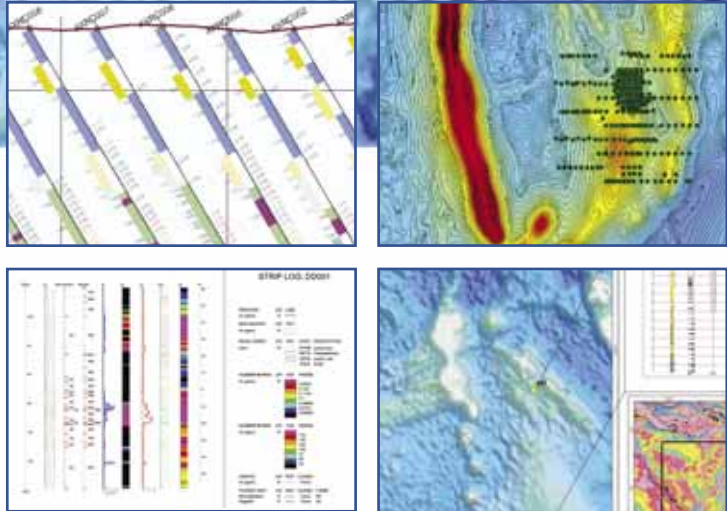
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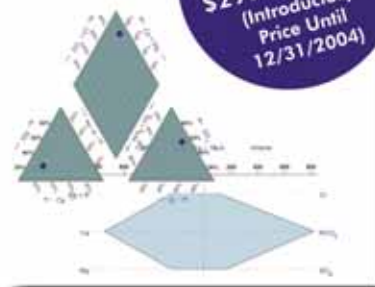
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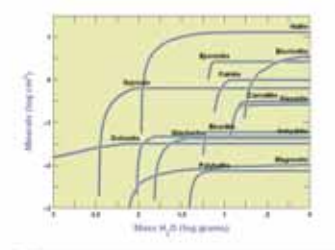
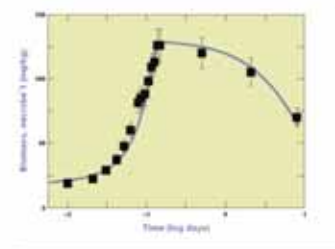
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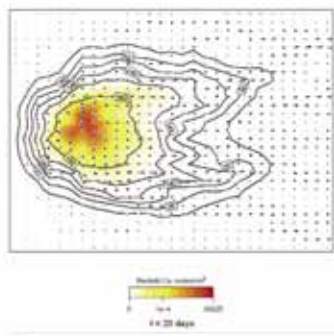


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