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## Eocene Meridional Weather Patterns Reflected in the Oxygen Isotopes of Arctic Fossil Wood

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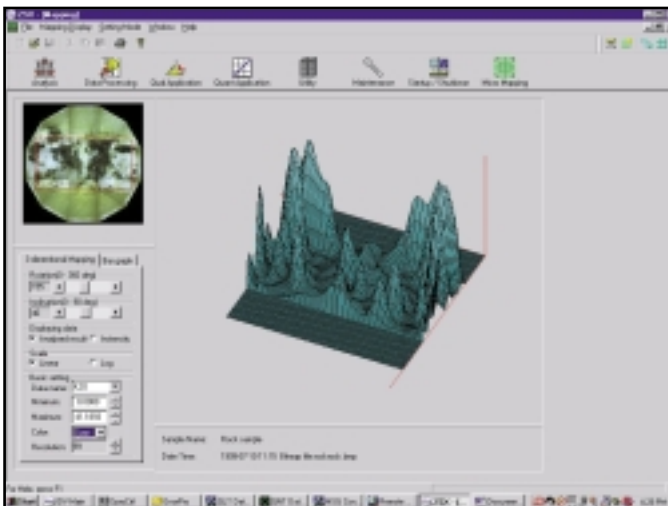
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**On the cover:** Arctic fossil wood on Axel Heiberg Island, Canadian High Arctic. See "Eocene Meridional Weather Patterns Reflected in the Oxygen Isotopes of Arctic Fossil Wood," by A.H. Jahren and L.S.L. Sternberg, p. 4–9.

# Eocene Meridional Weather Patterns Reflected in the Oxygen Isotopes of Arctic Fossil Wood

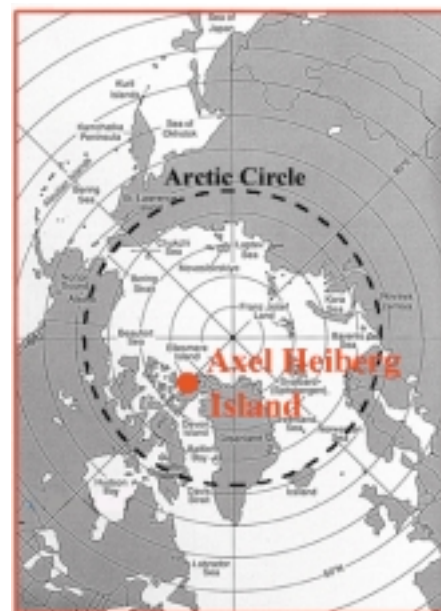


Figure 1. Map showing present-day location of Axel Heiberg Island.

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## ABSTRACT

The spectacularly preserved *Metasequoia* wood excavated from the Fossil Forest site of Axel Heiberg Island (Canadian High Arctic) provides a unique window into the  $\delta^{18}\text{O}$  value of Eocene meteoric water via the analysis of fossil cellulose. Seventeen fossilized *Metasequoia* individuals yielded cellulose with  $\delta^{18}\text{O}$  (Vienna standard mean ocean water [VSMOW]) values ranging from 17.1‰ to 21.4‰ and with a mean value of 19.9‰—strikingly low compared to modern trees of all latitudes. Using established biosynthetic relationships for plant cellulose, we reconstructed the  $\delta^{18}\text{O}$  (VSMOW) value of Eocene meteoric water to be  $-15.1\text{‰}$  on Axel Heiberg Island—a value similar to previous determinations of Eocene terrestrial water using varied paleoenvironmental indicators. A wholly temperature-based interpretation of these isotopic results would predict a mean annual temperature of  $-2.7\text{ °C}$ , but this is incompatible with extremely high forest productivity. Instead, a calculation of isotopic fractionation in moisture transported from the Pacific Ocean north across North America explains the simultaneous arrival of warm air and isotopically depleted moisture in the Eocene Arctic; we suggest that these meridional weather patterns were caused by the absence of a Polar Front during the ice-free Eocene.

## INTRODUCTION

The sediments of Axel Heiberg Island, located in the High Arctic of Canada (Fig. 1), contain hundreds of fossil *Metasequoia* trees that grew at a paleolatitude of  $82^{\circ}\text{N}$ . The Fossil Forest site, near the western coast of the island, has been a focus of research since 1986 and has inspired numerous monographs on the evolutionary and biogeographic history of plants. All fossil wood recovered from Axel Heiberg Island has been of gymnosperm origin, mostly *Metasequoia* with rare occurrences of *Picea* and *Larix* (Jagels et al., 2001); however, significant angiosperm populations were present in Fossil Forest communities (Kalkreuth et al., 1996). The forest-bearing sediments are extensive (Fig. 2A), and contain large quantities of mummified litter, stumps, boles, roots, seeds, cones, rhizomes, soil organic matter, and fossilized resin. The excellent state of preservation, which suggests little alteration beyond drying (Fig. 2B), presents a unique opportunity to apply stable isotope techniques usually reserved for much younger substrates. Holocene trees have been used to estimate paleotemperature using relationships between  $\delta^{18}\text{O}$  value of cellulose and  $\delta^{18}\text{O}$  value of site precipitation (Burk

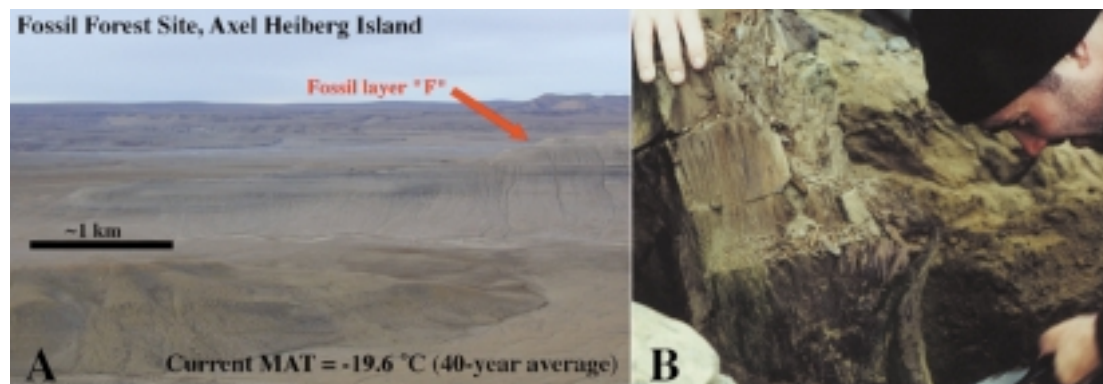


Figure 2. A: The Fossil Forest site of Axel Heiberg Island. B: Exceptional preservation of Eocene wood fossils.

and Stuvier, 1981) and between  $\delta D$  value of cellulose-nitrate and  $\delta D$  value of site precipitation (Yapp and Epstein, 1977). However, lack of well-preserved fossils has prevented application of these relationships in deep time until now.

### AGE OF THE FOSSIL FOREST

The age of the Fossil Forest site on Axel Heiberg Island has been a subject of controversy. We prefer a middle-to-late Eocene interpretation of the age of *Metasequoia* fossils analyzed, but previous workers have assigned a larger age window, from middle

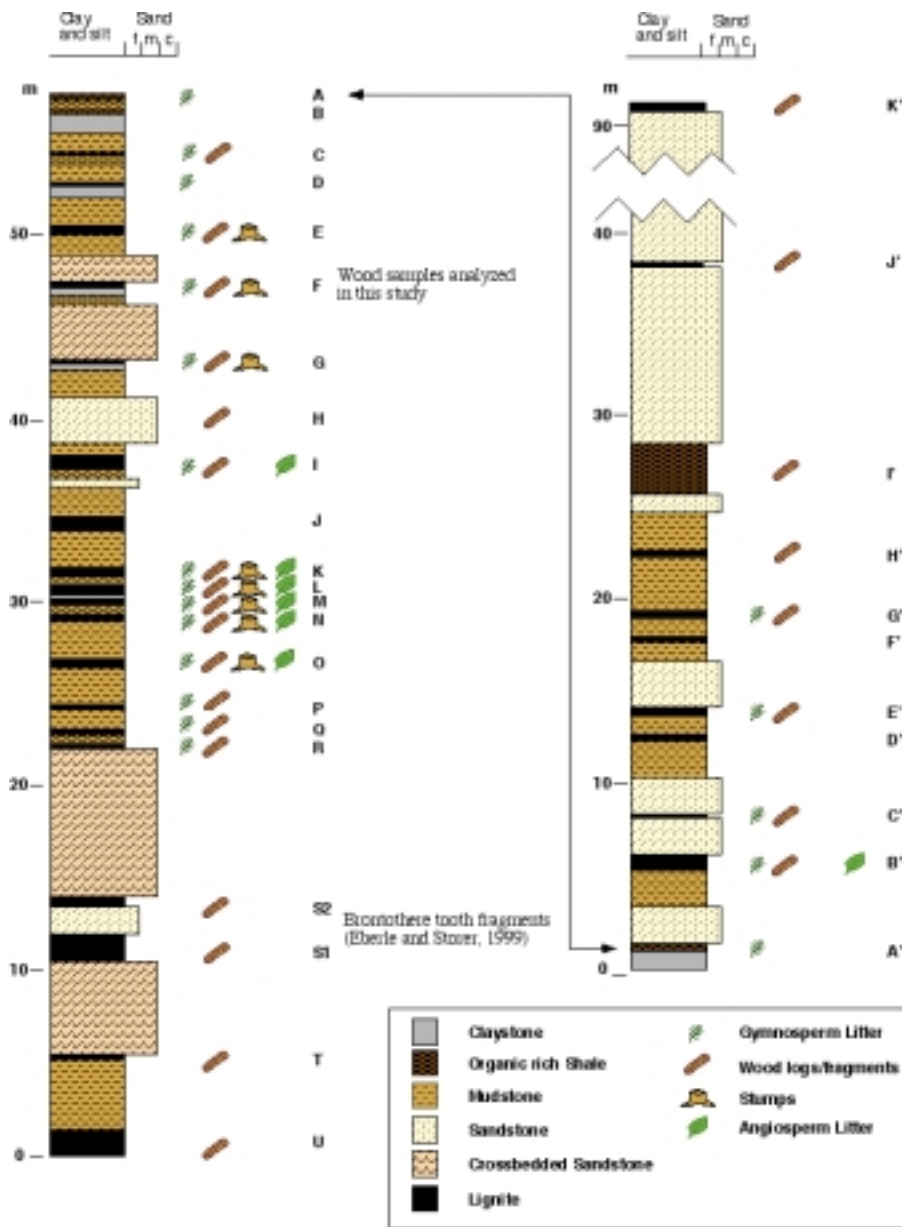
Eocene to early Oligocene. The most widely known age was assigned using vertebrate fossils found within the correlative Eureka Sound Group on western Ellesmere Island (Dawson et al., 1976) and elsewhere on Axel Heiberg Island; these have been used to assign a middle Eocene age for the Fossil Forest that is often assumed today (Jagels et al., 2001). Unfortunately, the vertebrate fossils in question were recovered from strata with different lithology and were at stratigraphic levels substantially below the Fossil Forest. The only vertebrate fossils that have been recovered from the Fossil

Forest site itself are three tooth enamel fragments found as “float on poorly consolidated, reddish brown sandstone” directly overlying the R-S-T coal of the Fossil Forest site (Fig. 3; Eberle and Storer, 1999, p. 979). The fossils were identified as brontothere (quadrupedal herbivores that became extinct in North America during the late Eocene) teeth (Eberle and Storer, 1999). However, Eberle and Storer (1999) did not address the possibility that this float might represent the reworked debris of older sediments. Rich and diverse pollen assemblages within the Fossil Forest strata are “probably middle Eocene in age, but a late Eocene age cannot be discounted” (McIntyre, 1991, p. 83). Ricketts (1987, p. 2503) discussed a “wide range of reworked pollen, spores and dinoflagellates” of Paleocene and Cretaceous age included in the microfossil assemblages of the Fossil Forest site. Examination of sedimentary relationships suggested that the Fossil Forest site extends “perhaps into the earliest Oligocene” (Ricketts, 1991, p. 1). Plant macrofossil assemblages (*Betula*, *Glyptostrobus*, *Larix*, *Metasequoia*, *Picea*, *Pinus*, *Pseudolarix*, and *Tsuga*) are not temporally specific within the Paleogene. We analyzed fossils from high in the Fossil Forest section, located >30 m stratigraphically above the R-S-T coal (Figs. 2A and 3), which we believe are middle-to-late Eocene in age.

### EOCENE PALEOCLIMATE

The Eocene (57.8–36.6 Ma) has been considered by many as an unusually warm period in Earth’s history. Latest Paleocene Thermal Maximum rocks record a methane release (Dickens et al., 1995) that prevented severe winter cooling in polar regions (Sloan et al., 1992). This event resulted in a dramatic 4–8 °C increase in deep-ocean, high-latitude, and continental temperatures (Zachos et al., 1993), marking the onset of warm conditions that extended into the Eocene.

The global plant fossil record for the Eocene (reviewed in Graham, 1999) reveals a lavishly vegetated planet Earth. Vegetation described as “subtropical” may have extended to 60°N lat, and full “tropical rainforests” occurred up to 30°N lat (Wolfe, 1985, p. 357). For this reason, we expect that the fossils of



**Figure 3.** Stratigraphic sequence illustrating fossiliferous sediments of Fossil Forest; sampling location for this study is highlighted, as is position of brontothere fossil teeth described by Eberle and Storer (1999).

Axel Heiberg Island result from a period of maximum primary productivity at high latitudes, and represent the upper limit of terrestrial biomass production in polar regions. However, paleontological methods used to characterize Eocene “tropicality” are based on comparison with features of modern biota, presenting inevitable complications when dealing with environments that no longer exist. Most authors recognize that the Fossil Forest of Axel Heiberg Island represents a unique ecosystem for which there is no modern analog. Both plant and animal fossils of Axel Heiberg and Ellesmere Islands have been used alternatively to characterize the Arctic paleoclimate (Basinger, 1986; Estes and Hutchinson, 1980) and to infer the environmental tolerances of the species present (Eberle and Storer, 1999; Francis, 1991). Therefore, inherent limits in paleontological methods of climate reconstruction suggest further information might be gained from isotopic techniques.

Fossil leaf margin analysis from the Bighorn Basin, Wyoming, indicated a short-lived  $\sim 8^\circ\text{C}$  temperature drop during the early Eocene (Wing et al., 2000), demonstrating variability in continental temperatures during this interval of the Cenozoic. During the early Eocene to middle Eocene transition ( $\sim 52$  Ma) marine isotopic records show dramatic recovery to early Paleocene values: marine bulk carbonate  $\delta^{13}\text{C}$  (Vienna Peedee belemnite [VPDB]) value returned to  $+1.8\text{‰}$  (from  $+0.2\text{‰}$ ) (Shackleton et al., 1984); and ocean water  $\delta^{18}\text{O}$  (Vienna standard mean ocean water [VSMOW]) value (as calculated from the composition of benthic foraminifera) returned to  $+0.0\text{‰}$  (from  $-0.7\text{‰}$ ) (Miller et al., 1987). These isotopic increases have been consistently interpreted as a global cooling event that occurred long after the Paleocene-Eocene warming event.

Efforts have been made to characterize the paleoclimate of the Eocene using general circulation and other models. For example, early Eocene mean global surface temperature was estimated to be at least  $2^\circ\text{C}$  warmer than at present (Barron, 1987) and  $\text{CO}_2$  levels were

estimated to be at least twice that of today (Bernier, 1994; Sloan and Rea, 1995). Eocene cooling trends were reinforced by general circulation model results which found that  $\sim 1.0^\circ\text{C}$  of cooling in northern hemisphere mean annual surface temperature occurred during the whole of the Eocene, caused by changes in atmospheric and oceanic heat transport (Bice et al., 2000a). Despite this myriad of paleoclimate determinations, a congruent climate hypothesis remains elusive for the Eocene. Sloan and Morrill (1998) described “persistent discrepancies” between climate model results and



**Figure 4.** Bulk fossil wood from Axel Heiberg Island (note preserved growth rings) and the resultant purified  $\alpha$ -cellulose.

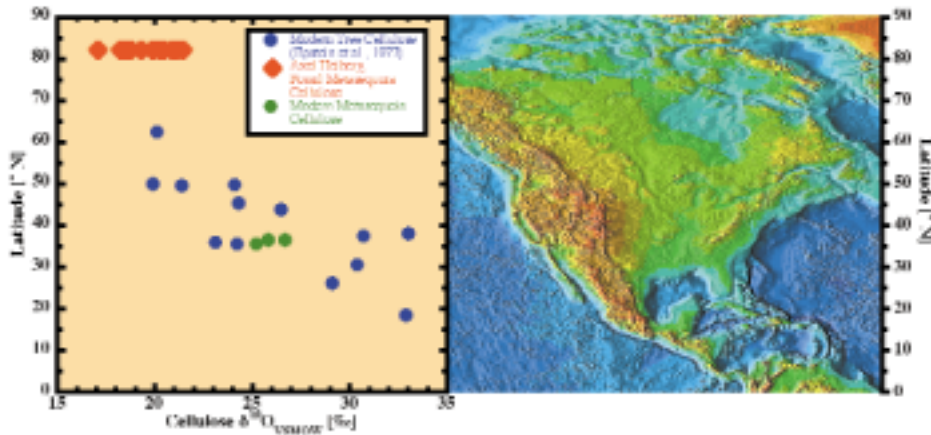
interpretations from proxy data in the Eocene.

### $\delta^{18}\text{O}$ IN EOCENE FOSSIL CELLULOSE

We have measured oxygen isotope composition within a substrate that is extremely well characterized with respect to chemical and biological synthesis—Eocene fossil cellulose—and use these results to shed new light on the meteorologic patterns of the Eocene. Seventeen *Metasequoia* individuals excavated from Fossil Forest lignite layer F (Fig. 3) were analyzed in duplicate for  $\delta^{18}\text{O}$  (VSMOW) value of extracted cellulose. The purification process to obtain  $\alpha$ -cellulose from plant tissue involved the standard technique based on Green (1963), modified by Sternberg (1989). The procedure is widely used for carbon, oxygen, and hydrogen stable isotope studies on  $\alpha$ -cellulose (e.g., Feng et al., 1999). Five to 10 grams of bulk fossil sample were analyzed; pre-extraction of lipids was necessary because conifer tissues contain considerable amounts of resin, which is isotopically depleted relative

to most plant tissues. The fluffy, white  $\alpha$ -cellulose extracted from Fossil Forest samples is shown in Figure 4; cellulose content of extracted samples was verified using classical biochemical assay techniques (Updegraff, 1969). We quantitatively converted oxygen in cellulose into pure  $\text{CO}_2$  using the procedure described by Sternberg (1989) with a modification of the HCl removal step (Sauer and Sternberg, 1994). Resulting  $\text{CO}_2$  gas was then analyzed on a VG Isogas Prism dual-inlet isotope ratio mass spectrometer at the University of Miami.  $\delta^{18}\text{O}$  (VSMOW) variability within each individual was found to be  $0.5\text{‰}$ ; total uncertainty in value of each sample (conservatively calculated as the total of field variability and instrumental uncertainty) was found to be  $1.0\text{‰}$ . The total range of  $\delta^{18}\text{O}$  (VSMOW) values found in these fossil samples ( $n = 17$ ) was  $17.1\text{‰}$ – $21.4\text{‰}$  with a mean value of  $19.9\text{‰}$ . These are strikingly low oxygen isotope values compared to published  $\delta^{18}\text{O}$  values of modern tree cellulose (Fig. 5).

The  $\delta^{18}\text{O}$  value of tree cellulose can be used to estimate the  $\delta^{18}\text{O}$  value of meteoric water used by the plant; however, processes of isotopic fractionation during cellulose synthesis are complex. The biosynthesis of wood cellulose in trees can be understood by the following sequence of events. (1) Leaf water is isotopically enriched relative to stem water by the process of transpiration; this enrichment is a function of both relative humidity and leaf characteristics. (2) Carbohydrates synthesized in the leaf during photosynthesis and then transported to stem and roots have the oxygen isotopic signature of leaf water (i.e.,  $\delta^{18}\text{O}_{\text{carbohydrate}} = \delta^{18}\text{O}_{\text{leaf water}} + 27\text{‰}$ ). (3) During cellulose synthesis in the stem,  $\sim 30\%$ – $40\%$  of oxygen atoms in carbohydrate exchange with stem water via the carbonyl-hydration reaction. Therefore, some cellulose oxygen atoms retain their isotopic signature from previous equilibration with leaf water, while others show isotopic ratios consistent with stem water equilibrium. For this reason, we expect the  $\delta^{18}\text{O}$  value of stem cellulose to be higher than  $\delta^{18}\text{O}_{\text{meteoric water}} + 27\text{‰}$ . We use



**Figure 5.** Comparison of cellulose  $\delta^{18}\text{O}$  values in modern trees (blue circles) across a wide range of latitude, modern *Metasequoia* wood from Japan (green circles), and fossil *Metasequoia* wood from Fossil Forest site (red diamonds).

here the empirically observed fractionation for modern *Metasequoia* grown under controlled conditions in Japan (Table 1). Taking this observed value,  $\Delta = \delta^{18}\text{O}_{\text{cellulose}} - \delta^{18}\text{O}_{\text{plant water}} = 35\text{‰}$ , in conjunction with the  $\delta^{18}\text{O}$  (VSMOW) mean value of Fossil Forest cellulose of 19.9‰, we reconstructed an oxygen isotope composition of Eocene meteoric water equal to  $-15.1\text{‰}$  on Axel Heiberg Island.

### THE SOURCE OF LOW- $\delta^{18}\text{O}$ VALUES IN EOCENE METEORIC WATER

Other studies have also documented low- $\delta^{18}\text{O}$  values in Eocene terrestrial substrates, and inferred  $^{18}\text{O}$ -depleted meteoric water. Norris et al. (1996) observed  $\delta^{18}\text{O}$  values as low as  $-16\text{‰}$  (VPDB) in Eocene lacustrine carbonates and calculated source waters as low as  $\delta^{18}\text{O}$  (VSMOW) =  $-19.8\text{‰}$  for the Green River Basin, perhaps representative of paleo-snowfall.  $\delta^{18}\text{O}$  values of Fe-oxides from early Eocene rocks of the Bighorn Basin suggested a change in surface water  $\delta^{18}\text{O}$  (VSMOW) value,  $\Delta = -3.25\text{‰}$ , in the earliest Eocene (Wing et al., 2000). Based on the oxygen isotope value of soil carbonates and fossil teeth, Koch et al. (1995) concluded that Paleocene-Eocene meteoric water was “significantly”  $^{18}\text{O}$  depleted, with values as low as  $\delta^{18}\text{O}$  (VSMOW) =  $-14\text{‰}$ .

One explanation for low- $\delta^{18}\text{O}$  values would be cold temperatures. An empirical (modern) relationship

$$\delta^{18}\text{O}_{\text{cellulose}} = 21 + 0.4 (\text{°C MAT}) \quad R^2 = 0.71 \quad (1)$$

between  $\delta^{18}\text{O}$  in tree cellulose and site mean annual temperature has been observed, based on analyses of a large set of tree species across  $50^\circ$  of latitude (Epstein et al., 1977).

When we used this to estimate Eocene paleotemperature from our Axel Heiberg fossil wood  $\delta^{18}\text{O}$  results, we obtained predicted mean annual temperature for the site equal to  $-2.7 \text{ °C} (\pm 2.5)$ . For comparison, mean annual temperature in Dawson, Yukon, Canada, is  $-4.7 \text{ °C}$ ; Godthåb, Greenland, is  $-1.1 \text{ °C}$ ; and Whitehorse is  $-0.9 \text{ °C}$ . Thus, paleotemperature predicted for Axel Heiberg Island using equation 1 would have been similar to modern Arctic regions. However, we reject a wholly temperature-based interpretation of our isotopic results: The Arctic could not have had below-zero mean annual

temperature during the Eocene based on climate models and also based on the apparent high bioproductivity of the Fossil Forest during the Eocene. Koch et al. (1995) similarly rejected a cold-climate interpretation of low- $\delta^{18}\text{O}$  values in Eocene soil carbonates and fossil teeth and suggested an isotopic “rain-out effect” as more likely.

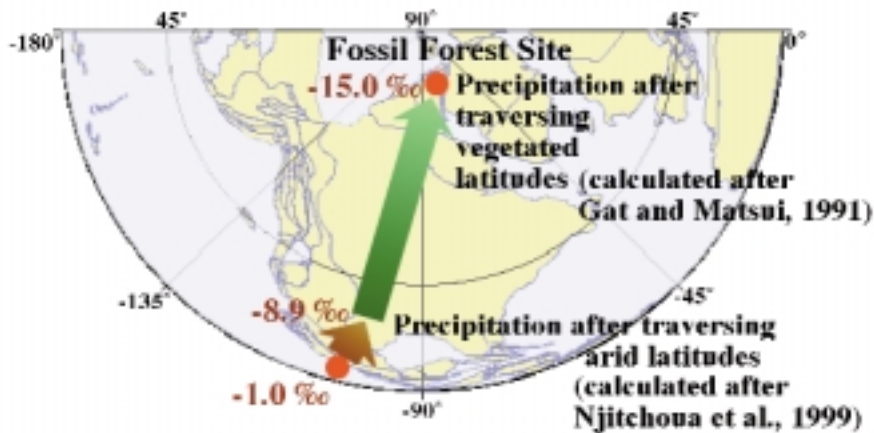
Our preferred explanation for the low- $\delta^{18}\text{O}$  values involves changing weather patterns. For example, altered meteoric transport patterns have been proposed to control  $\delta^{18}\text{O}$  values in the ice-core (Hendricks et al., 2000), marine carbonate (Wolff et al., 1998), and soil carbonate (Amundson et al., 1996) paleorecords. As clouds travel across continents, the moisture they carry becomes isotopically lighter as  $^{18}\text{O}$  and D isotopes “rain-out” during Rayleigh distillation. Furthermore, traveling clouds are replenished with moisture evaporated from continental lakes and with moisture transpired through vegetation (Moreira et al., 1997). Therefore, the isotopic composition of moisture arriving at a given latitude is dependent upon dominant storm paths of moisture transport. Recycling of water to the atmosphere via transpiration in forested regions must have been an important meteorologic influence during the Eocene, as highly productive vegetation extended from the low to high latitudes (Ziegler et al., 1983).

We suggest that the absence of polar ice during the early Tertiary was an important factor in determining meteoric transport patterns during the Eocene. At present, high latitudes are consistently cold due to the stable configuration of the Polar Front, the abrupt separation between the low-temperature arctic atmosphere and the higher-temperature mid-latitude atmosphere that encourages west-east circumpolar

**TABLE 1. ISOTOPIC FRACTIONATION BETWEEN ENVIRONMENTAL WATER AND *METASEQUOIA* CELLULOSE AS MEASURED IN MODERN SYSTEMS**

Site of Collection	$\delta^{18}\text{O}_{\text{plant water}} [\text{‰}]$	$\delta^{18}\text{O}_{\text{cellulose}} [\text{‰}]$	$\Delta = \delta^{18}\text{O}_{\text{cellulose}} - \delta^{18}\text{O}_{\text{plant water}} [\text{‰}]$
Kyoto, Japan	-8.4	25.3	33.7
Tanashi, Japan (40-year stand)	-9.3	25.9	35.2
Tanashi, Japan (70-year stand)	-9.3	26.8	36.1

Note: Mean value = 35.0



**Figure 6.** Calculation of fractionation in oxygen isotope value of moisture during transport across Eocene paleogeography; moisture originating in Pacific Ocean arrives at Fossil Forest site via meridional weather patterns. Map of continental position was created by GEOMAR, Ocean Drilling Stratigraphic Network (Research Center for Marine Geosciences at Kiel and the Geological Institute of the University of Bremen, Germany).

transport. The steep atmospheric-temperature gradient across the Polar Front results from low radiation absorption by the high-albedo ice cap, relative to the ice-free lower latitudes. Today's  $1.3 \times 10^{13}$  m<sup>2</sup> of arctic ice cover (annual average) has albedo of ~60% and absorbs  $\sim 1 \times 10^{15}$  W of energy annually. By comparison, the same area forested, or covered by water during the Eocene would have mean albedo of ~10%, resulting in the absorption of  $\sim 2.3 \times 10^{15}$  W each year in the region—more than doubling the amount of heat energy impacting the Arctic, relative to today. A weak net temperature gradient from equator to pole would exist during the Eocene, due to the 2 $\times$  annual difference in incoming solar radiation between 90° and 0°N lat. This would give rise to meridional weather patterns as warm air swept north across North America to the Arctic and continued in a transpolar pattern across the north pole and into Siberia.

Evidence of meridional weather patterns during the Eocene is apparent in the  $\delta^{18}\text{O}$  value of fossil cellulose from the Fossil Forest site of Axel Heiberg Island: Figure 6 illustrates how source water with  $\delta^{18}\text{O}$  (VSMOW) =  $\sim -1.0\text{‰}$  (Bice et al., 2000b) originating off the coast of Mexico in the Pacific Ocean is fractionated during transport across arid and forested regions of North America. Field experiments measuring precipitation across a Rayleigh-distillation dominated

inland transect of Central Africa revealed a  $\delta^{18}\text{O}$  (VSMOW) gradient of  $-1.58\text{‰}$  per 100 km (Njitchoua et al., 1999). Combining these observations with the fact that western Mexico was persistently arid during the Cenozoic (Parrish et al., 1982), we calculated that a traverse across the  $\sim 500$  km region would result in a change in  $\delta^{18}\text{O}$  (VSMOW) value,  $\Delta = -7.9\text{‰}$  (Fig. 6). Measurements made of precipitation across large transects in the forested Amazon basin revealed a  $\delta^{18}\text{O}$  (VSMOW) gradient of  $-0.08\text{‰}$  per 100 km (Gat and Matsui, 1991), and allowed us to calculate a final  $\delta^{18}\text{O}$  (VSMOW) value =  $\sim -15\text{‰}$  of Eocene precipitation arriving at the Axel Heiberg site after traversing the vegetated  $\sim 7000$  km expanse of Canada (Fig. 6).

#### SUMMARY

We present a meridional-transport model that explains the low- $\delta^{18}\text{O}$  value of meteoric water arriving at the Fossil Forest site during the Eocene. This value agrees with the  $\delta^{18}\text{O}$  value of Eocene meteoric water calculated using the oxygen isotope composition of Axel Heiberg fossil wood. We suggest that meridional weather patterns were responsible for the simultaneous delivery of warm air and moisture to high latitudes during the Eocene. In addition, the extensive Eocene conifer communities of Siberia (LePage and Basinger, 1995) may have been maintained by transpolar weather

patterns as this warm, wet air continued across the North Pole.

The extremely bioproductive Eocene *Metasequoia* forests of Axel Heiberg Island were deciduous ecosystems restricted to a short, intense growing season. These trees endured four months of total darkness during winter months and gained most of the light required for growth during four months of continuous summer daylight. The temperature gradient between the equator and the North Pole was at an annual minimum during Eocene summer months as high latitudes received maximum solar radiation, facilitating meridional transport. Thus, moisture transported from equatorial latitudes supplied water to Axel Heiberg Island during summer episodes of explosive vegetative growth, as was recorded in the isotopic composition of fossil cellulose. Our results suggest that a meridional weather pattern was the dominant path of water transport to the high latitudes during the Eocene, but do not preclude coexisting north-to-south or other weather patterns, particularly during the drier seasons. During the winter months, the equator-to-pole temperature gradient was highest, opening the possibility of east-west moisture transport, or transport from the adjacent ice-free Arctic Ocean. Both of these possibilities would deliver a small amount of meteoric water with relatively high- $\delta^{18}\text{O}$  value (perhaps  $\sim -2\text{‰}$  to  $-5\text{‰}$ ) prior to the start of each growing season. We plan to look for this heavy isotopic signal in the cellulose of early-season wood preserved in Fossil Forest *Metasequoia* fossils by performing a series of oxygen isotope analyses within single growth rings (Fig. 4).

Our work presents isotopic evidence that weather patterns are subject to change on a global scale during the evolution of Earth's surface and features. During the Eocene, tree cellulose was synthesized in the Arctic using water transported from the equatorial Pacific Ocean. Such weather patterns are radically different than those thought to be in place during the Mesozoic (White et al., 2001) and may partially account for the abundance of vegetation at high latitudes during the



Eocene relative to the Cretaceous or any other period. The Eocene fossil forests of Axel Heiberg demanded environmental resources (e.g., nitrogen, phosphorous, water) at rates meeting or exceeding those displayed in modern conifer forests. We suggest that the vital resources of warm air and summer moisture were delivered via meridional transport, and supported this unusual and dramatic annual growth at high latitudes.

## ACKNOWLEDGMENTS

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## EDUCATION & OUTREACH DIRECTOR The Geological Society of America

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The Geological Society of America (GSA) seeks an Education and Outreach Director to lead the Society's efforts to promote excellent geoscience education, in its broadest sense, to students, educators, GSA members, the public, the media, and public policy makers. GSA is a scientific society serving 17,000 members worldwide and is headquartered in Boulder, Colorado.

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Morris W. Leighton

Morris W. Leighton stepped down from the GSA Foundation's Board of Trustees at the conclusion of the Board's November meeting in Boston. "Brud" (short for brother), as his family and friends know him, served on the Board since 1996. He has been its chairman for the past four years, a critical time during which the Foundation's Second Century Campaign was successfully concluded, several transitions in its leadership occurred smoothly, and contributions steadily grew. Our Society and Foundation are deeply indebted to him for the enormous amount of personal time and resources he has given during his lengthy tenure of wise and dedicated leadership.

In announcing his intention to leave the Board, Brud cited his desire to spend more time with his wife, children, and grandchildren while he still enjoys good health. He noted that he leaves with "confidence that things are in good hands—as good as we could possibly hope for," thanks to the appointment of Tom Fouch as new Foundation President, the excellent contributions of Donna Russell, Director of Foundation Operations, Joan Bell, Donor Database Manager, and the Foundation's consultant, Joan Mason, as well as a strong and active Board of Trustees.

Brud's professional career is marked by high distinction in scholarly activity and administration and tireless volunteer public service to the geoscience community and to his alma mater, the University of Illinois. For over 30 years, he was affiliated with Exxon and its Esso affiliates in research, exploration, and management positions. In 1983, he returned to his hometown of Urbana as chief of the Illinois Geological Survey, a position he held until his

retirement in 1994. He was elected president of the Association of American State Geologists in 1992 and has received distinguished service awards from the American Institute of Professional Geologists, the American Association of Petroleum Geologists, and the University of Illinois.

Throughout his service to GSA and the Foundation, Brud has set the highest standards of excellence, responsibility, and personal integrity. His skillful attention to detail, loyalty to the Society, breadth of knowledge of both Society and Foundation affairs, and unselfish giving of his time and energy epitomize the model of a true and distinguished volunteer leader. In his statement to the Board, Brud observed, "The Foundation is in a unique position to help our science and to promote our profession as it works to support the programs and activities of GSA. It has been a pleasure to help give something back to an organization that has helped so many of us along in our geoscience careers."

Few have given back more to GSA than Brud Leighton. On behalf of all who his efforts have touched, I extend to him heartfelt praise and appreciation.



### *Most memorable early geologic experience*

One of my most memorable geological experiences was an introduction to the Sierra Nevada and igneous petrology. As his field assistant, summer 1948, Paul Bateman took me to a high cirque on Mount Tom near Bishop. There, I first learned the grandeur of the High Sierra and the beauty of its granitoid rocks.

— Max Carman

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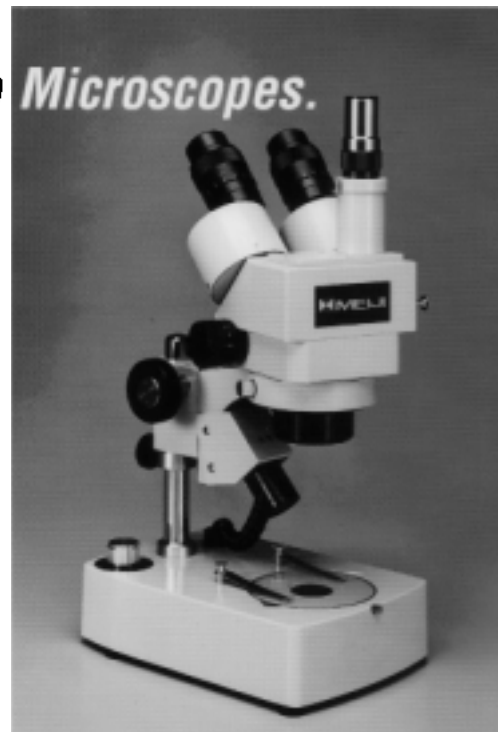
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# Call for Nominations: GSA Division Awards

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

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## **DON J. EASTERBROOK DISTINGUISHED SCIENTIST AWARD**

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

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

Members of the Quaternary Geology and Geomorphology Division Award Panel will evaluate nominations for the Easterbrook Award. Because the award primarily recognizes research excellence, self-nomination is not allowed. Nominees need not be members of the division. Nominations are not automatically carried forward to subsequent years, but the same individuals may be renominated.

Nominations must be accompanied by supporting documentation, including a statement of the significance of the nominee's research, curriculum vitae, letters of support, and any other documents deemed appropriate by the nominating committee. Send nominations by April 1, 2002, to Debbie Harden, [harden@geosunl.sjsu.edu](mailto:harden@geosunl.sjsu.edu), San Jose State University, One Washington Square, San Jose, CA 95192-0102.

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## **FAROUK EL-BAZ AWARD FOR DESERT RESEARCH**

The GSA Quaternary Geology and Geomorphology Division seeks nominations for the Farouk El-Baz Award for Desert Research. This award rewards excellence in research in desert geomorphology worldwide and is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it (\$10,000 in 2002) may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership. Monies for the award are derived from annual interest income from the Farouk El-Baz Fund, administered by the GSA Foundation.

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

Send nominations by April 1, 2002, to J. Steven Kite, [jkite@wvu.edu](mailto:jkite@wvu.edu), Dept. of Geography, West Virginia University, 223 White Hall, P.O. Box 6300, Morgantown, WV 26506.

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## **LAURENCE L. SLOSS AWARD FOR SEDIMENTARY GEOLOGY**

The Sedimentary Geology Division of GSA solicits nominations for the 2002 Laurence L. Sloss Award for Sedimentary Geology. This award is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—i.e., achievements that contribute widely to the field of sedimentary geology

and through service to GSA. Monies for the award are derived from annual interest income from the Laurence L. Sloss Award for Sedimentary Geology fund, administered by the GSA Foundation.

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

Send nominations by March 1, 2002, to Paul Karl Link, Secretary, Sedimentary Geology Division, Dept. of Geology, Box 8072, Idaho State University, 1400 E. Terry, Pocatello, ID 83209-8072.

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## **GILBERT H. CADY AWARD**

The Coal Geology Division of GSA seeks nominations for the 2002 Gilbert H. Cady Award, made for outstanding contributions in the field of coal geology. As defined in the division's bylaws, "Coal geology refers to a field of knowledge concerning the origin, occurrence, relationships, and geologic characteristics of the many varieties of coal and associated rocks, including economic implications." The first award, established by the division in honor of Gilbert H. Cady, was presented in 1973. Monies for the award are derived from annual interest income from the Gilbert H. Cady Memorial Fund, administered by the GSA Foundation. The award (a certificate and an engraved silver tray) will be made for contributions considered to advance the field of coal geology within and outside North America and will be presented at the Coal Geology Division Business Meeting at the 2002 GSA Annual Meeting in Denver.

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

Send three copies of the nomination by February 28, 2002, to Charles E. Barker, U.S. Geological Survey, Denver Federal Center, Sixth Avenue and Kipling Street, Building 20, MS 977, Denver, CO 80225, (303) 236-5797, fax 303-236-3202, [barker@usgs.gov](mailto:barker@usgs.gov).





## Three-Dimensional Flow, Fabric Development, and Strain in Deformed Rocks and the Significance for Mountain Building Processes: New Approaches

August 18–24, 2002, Ascona, Switzerland

### Conveners:

**Hermann Lebit** and **Catalina Lüneburg**, Department of Geoscience, State University of West Georgia, Carrollton, GA 30118, USA, (770) 838-3203, fax 770-836-4373, [hlebit@westga.edu](mailto:hlebit@westga.edu), [clunebur@westga.edu](mailto:clunebur@westga.edu)

**Peter Hudleston**, Department of Geology and Geophysics, University of Minnesota, 310 Pillsbury Drive SE, Minneapolis, MN 55455, USA, (612) 625-0046, fax 612-625-3819, [hudlesto@mailbox.mail.umn.edu](mailto:hudlesto@mailbox.mail.umn.edu)

**John Ramsay**, Cratoule-Issirac, F-30760 St. Julien de Peyrolas, France, [Ramsay-Dietrich@wanadoo.fr](mailto:Ramsay-Dietrich@wanadoo.fr)

The major goal of this conference is to discuss new approaches to tectonics that address the spatial and temporal complexities of three-dimensional deformation processes. The topics that will be covered include a broad range of subjects and methodologies, from large-scale views of lithospheric processes to the micro-mechanics at the grain scale of deformation. The conference will focus on specific and sometimes controversial topics, which should stimulate future discussions in structural geology. Topics will include:

- The nature of heterogeneous strain fields in repeatedly deformed rocks as a result of superposed folds or reactivated shear zones. How do strains accumulate in such systems and how does the state of finite strain correlate with the development of structures and fabrics in these rocks?
- The significance of final structures and fabrics for the analysis of complex deformation. Can rock structures and rock fabrics be used to track the deformation path?
- The relationship between rock fabrics and finite or incremental strain. How do fabrics and textures behave under non-steady deformation? Is fabric development cumulative, cyclic, or does it reflect certain segments of the deformation path?

- The scale dependency of structural analysis. Can we use outcrop-scale information to interpret regional kinematics, and are macroscopic structures controlled by local strain or by the regional background deformation?
- Three-dimensional forward modeling of deformation systems. How can we approach the complexity of deformation paths arising from non-steady state conditions and/or three-dimensional displacement fields? Which models are appropriate?

The conference is to be held at Monte Verita, a small ETH (Swiss Federal Institute of Technology) Zurich conference center above Ascona, on the shores of Lago Maggiore (see [www.csf-mv.ethz.ch/](http://www.csf-mv.ethz.ch/)), where nearby spectacular rock exposures can be studied in order to integrate direct observations into our discussions. The Alps are an ideal environment for this conference as these mountains represent one of the best-documented geological archives of a complex tectonic history, which perfectly exemplifies the conference topics. Three of the six conference days are reserved for field trips to different areas of the Alps relevant to the conference topics. The other three days are covered by lectures, poster presentations, and discussions. The conference is cosponsored by the Swiss Geological Society and the Tectonic Studies Group of the Geological Society.

The conference is limited to 80 participants. We encourage interested graduate students to apply, and some partial student subsidies will be available. The registration fee, which will cover lodging, meals, field trips, and all other conference costs except personal incidentals, is not expected to exceed \$950. Participants will be responsible for transportation to and from the conference. Further information on travel will be provided in the letter of invitation, but is also available at [www.csf-mv.ethz.ch/official/travelinfo/travelinfo.htm](http://www.csf-mv.ethz.ch/official/travelinfo/travelinfo.htm).

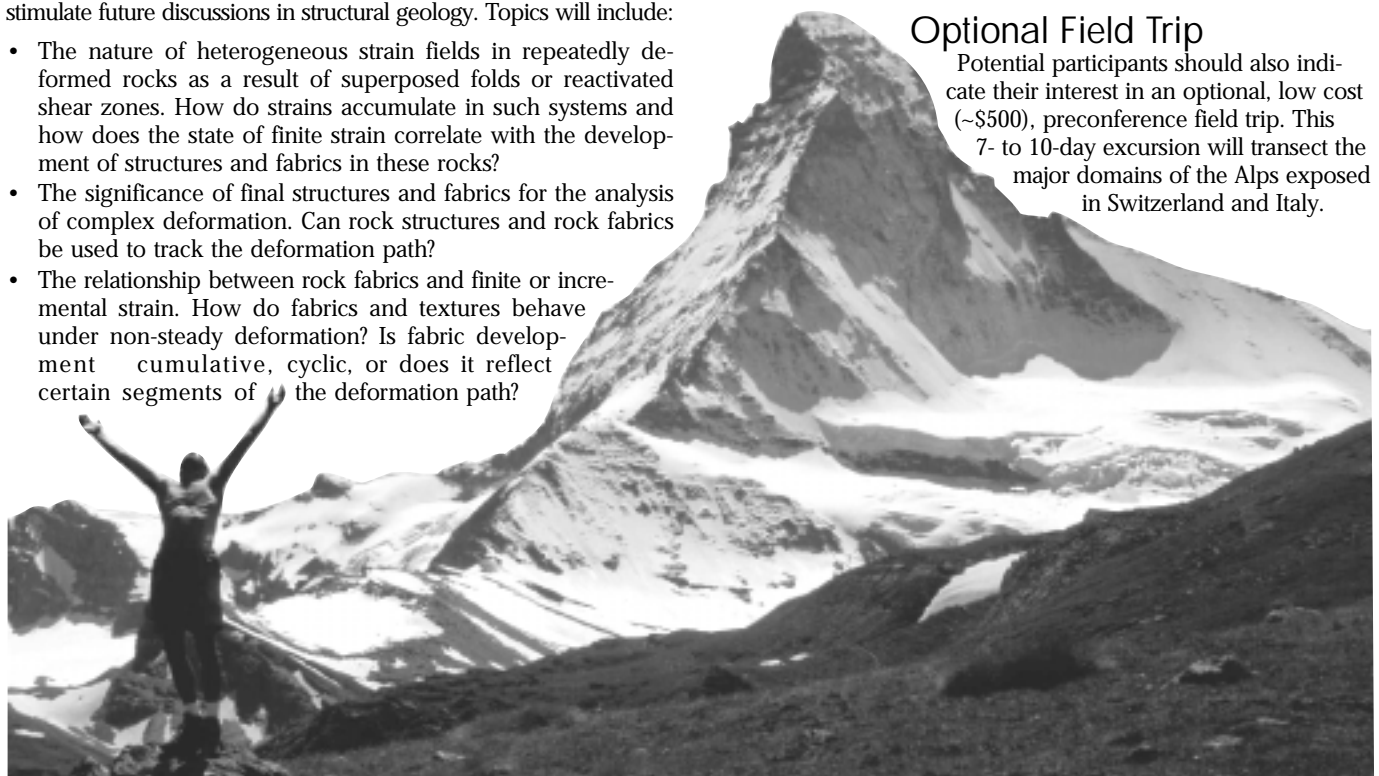
All participants will be encouraged to present posters and short notes on their current research related to the topics of the meeting, and significant time will be given to view and discuss these.

### Application deadline: March 15, 2002

Invitations will be mailed to participants by early April 2002. Potential participants should send a letter of application to Hermann Lebit (address above), including a brief statement of interests, the relevance of the applicant's recent work to themes of the meeting, and the subject of any proposed presentation.

### Optional Field Trip

Potential participants should also indicate their interest in an optional, low cost (~\$500), preconference field trip. This 7- to 10-day excursion will transect the major domains of the Alps exposed in Switzerland and Italy.



GSA and a number of other societies involved in the earth sciences collaborate on GSA Annual and/or Section Meetings, where the societies help develop scientific programs, Penrose Conferences, publications, issues of public policy or education, and professional development. "In the Spotlight" features these GSA Associated Societies. For information on how to become an Associated Society, contact [gsa@geosociety.org](mailto:gsa@geosociety.org).

## The Mineralogical Society of America

In establishing its society Web site, the Mineralogical Society of America (MSA) recognized it could reach beyond its traditional scientific professional audience to a wider group interested in minerals. This includes K-12 earth science students and teachers, amateur mineralogists and gemologists, collectors, lapidarists, and the general public. The costs of printing and distributing material to this other audience is prohibitive for a society like MSA, but these costs disappear with the Internet. With the help of the National Science Foundation, MSA developed several outreach sections on its Web site, [www.minsocam.org](http://www.minsocam.org). The goal was to provide a variety of educational and informational resources rather than a mineralogy curricula.

"Collector's Corner" is a collection of mineral information that is frequently requested, or that is just generally interesting. It is a site developed with mineral collectors in mind. It includes:

- a brief introduction to rock-hounding and mineral collecting;
- an extensive listing for the topographical mineralogy of the United States (publications by state geological surveys, articles in the hobby literature, and resources available on the Internet of where to find minerals state by state);
- a listing of minerals from classic mineral localities that have produced an extraordinarily large number of minerals;
- a sampling of articles from the 85 years of archives of *The American Mineralogist* (including articles such as Peter C. Rickwood's "The largest crystals," a survey of the 39 largest mineral crystals);
- the official rocks, minerals, gems, and fossils for the U.S. states and Canadian provinces; and
- answers to frequently asked questions.

"Mineralogy 4 Kids" is MSA's newest Internet-based educational effort. The site has pages on the rock cycle, mineral properties, crystals, and links to mineral tests and games. "Rock Cycle" pages describe how igneous, sedimentary, and metamorphic rocks can be related to one another, as well as how different types of rocks can be identified and named. "Mineral Properties" covers hardness, cleavage, luster, color, streak, specific gravity, and miscellaneous properties such as magnetism, feel, and smell, among others. It also provides access to pages that describe what minerals can be found in the home. "All About Crystals" describes what a crystal is, crystal forms (with some animation), crystal systems, and symmetry.

The symmetry pages contain more animation showing symmetry operations in action, and they include an application that allows users to design their own patterns using the symmetry of their choice.

"Ask-a-Mineralogist" is for anyone who has a question, would like to learn from previous questions and answers, or would like to post a response to a question. It was designed for the general public, but we do have professionals asking questions. The questions are rather diverse and remarkably inquisitive. Most individuals ask about specific minerals and rocks or how to identify something they have. Others ask how natural opals form; how to get started collecting minerals; mineralogy and crystallographic terminology; and where to find additional information. Most questions and answers are learning experiences in and of themselves. For example: Why does tenebrescence happen? (Tenebrescence is the property that some minerals and phosphors show of darkening or changing color in response to radiation of one wavelength and then reversibly bleaching on exposure to a different wavelength.)

Curious? Check Ask-a-Mineralogist.

## SEPM—Society for Sedimentary Geology

The Latest Society to Associate with GSA

**Howard Harper**, Executive Director

**Dag Nummedal**, President

**Peter McCabe**, President Elect

At the GSA Annual Meeting in Boston, SEPM President Dag Nummedal and GSA President Sharon Mosher signed a document formally making SEPM—Society for Sedimentary Geology an Associated Society of GSA. This affiliation brings many benefits to members of both societies and enhanced visibility for the sedimentary side of the geosciences. In particular, there will be improved access to electronic publications, cooperation on meetings, and a broader outreach to student members. For the first time, SEPM was a cosponsor of several sessions at the GSA Annual Meeting in Boston and was particularly proud of the session honoring John Southard—an outstanding scientist and one of SEPM's honorary members.

Although there can be few GSA members who do not know of SEPM, many may not be familiar with how it has evolved over the last decade or so. Originally formed as a division of the American Association of Petroleum Geologists (AAPG), SEPM became a fully independent society in 1986. It subsequently changed its name from the Society of Economic Paleontologists and Mineralogists to the Society for Sedimentary Geology, reflecting the wide range of interests of its members, but it decided to keep its famous SEPM initials.

About half of SEPM members have interests in the petroleum industry. Its association with AAPG remains strong, and it holds its annual meeting jointly with AAPG. At the same time, an increasing proportion of members are employed in fields such as environmental geology and hydrogeology or are academics whose research has little immediate relevance to industry. For many of these members, participating in SEPM sessions at a GSA meeting may be of more interest than attending AAPG meetings. However, the society hopes to continue to ensure that relevant research from academia is known by industry, and that important new concepts developed by industry are rapidly conveyed to the academic community.

SEPM—Society for Sedimentary Geology celebrated its 75th anniversary in 2001 with a jubilee celebration in Denver. Although a celebration of the society's longevity, it was focused on fu-

ture research trends. Outstanding talks were delivered on topics as diverse as paleoclimatology and three-dimensional subsurface facies architecture. The talks demonstrated that sedimentary geology has entered a new era—one in which students, academics, and applied professionals now have access to comprehensive data, powerful software, and other analytical tools. The only limitation to progress is our own ingenuity. We have a responsibility to broadcast the exciting new developments in sedimentary geology to students across the globe.

For many years, there have been eight regional SEPM sections in the United States and one specialty section (North American Micropaleontology Section). These sections organize conferences, field trips, and meetings with regional GSA or AAPG sections. Over time, the SEPM—Society for Sedimentary Geology has become increasingly international in flavor: Approximately one-third of its

4,500 members now live outside of the United States. This welcome recognition of its leadership role provides SEPM with a challenge as to how to better serve the international sedimentary geology community. One method is the formation of sections overseas. Both a Latin American and a Central European section have recently been established.

SEPM also has research groups on specific topics. These groups hold get-togethers at the annual meetings and are the place to go for lively debates.

We look forward to a long and fruitful association with GSA, and we invite you to visit our Web site, [www.sepm.org](http://www.sepm.org). In particular, find out about the latest in our Special Publication series and our well-respected journals, *Journal of Sedimentary Research* and *PALAIOS*. Let us know of any opportunities you see for increased cooperation between GSA and SEPM.

2002

# GSA SECTION MEETINGS



## NORTHEASTERN SECTION

March 25–27

Sheraton Springfield, Springfield, Mass.

**Information:** Sheila Seaman, (413) 545-2822, [sjs@geo.umass.edu](mailto:sjs@geo.umass.edu).

## NEW THEME SESSION ADDED: Taphonomy: Insight into Stratigraphy, Sedimentology, and Evolution.

David Lehmann, (814) 641-3602,

[LEHMANN@juniata.edu](mailto:LEHMANN@juniata.edu); Mark Leckie, (413) 545-1948, [mleckie@geo.umass.edu](mailto:mleckie@geo.umass.edu).

## SOUTHEASTERN AND NORTH-CENTRAL SECTIONS

April 3–5, 2002

Hyatt Regency Hotel and Lexington Civic Center,

Lexington, Ky. **Information:** John D. Kiefer,

[kiefer@kgs.mm.uky.edu](mailto:kiefer@kgs.mm.uky.edu), or James C. Cobb,

[cobb@kgs.mm.uky.edu](mailto:cobb@kgs.mm.uky.edu), (859) 257-5500.

## SOUTH-CENTRAL SECTION

April 11–12, 2002

Sul Ross State University Center, Alpine, Texas.

**Information:** Kevin Urbanczyk, (915) 837-8110, [kevinu@sulross.edu](mailto:kevinu@sulross.edu).

## ROCKY MOUNTAIN SECTION

May 7–9, 2002

Southern Utah University Campus, Cedar City, Utah.

**Information:** Robert Eves, (435) 586-1934, [eves@suu.edu](mailto:eves@suu.edu).

**Abstract deadline: February 4, 2002**

## CORDILLERAN SECTION

May 13–15, 2002

Oregon State University, Corvallis, Oregon.

**Information:** Robert S. Yeats, (541) 737-1226, [yeatsr@geo.orst.edu](mailto:yeatsr@geo.orst.edu).

**Abstract deadline: February 7, 2002**

## STUDENTS: SECTION MEETINGS HAVE WORKSHOPS JUST FOR YOU

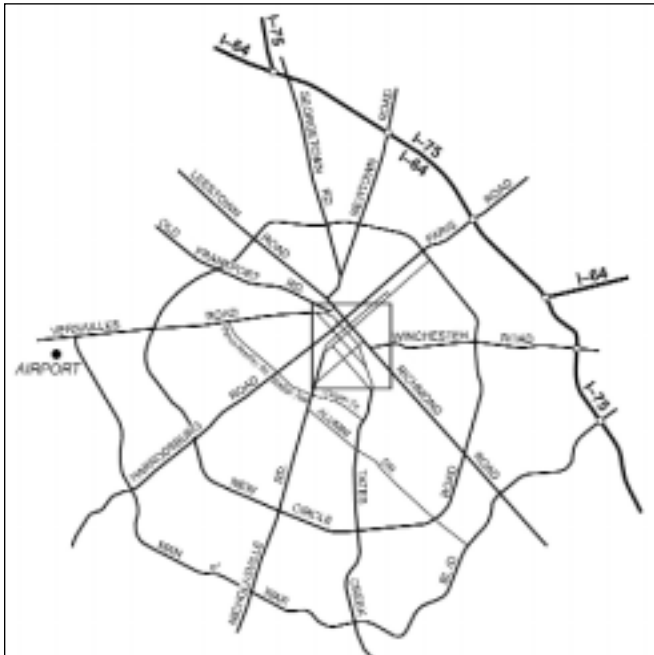
If you're interested in pursuing a career in applied geoscience, you'll find the Roy J. Shlemon Mentor Workshops valuable, informative, fun, and filling (lunch is included). The workshops extend the mentoring reach of individual professionals from applied geology to advanced undergraduate and graduate students attending GSA Section Meetings.

Mark your calendar with the dates for the 2002 Section Meeting closest to you (see above), and watch for announcements in *GSA Today* pertaining to each Section's Roy J. Shlemon Mentor Program in Applied Geology.



# JOINT MEETING

36th Annual Meeting, North-Central Section, GSA, and 51st Annual Meeting, Southeastern Section, GSA · Lexington, Kentucky · April 3–5, 2002



The Kentucky Geological Survey and the Department of Geological Sciences, University of Kentucky, and the Department of Geology, University of Cincinnati, will host a joint meeting of the North-Central and Southeastern Sections of the Geological Society of America. The meeting will include premeeting and postmeeting field trips and workshops.

### HEADQUARTERS, ACCOMMODATIONS, AND REGISTRATION

**Preregistration deadline: February 22, 2002**  
**Cancellation deadline: March 1, 2002**

Lexington, Kentucky, is an ideal site for this joint meeting of the GSA North-Central and Southeastern Sections. The area surrounding Lexington contains excellent exposures of Ordovician through Pennsylvanian rocks, many of which will be examined during meeting field trips. The

meeting will be held at the Hyatt Regency Hotel and the adjacent Lexington Center's Heritage Hall in downtown Lexington.

A block of rooms has been reserved at the Hyatt Regency for meeting attendees, with a single meeting rate of \$110 for 1–4 persons per room per night. Meeting attendees are responsible for making their own housing arrangements. Please call Hyatt Hotels reservations at 1-800-233-1234 or (859) 253-1234 (local number) and refer to the Geological Society of America room block. For more information on registration, lodging, and the meeting schedule, please visit the meeting Web site at [www.geosociety.org/sectdiv/Northc/02nc-semtg.htm](http://www.geosociety.org/sectdiv/Northc/02nc-semtg.htm). Information is also posted at [www.uky.edu/KGS/gsa2002](http://www.uky.edu/KGS/gsa2002).

Please register online at [www.geosociety.org/sectdiv/Northc/02nc-semtg.htm](http://www.geosociety.org/sectdiv/Northc/02nc-semtg.htm). Forms are also available there for down-

load, or use the form printed on page 25. Preregistration rates will be available through February 22, 2002. After that date, on-site rates will apply.

### TECHNICAL SESSIONS

#### Oral Sessions

Conveners and chairs for all oral sessions are requested to keep their sessions on schedule. Each speaker is allowed a total of 20 minutes, which includes approximately 15 minutes for the presentation, 3 minutes for questions, and 2 minutes to allow speakers to approach and depart the podium. Session conveners and chairs are provided with laser pointers and timers.

Each oral session room will have one 35 mm slide projector, one computer data projector, and one overhead projector. Two screens will be provided for use with any combination of the above projectors. Note that only one 35 mm slide projector will be provided. This allows us to provide computer data projectors. All slides must be 2" x 2" size and fit in standard 35 mm slide carousels. Speakers should bring their own carousel tray, already loaded with their slides. The slide tray should be labeled with speaker's name, session, and speaker number and should be delivered to the projectionist immediately prior to

Registration Fees	Preregistration	On-site	One Day
Professional Member	\$120	\$150	\$80
Professional Non-Member	\$130	\$160	\$80
Student Member	\$40	\$55	\$30
Student Non-Member	\$45	\$60	\$30
K–12 Professional	\$10	\$10	—
Guest/Spouse	\$35	\$35	—

the beginning of the session. A limited number of slide trays will be available for loan in the Speaker Ready Room.

#### **Important note to oral presenters:**

For the first time, the North-Central and Southeast Sections **will** provide computer data projectors in the technical sessions. We will have one data projector and a laptop PC with Microsoft PowerPoint 2000 software available in each session room. Presenters should bring their Microsoft PowerPoint presentation file on a CD-ROM or 3.5 inch diskette. Personal laptops cannot be used for presentations—you must load your file on the PC set up in the session room. Zip disk drives **will not** be available. Several laptop PC computers will also be available in the speaker ready room to review your presentation. Macintosh users should ensure that their disks and files are compatible with Windows-based PowerPoint software.

#### **Poster Sessions**

Poster presenters will have one 4' × 8' horizontal board for display of papers. Poster papers will be scheduled for half-day sessions. Due to traffic considerations, the use of tables is not encouraged, but one table per poster can be arranged upon advance request. Electrical hookups are not available, and all computer equipment must be battery-powered.

Proposed symposia and theme sessions are listed below. Please contact Dave Harris, technical program chair, for more information at [harris@kgs.mm.uky.edu](mailto:harris@kgs.mm.uky.edu), (859) 257-5500. For more details on a proposed session, please check the meeting Web site, [www.uky.edu/KGS/gsa2002](http://www.uky.edu/KGS/gsa2002), or contact the chairpersons listed for each session.

#### **SYMPOSIA**

1. **High-Resolution Event Stratigraphy in the Paleozoic Midcontinent.** Warren Huff, University of Cincinnati, [warren.huff@uc.edu](mailto:warren.huff@uc.edu), (513) 556-3731; Carl Brett, University of Cincinnati, [carlton.brett@uc.edu](mailto:carlton.brett@uc.edu), (513) 556-4556.
2. **Pander Society Symposium.** Jeff Bauer, Shawnee State University, [jbauer@shawnee.edu](mailto:jbauer@shawnee.edu), (740) 351-3421; Mark Kleffner, Ohio State University—Lima, [Kleffner.1@osu.edu](mailto:Kleffner.1@osu.edu), (419) 995-8208.
3. **Shoreline Processes: Ocean Coastal and Great Lakes Issues.** (*Sponsored by the Southeast and North-Central Sections, SEPM.*) David Bush, State University of West Georgia, [dbush@westga.edu](mailto:dbush@westga.edu), (770) 836-4369; Donald Guy, Ohio Division of Geological Survey, [don.guy@dnr.state.oh.us](mailto:don.guy@dnr.state.oh.us), (419) 626-4296.
4. **Lacustrine Geology and Geochemistry.** David Long, Michigan State

University, [long@msu.edu](mailto:long@msu.edu), (517) 353-9618; George Kipphut, Murray State University, [George.Kipphut@murraystate.edu](mailto:George.Kipphut@murraystate.edu), (270) 762-2847.

5. **Applied Coal Geology.** (*Cosponsored by The Society for Organic Petrology and GSA Coal Geology Division.*) Jim Hower, University of Kentucky, [hower@caer.uky.edu](mailto:hower@caer.uky.edu), (859) 257-0261; John Popp, Alliance Coal, [johnp@arlp.com](mailto:johnp@arlp.com), (859) 224-7219.
6. **Geology and Public Policy.** (*Sponsored by the GSA Southeastern and North-Central Sections Committees on Geology and Public Policy and the GSA Southeastern Section Education Committee.*) Jim Cobb, Kentucky Geological Survey, [cobb@kgs.mm.uky.edu](mailto:cobb@kgs.mm.uky.edu), (859) 257-5500; John Kiefer, Kentucky Geological Survey, [kiefer@kgs.mm.uky.edu](mailto:kiefer@kgs.mm.uky.edu), (859) 257-5500.
7. **Ancient Basement Faults and Modern Earthquakes.** Bill Thomas, University of Kentucky, [geowat@uky.edu](mailto:geowat@uky.edu), (859) 257-6222; Russ Wheeler, U.S. Geological Survey, [wheeler@usgs.gov](mailto:wheeler@usgs.gov), (303) 273-8589; John McBride, Illinois State Geological Survey, [mcbride@geoserv.isgs.uiuc.edu](mailto:mcbride@geoserv.isgs.uiuc.edu), (217) 333-5107.
8. **A River Runs Through It.** (Landscape evolution, glaciation, paleohydrology, geoarcheology, sedimentation, and engineering geology in the Ohio River basin.) Steven Kite, West Virginia University, [kite@geo.wvu.edu](mailto:kite@geo.wvu.edu), (304) 293-5603, ext. 4330; Darryl Granger, Purdue University, [dgranger@purdue.edu](mailto:dgranger@purdue.edu), (765) 494-0043.
9. **Energy and Environmental Geology Issues in the Illinois Basin.** (*Sponsored by the Illinois Basin Consortium.*) Beverly Herzog, Illinois State Geological Survey, [herzog@isgs.uiuc.edu](mailto:herzog@isgs.uiuc.edu), (217) 244-2788; Dave Williams, Kentucky Geological Survey, [williams@kgs.mm.uky.edu](mailto:williams@kgs.mm.uky.edu), (270) 827-3414.
10. **Large-Scale Glacial Geomorphology—What Can It Tell Us?** Tom Lowell, University of Cincinnati, [thomas.lowell@uc.edu](mailto:thomas.lowell@uc.edu), (513) 556-4165; Gregory Wiles, College of Wooster, [gwiles@wooster.edu](mailto:gwiles@wooster.edu), (330) 263-2298; Don Pair, University of Dayton, [don.pair@notes.udayton.edu](mailto:don.pair@notes.udayton.edu), (937) 229-2936.
11. **New Challenges in Paleontological Education.** (*Sponsored by the Southeast Section—National Association of Geoscience Teachers, the Southeast Section of the Paleontological Society, and the GSA Southeastern Section Education Committee.*) Michael Gibson, University of Tennessee—Martin, [migibson@utm.edu](mailto:migibson@utm.edu), (731) 587-7435; Michael

Savarese, Florida Gulf Coast University, [msavares@fgcu.edu](mailto:msavares@fgcu.edu), (941) 590-7165.

12. **Evolutionary Morphology.** (*Sponsored by the North-Central Section of the Paleontological Society.*) Steve Loduca, Eastern Michigan University, [geo\\_loduca@online.emich.edu](mailto:geo_loduca@online.emich.edu), (734) 487-8589; Tom Baumiller, University of Michigan, [tomaszb@umich.edu](mailto:tomaszb@umich.edu), (734) 764-7543.

#### **THEME SESSIONS**

1. **Groundwater Flow and Geochemistry in Carbonate Terranes.** (*Sponsored by the GSA Hydrogeology Division and the National Ground Water Association.*) Chris Groves, Hoffman Environmental Research Institute, Western Kentucky University, [chris.groves@wku.edu](mailto:chris.groves@wku.edu), (270) 745-5974; Alan Fryar, University of Kentucky, [afryar1@uky.edu](mailto:afryar1@uky.edu), (859) 257-4392; Jim Currens, Kentucky Geological Survey, [currens@kgs.mm.uky.edu](mailto:currens@kgs.mm.uky.edu), (859) 257-5500.
2. **Geologic Sequestration of CO<sub>2</sub>.** Jim Drahovzal, Kentucky Geological Survey, [drahovzal@kgs.mm.uky.edu](mailto:drahovzal@kgs.mm.uky.edu), (859) 257-5500; Larry Wickstrom, Ohio Division of Geological Survey, [larry.wickstrom@dnr.state.oh.us](mailto:larry.wickstrom@dnr.state.oh.us), (614) 265-6598.
3. **Geologic Hazards.** (*Sponsored by the GSA Engineering Geology Division.*) John Kiefer, Kentucky Geological Survey, [kiefer@kgs.mm.uky.edu](mailto:kiefer@kgs.mm.uky.edu), (859) 257-5500.
4. **Black Shales—Old Problems, New Solutions.** (*Sponsored by the Society for Organic Petrology.*) Sue Rimmer, University of Kentucky, [srimmer@uky.edu](mailto:srimmer@uky.edu), (859) 257-4607; Maria Mastalerz, Indiana Geological Survey, [mmastale@indiana.edu](mailto:mmastale@indiana.edu), (812) 855-9416.
5. **Geology and Human History I: Geological and Regional Perspectives on Historical Events.** (*Sponsored by the GSA Southeastern Section Education Committee.*) William Andrews, Kentucky Geological Survey, [wandrews@kgs.mm.uky.edu](mailto:wandrews@kgs.mm.uky.edu), (859) 257-5500; Bob Whisonant, Radford University, [rwhisona@radford.edu](mailto:rwhisona@radford.edu), (540) 831-5224.
6. **Wetlands Hydrology and Biogeochemistry.** (*Sponsored by the GSA Hydrogeology Division.*) Alan Fryar, University of Kentucky, [afryar1@uky.edu](mailto:afryar1@uky.edu), (859) 257-4392; Elisa D'Angelo, University of Kentucky, [edangelo@ca.uky.edu](mailto:edangelo@ca.uky.edu), (859) 257-8651; A.D. Karathanasis, University of Kentucky, [akaratha@ca.uky.edu](mailto:akaratha@ca.uky.edu), (859) 257-5925; Abinash Agrawal, Wright State University, [abinash.agrawal@wright.edu](mailto:abinash.agrawal@wright.edu), (937) 775-3452.

7. **Ancient Seismites.** (*Sponsored by the Southeast and North-Central Sections, SEPM.*) Frank Ettensohn, University of Kentucky, fettens@uky.edu, (859) 257-1401; Carl Brett, University of Cincinnati, carlton.brett@uc.edu, (513) 556-4556.
8. **Geology and Human History II: Geoarchaeology and Site Formation Studies.** Chris Pool, University of Kentucky, capool0@uky.edu, (859) 257-2793.
9. **Precambrian of North-Central and Southeastern United States: Craton to Continental Margin.** Dave Moecher, University of Kentucky, moker@uky.edu, (859) 257-6939.
10. **Geologic Data Distribution on the World Wide Web.** Dan Carey, Kentucky Geological Survey, carey@kgs.mm.uky.edu, (859) 257-5500.
11. **Geology and Public Health.** Jim Dinger, Kentucky Geological Survey, dinger@kgs.mm.uky.edu, (859) 257-5500; Ed Mehnert, Illinois State Geological Survey, mehnert@isgs.uiuc.edu, (217) 244-2765.
12. **Technology Transfer and Scientific Communication.** Marie-France Dufour, Illinois Geological Survey, dufour@isgs.uiuc.edu, (217) 333-5115; Deborah DeChurch, Indiana Geological Survey, ddechur@indiana.edu, (812) 855-1941.
13. **Neotectonics and Liquefaction Phenomena.** Ed Woolery, University of Kentucky, ewoolery@kgs.mm.uky.edu, (859) 257-5500; John McBride, Illinois State Geological Survey, mcbride@geoserv.isgs.uiuc.edu, (217) 333-5107; Russ Wheeler, U.S. Geological Survey, wheeler@usgs.gov, (303) 273-8589.
14. **Digital Geologic Mapping.** Jerry Weisenfluh, Kentucky Geological Survey, jerryw@kgs.mm.uky.edu, (859) 257-5500; Warren Anderson, Kentucky Geological Survey, wanderson@kgs.mm.uky.edu, (859) 257-5500.
15. **Regionally Considering Coastal Erosion: Examples from the Southeast United States.** Paul Gayes, Center for Marine and Wetland Studies, Coastal Carolina University, ptgayes@coastal.edu, (843) 347-9152; William Schwab, U.S. Geological Survey, Woods Hole Field Center, bschwab@usgs.gov, (508) 457-2299; Rick DeVoe, South Carolina Sea Grant Consortium, rick.devoe@scseagrant.org, (843) 727-2078.
16. **Expanding Earth Science Inquiry-Based Education, K-16.** (*Sponsored by the East-Central and Southeast Sections of the National Association of Geoscience Teachers and the GSA Southeastern Section Education Committee.*) Diann S. Kiesel, University of Wisconsin—Baraboo—Sauk County, dkiesel@uwc.edu, (608) 356-8351, ext. 223.
17. **Technology for Inquiry-Based Earth Science Education.** (*Sponsored by the East-Central and Southeast Sections of the National Association of Geoscience Teachers and the GSA Southeastern Section Education Committee.*) Roderic Brame, Wright State University, roderic.brame@wright.edu, (937) 775-3455; David McConnell, University of Akron, dam6@uakron.edu, (330) 972-8047.
18. **Undergraduate Research Posters.** (*Sponsored by the Council for Undergraduate Research.*) Robert Shuster, University of Nebraska—Omaha, Robert.Shuster@unomaha.edu, (402) 554-2457, fax 402-554-3518; David Matty, Central Michigan University, David.J.Matty@cmich.edu, (517) 774-3179, fax 517-774-3537, (North-Central Section); Brannon Andersen, Furman University, Brannon.Andersen@furman.edu, (864) 294-3362 (Southeastern Section).
19. **Weathering and Landscape Evolution.** Jonathan D. Phillips, University of Kentucky, jdp@uky.edu, (859) 257-6950.
20. **Carboniferous Paleontology and Biostratigraphy.** Glenn Storrs, Cincinnati Museum Center, storrgw@email.uc.edu, (513) 287-7000, ext. 2374; Steve Greb, Kentucky Geological Survey, greb@kgs.mm.uky.edu, (859) 257-5500.
21. **Near-Surface Geophysics.** Paul J. Wolfe, Wright State University, paul.wolfe@wright.edu, (937) 775-3455; Ernest C. Hauser, Wright State University, ernest.hauser@wright.edu, (937) 775-3455.

## WORKSHOPS

Workshops will be held before and after the meeting, on April 1, 2, 3 and 6. Registration for some workshops is limited. For additional information, please check the meeting Web site, [www.uky.edu/KGS/gsa2002](http://www.uky.edu/KGS/gsa2002), contact the workshop chair, Steve Greb, [greb@kgs.mm.uky.edu](mailto:greb@kgs.mm.uky.edu), (859) 257-5500, or contact the workshop conveners.

1. **Digital Collection of Geologic and Geotechnical Data using a Personal Digital Assistant (PDA) and a GPS Receiver.** (*Sponsored by the Southeast and North-Central Sections, SEPM.*) Tues., April 2, 8:30 a.m.–5 p.m. Randy Kath, State University of West Georgia, rkath@westga.edu, (770) 836-6480, fax

770-836-4373; Lester Williams, U.S. Geological Survey, lesterw@usgs.gov, (770) 903-9100, fax 770-903-9199. Cost: \$50. Max.: 28. (Please bring your PDA, GPS, and serial cables if possible; cost includes course notes.)

2. **Earth Science Education and the Development of Reasoning.** (*Sponsored by the East-Central and Southeast Sections of the National Association of Geoscience Teachers and the GSA Southeastern Section Education Committee.*) Sat., April 6, 8:30 a.m.–5 p.m. Roderic Brame, Wright State University, roderic.brame@wright.edu, (937) 775-3455; David McConnell, University of Akron, dmccConnell@uakron.edu, (330) 972-8047; William Slattery, Wright State University, william.slattery@wright.edu, (937) 775-3455. Hyatt Regency Hotel, Regency Ballroom. Cost: \$20 (includes workshop notes). Max.: 100.
3. **Planning and Reviewing for Professional Geology Examinations.** Tues., April 2, 8:30 a.m.–5 p.m. (8 a.m. sign-in). William Andrews, Kentucky Geological Survey, wandrews@kgs.mm.uky.edu, (859) 257-5500. Kentucky Geological Survey Core and Sample Repository, 2500 Research Park Drive, Lexington, KY 40511. Cost: \$50 (includes course notes, workbook, snacks, and lunch). Max.: 50.
4. **Introduction to ArcView GIS.** Tues., April 2, 8:30 a.m.–4:30 p.m., and Wed., April 3, 8 a.m.–noon. Dan Carey, Kentucky Geological Survey, carey@kgs.mm.uky.edu, (859) 257-5500, William T. Young Library, University of Kentucky. Cost: \$75 (includes ESRI Intro to ArcView textbook; lunches on your own). Max.: 24.
5. **RockWare Earth Science Software: Using RockWorks2002.** Sat., April 6, 9 a.m.–4:30 p.m. Jim Reed, Rockware, Inc., jim@rockware.com, (303) 278-3534, ext. 113. William T. Young Library, University of Kentucky. Cost: \$10 (includes refreshments, trialware CD-ROM, and course outline). Max.: 24.
6. **Subsurface Techniques in Exploration.** (*Sponsored by the Kentucky Geological Survey and Kentucky Society of Professional Geologists.*) Sat., April 6, 8 a.m.–5 p.m. Patrick J. Gooding, Kentucky Geological Survey, gooding@kgs.mm.uky.edu, (859) 389-8810. Kentucky Geological Survey Core and Sample Library, 2500 Research Park Drive, Lexington, KY 40511. Cost: \$20 (includes refreshments, lunch, and course notes). Max.: 40.

## FIELD TRIPS

Field trips are planned before, during, and after the meeting. *If you are interested in a trip that runs during part of the meeting, please ensure that it does not conflict with a paper that you are scheduled to present or a technical session that you want to attend. The meeting program will be posted on the meeting Web sites approximately one month before the preregistration deadline, allowing you to review the schedule before registering.* Registration for most trips is limited. For additional information please check the meeting Web site, [www.uky.edu/KGS/gsa2002](http://www.uky.edu/KGS/gsa2002), contact field trip chair Frank Ettensohn, University of Kentucky, [fettens@uky.edu](mailto:fettens@uky.edu), (859) 257-1401, or contact the field trip leader.

1. **Carbonate Mud Mounds in the Fort Payne Formation (Lower Mississippian), Cumberland County, Kentucky.** Fri. April 5, 5 p.m., through Sat., April 6, 6 p.m. David Meyer, University of Cincinnati, [David.Meyer@uc.edu](mailto:David.Meyer@uc.edu), (513) 556-4530; Richard Krause, Jr., University of Cincinnati, [rakrause@fuse.net](mailto:rakrause@fuse.net), (513) 961-3389; William Ausich, Ohio State University, [ausich.1@osu.edu](mailto:ausich.1@osu.edu), (614) 292-3353. Cost: \$92 (includes transportation, lunch, overnight lodging). Max.: 40.
2. **Mississippian Stratigraphy and Karst Geology of the Mammoth Cave Region, Kentucky.** Tues., April 2, 7:45 a.m.–6 p.m. Walter Johnson, University of Kentucky, [wkjohn1@uky.edu](mailto:wkjohn1@uky.edu); (859) 257-3758; Joe Meiman, Mammoth Cave National Park, [joe\\_meiman@nps.gov](mailto:joe_meiman@nps.gov), (270) 758-2508; Ken Kuehn, Western Kentucky University, [kenneth.kuehn@wku.edu](mailto:kenneth.kuehn@wku.edu), (270) 745-4555. Cost: \$65 (includes lunch, transportation, and guidebook). Max.: 45.
3. **Middle and Upper Mississippian Stratigraphy and Depositional Environments in East-Central Kentucky: The New Big Hill Exposure.** Wed., April 3, 7:45 a.m.–1 p.m. Frank Ettensohn, University of Kentucky, [fettens@uky.edu](mailto:fettens@uky.edu), (859) 257-1401; Walter Johnson, University of Kentucky, [wkjohn1@uky.edu](mailto:wkjohn1@uky.edu); (859) 257-3758; Alex Stewart, University of Kentucky, [akstew0@uky.edu](mailto:akstew0@uky.edu); (859) 257-3758; Mike Solis, University of Kentucky, (859) 257-3758; Tina White, University of Kentucky, [tmwhit1@uky.edu](mailto:tmwhit1@uky.edu), (859) 257-3758. Cost: \$40 (includes transportation and guidebook). Max.: 40.
4. **Silurian through Lower Mississippian Geology, Paleontology, and Economic Influence in the Falls of the Ohio Region, North-Central Kentucky.** Tues., April 2, 7:30 a.m.–6 p.m.

Todd Hendricks, Kentucky Division of Waste Management, [todd.hendricks@mail.state.ky.us](mailto:todd.hendricks@mail.state.ky.us), (502) 564-6716; Robert Whittemore, General Shale Brick, (423) 282-4661; Frank Ettensohn, University of Kentucky, [fettens@uky.edu](mailto:fettens@uky.edu), (859) 257-1401. Cost: \$60 (includes lunch, transportation, and guidebook). Max.: 40.

5. **The Middlesboro Impact Structure and Regional Geology of the Pine Mountain Thrust Sheet.** Fri. and Sat., April 5–6, 9:30 a.m.–5 p.m. Keith Milam, University of Tennessee, [kmilam@utk.edu](mailto:kmilam@utk.edu), (865) 974-2789; Josh Cahill, University of Tennessee, [jcahill@utk.edu](mailto:jcahill@utk.edu), (865) 974-3936; Ken Kuehn, Western Kentucky University, [kenneth.kuehn@wku.edu](mailto:kenneth.kuehn@wku.edu), (270) 745-4555. Cost: \$130 (includes transportation, lunches, and overnight lodging). Max.: 15.
6. **Upper and Middle Pennsylvanian Stratigraphy, Sedimentology, and Coal Geology in Eastern Kentucky.** (Sponsored by the GSA Coal Geology Division.) Sat., April 6, 7 a.m.–6 p.m. Cortland Eble, Kentucky Geological Survey, [eble@kgs.mm.uky.edu](mailto:eble@kgs.mm.uky.edu), (859) 257-5500; Steve Greb, Kentucky Geological Survey, [greb@kgs.mm.uky.edu](mailto:greb@kgs.mm.uky.edu), (859) 257-5500; Ron Martino, Marshall University, [martino@marshall.edu](mailto:martino@marshall.edu), (304) 696-2715. Cost: \$50 (includes snacks, lunch, transportation, and guidebook). Max.: 40. (Trip will depart from and return to Lexington, leaving at 7 a.m. and returning at approximately 6 p.m.)
7. **The Influence of Geology on the Military and Cultural History of the Bluegrass Region, Central Kentucky.** (Sponsored by the GSA Southeastern Section Education Committee.) Sat., April 6, 8 a.m.–6 p.m. William Andrews, Kentucky Geological Survey, [wandrews@kgs.mm.uky.edu](mailto:wandrews@kgs.mm.uky.edu), (859) 257-5500; John Hickman, Kentucky Geological Survey, [jhickman@kgs.mm.uky.edu](mailto:jhickman@kgs.mm.uky.edu), (859) 257-5500; Matt Crawford, Kentucky Geological Survey, [mrcrawford@kgs.mm.uky.edu](mailto:mrcrawford@kgs.mm.uky.edu), (859) 257-5500. Cost: \$55 (includes morning and afternoon snacks, lunch, transportation, admission to guided tours, and guidebook). Max.: 45.
8. **The Geology of Pound Gap on the Pine Mountain Thrust Sheet: Eastern Kentucky and Virginia.** Tues., April 2, 7 a.m.–6 p.m. Steve Greb, Kentucky Geological Survey, [greb@kgs.mm.uky.edu](mailto:greb@kgs.mm.uky.edu), (859) 257-5500. Cost: \$50 (includes lunch, transportation, and guidebook). Max.: 28. (Trip will depart from and return to Lexington, leaving

at 7 a.m. and returning at approximately 6 p.m.)

9. **Middle and Late Ordovician Seismites from Central Kentucky.** (Sponsored by the Southeast and North-Central Sections, SEPM.) Fri., April 5, 1–6 p.m. Frank Ettensohn, University of Kentucky, [fettens@uky.edu](mailto:fettens@uky.edu), (859) 257-1401; Alex Stewart, University of Kentucky, [akstew0@uky.edu](mailto:akstew0@uky.edu), (859) 257-3758; Carl Brett, University of Cincinnati, [carlton.brett@uc.edu](mailto:carlton.brett@uc.edu), (513) 556-4556; Pat McLaughlin, University of Cincinnati, [pimclau@hotmail.com](mailto:pimclau@hotmail.com), (513) 556-3732. Cost: \$40 (includes transportation and guidebook). Max.: 45. **Note:** Special Ordovician Combo: Attend both Trip 9 and 10 for reduced price of \$60.
10. **Middle and Late Ordovician Stratigraphy and Depositional Environments in Central and North-Central Kentucky.** (Sponsored by the Southeast and North-Central Sections, SEPM.) Sat., April 6, 8 a.m.–5 p.m. Carl Brett, University of Cincinnati, [carlton.brett@uc.edu](mailto:carlton.brett@uc.edu), (513) 556-4556; Pat McLaughlin, University of Cincinnati, [pimclau@hotmail.com](mailto:pimclau@hotmail.com), (513) 556-3732; Frank Ettensohn, University of Kentucky, [fettens@uky.edu](mailto:fettens@uky.edu), (859) 257-1401. Cost: \$45 (includes lunch, transportation, and guidebook). Max.: 45. **Note:** Special Ordovician Combo: Attend both Trip 9 and 10 for reduced price of \$60.

## STUDENT TRAVEL GRANTS

The Southeastern Section, in cooperation with the GSA Foundation, is giving travel grants to students who are presenting papers at the meeting. All eligible students will receive some support, the amount depending on the number of applicants. The application form can be found at [www.geology.ecu.edu/geology/segas/travel.html](http://www.geology.ecu.edu/geology/segas/travel.html). Applications must be postmarked no later than March 1, 2002. Additional information may be obtained from Donald Neal, (252) 328-4392, [neald@mail.ecu.edu](mailto:neald@mail.ecu.edu).

The North-Central Section, in cooperation with the GSA Foundation, will provide grants of up to \$200 for travel assistance (exclusive of field trip fees) to Student Members and Associates of GSA. Assistance will be offered on a first-come, first-served basis, with priority given to students presenting papers at the meeting. Application information is available from GSA campus representatives.

## ROY J. SHLEMON MENTOR PROGRAM IN APPLIED GEOLOGY

**Real Jobs for Geologists in the Real World.** Thurs., April 4, and Fri., April 5, 11:30 a.m.–1:30 p.m. Karlon Blythe, GSA Program Officer, kblythe@geosociety.org. This GSA-sponsored program is designed to acquaint advanced undergraduate and beginning graduate students with careers in applied geoscience. The mentors' goal is to provide real-world information and insight, based on his or her own career, to which students may not be exposed through their academic experiences. Several mentors with diverse backgrounds will participate; they are uniquely qualified with backgrounds in applied environmental geoscience, mining, education, and government. Each session will be different. There is no cost but you must register, as lunch will be provided. Space is limited. Meeting registration is not required to attend only this workshop.

### GUEST ACTIVITIES

Guests and spouses must register for the meeting in order to attend these activities. All will leave from and return to the lobby of the Hyatt Regency Hotel in Lexington. Signs will be posted in the lobby.

1. **Lexington Walking Tour.** Wed., April 3, 12:45–4 p.m. Antebellum downtown Lexington; tour of Mary Todd Lincoln's girlhood home; tour of Hopemont, the federal-style home of Confederate general John Hunt Morgan. Cost: \$8 (includes admission to both homes). Max.: 20.
2. **Irish Acres Antique Gallery and Luncheon.** Thurs., April 4, 9:30 a.m.–2:30 p.m. Scenic drive to the tiny town of Nonesuch; 32,000 square feet of the finest antiques; gourmet lunch at the gallery's "The Glitz" dining room. Cost: \$20 (includes transportation and lunch). Max.: 28.
3. **Keeneland Thoroughbred Morning Workout and Horse Farm Tour.** Fri., April 5, 7:15–11:30 a.m. Watch thoroughbreds work out in the early morning; tour of a working thoroughbred farm. Cost: \$10 (includes transportation and pastries and coffee at the track). Max.: 30.
4. **Keeneland Thoroughbred Racing.** Fri., April 5, 1–5:30 p.m. Attend opening of the spring racing meet at Keeneland Race Track, a National Historic Landmark. Cost: \$10 (includes transportation and grandstand admission). Max.: 50.
5. **Field Trip 7: The Influence of Geology on the Military and Cultural History of the Bluegrass Region,**

**Central Kentucky.** Sat., April 6, 8 a.m.–6 p.m. Guests and spouses are welcome to accompany professional attendees on this field trip, which will also be of interest to non-geologists. See field trip section for more details. Cost: \$55 (includes morning and afternoon snacks, lunch, transportation via luxury motor coach, admission to guided tours, and a joint guidebook with other field trips). Max.: 45.

### SPECIAL EVENTS

**Welcoming Party.** Wed., April 3, 6–9 p.m. Heritage Hall East. You must be registered for the meeting to attend the Welcoming Party.

**MAP BLAST 2002 and North-Central Section Business Meeting.** Thurs., April 4, 5–7 p.m., in the poster session area, Heritage Hall East. Contact: Warren Anderson, Kentucky Geological Survey, wanderson@kgs.mm.uky.edu, (859) 257-5500; Tom Lowell, University of Cincinnati, thomas.lowell@uc.edu, (513) 556-4165.

### ASSOCIATED GROUP MEETINGS

Societies and groups who wish to schedule meeting space during the meeting should contact Jim Drahovzal at the Kentucky Geological Survey, (859) 257-5500, drahovzal@kgs.mm.uky.edu. Limited space is available at the Hyatt Regency for group meetings, with catering and audiovisual services available at additional cost.

### SCHEDULE OF AFFILIATED SOCIETY AND OTHER MEETINGS

#### WEDNESDAY, APRIL 3

**North-Central Section and Southeast Section of the Paleontological Society Joint Luncheon.** Noon, Hyatt Regency Hotel. Cost: \$20.

**Southeast Section GSA Management Board Meeting.** 4:30 p.m., Hyatt Regency Hotel. By invitation only.

#### THURSDAY, APRIL 4

**Southeastern Section NAGT and GSA Education Breakfast.**

6:30 a.m., location to be announced.

**North-Central Section GSA Management Board Breakfast.** 7 a.m., Hyatt Regency Hotel. By invitation only.  
**Southeastern Section GSA Geology and Public Policy Breakfast.**

7 a.m. Glass Garden, Hyatt Regency Hotel.

**Roy J. Shlemon Mentor Program Student Workshop and Luncheon.**

11:30 a.m., Hyatt Regency Hotel.

**Annual Meeting of SEPM Southeastern and Great Lakes Sections.**

12:30–1:30 p.m., Hyatt Regency Hotel.

**Southeast GSA Business Meeting.**

5 p.m., Hyatt Regency Hotel.

#### FRIDAY, APRIL 5

**North-Central Section GSA Campus Representatives Breakfast.** 7 a.m., Hyatt Regency Hotel.

**Southeastern GSA Ph.D.-Granting Earth Science Chairs Breakfast.**

Glass Garden, Hyatt Regency Hotel.

**International Geologic Correlation Program, Project #448, "Global Correlation of Karst Ecosystems."**

9 a.m., Hyatt Regency Hotel.

**Roy J. Shlemon Mentor Program Student Workshop and Luncheon.**

11:30 a.m., Hyatt Regency Hotel.

### EXHIBITS

Exhibit space will be available in an exhibit hall together with the poster sessions. Exhibits will open at noon on Wednesday, April 3, and will be highlighted during the Wednesday evening icebreaker reception. For more information on exhibit space, please contact Doug Reynolds, (859) 257-5500, dreynolds@kgs.mm.uky.edu

### SPONSORSHIP INFORMATION

Corporate and government sponsorship is welcome, and is an important part of funding the meeting. Sponsors will be recognized during the meeting and with a corporate listing and acknowledgment in the printed program. If desired, sponsors may designate their gift for a specific event or technical session during the meeting, with recognition during that event. For more information on sponsorship of the meeting, please contact Doug Reynolds, (859) 257-5500, dreynolds@kgs.mm.uky.edu.

### DETAILED INFORMATION

Complete descriptions of symposia, theme sessions, workshops, field trips, activities, and events are posted at [www.geosociety.org/sectdiv/Northc/02nc-semtg.htm](http://www.geosociety.org/sectdiv/Northc/02nc-semtg.htm) or the meeting Web site at [www.uky.edu/KGS/gsa2002](http://www.uky.edu/KGS/gsa2002). For more information, please contact any of the meeting co-chairs: Jim Cobb and John Kiefer, Kentucky Geological Survey, (859) 257-5500, cobb@kgs.mm.uky.edu, kiefer@kgs.mm.uky.edu; Frank Ettensohn, University of Kentucky, fetters@uky.edu, (859) 257-1401; or Tom Lowell, University of Cincinnati, thomas.lowell@uc.edu, (513) 556-4165. You may request a printout of the detailed announcement from GSA Meetings, P.O. Box 9140, Boulder, CO 80301-9140 or (303) 447-2020.



# Preregistration Form

GSA NORTH-CENTRAL AND SOUTHEASTERN SECTIONS JOINT MEETING  
LEXINGTON, KY. • APRIL 3-5, 2002

Preregistration deadline: February 22, 2002 Cancellation deadline: March 1, 2002  
Register online at [www.geosociety.org](http://www.geosociety.org).

GSA Mbr # \_\_\_\_\_

First Name \_\_\_\_\_ Last Name \_\_\_\_\_

Mailing address Is this a permanent address?  Yes  No Is this home  or work

City \_\_\_\_\_ State or Province \_\_\_\_\_ ZIP or Postal Code \_\_\_\_\_ Country \_\_\_\_\_

E-mail \_\_\_\_\_ Daytime Phone \_\_\_\_\_ Fax \_\_\_\_\_

## Badge Information

First Name/Nickname \_\_\_\_\_

School/Company \_\_\_\_\_ City/State/Prov. \_\_\_\_\_

Spouse/Guest First Name/Nickname \_\_\_\_\_ Last Name \_\_\_\_\_ City/State/Prov. \_\_\_\_\_

 Do you or your guest require any special considerations?  Yes  No

Check member affiliation(s) (to qualify for registration member discount):  (a) GSA  (b) AEG  (c) NAGT  (d) PANADER SOCIETY  (e) PS  (f) SEPM

Preregistration Fees (US\$)	Full Meeting	US\$ Amt.	One Day	US\$ Amt.
Professional Member*	..... (10)	\$120	\$	..... (11)
Professional Nonmember	..... (14)	\$130	\$	..... (15)
Student Member or Student Associate*	..... (30)	\$40	\$	..... (31)
Student Nonmember	..... (32)	\$45	\$	..... (33)
Guest or Spouse**	..... (90)	\$35	\$	N/A
K-12 Professional	..... (60)	\$10	\$	N/A
				<b>Total \$</b> _____

\*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed above. Discount does not apply to guest registrants. \*\*Guest or Spouse registration fee does not allow access to technical sessions.

FAX TO: 303-357-1071 or 303-357-1072  
MAIL TO: 2002 GSA NORTH-CENTRAL AND SOUTHEASTERN SECTIONS JOINT MEETING  
P.O. BOX 9140, BOULDER, CO 80301-9140

Remit in U.S. funds payable to 2002 GSA North-Central and Southeastern Sections Joint Meeting

(All preregistrations must be prepaid. Purchase orders not accepted.)

Payment by (check one):  Check # \_\_\_\_\_  American Express  VISA  MasterCard  Discover

Card Number \_\_\_\_\_ Expires \_\_\_\_\_

Signature \_\_\_\_\_  
GSAI

## TICKETED EVENTS

1. N-C & SE Sections, PS Luncheon—Wed., April 3

Qty \_\_\_\_\_ Amount \_\_\_\_\_  
(301) \$ 20 \_\_\_\_\_ \$ \_\_\_\_\_

## FIELD TRIPS

1. Ft. Payne Carbonate Mounds—Fri. & Sat., April 5-6

(401) \$ 92 \_\_\_\_\_ \$ \_\_\_\_\_

2. Miss. Strat., Karst, Mammoth Cave—Tues., April 2

(402) \$ 65 \_\_\_\_\_ \$ \_\_\_\_\_

3. Miss. Stratigraphy, Big Hill—Wed., April 3 (a.m.)

(403) \$ 40 \_\_\_\_\_ \$ \_\_\_\_\_

4. Falls of the Ohio—Tues., April 2

(404) \$ 60 \_\_\_\_\_ \$ \_\_\_\_\_

5. Middleboro Impact Structure—Fri. & Sat., April 5-6

(405) \$ 130 \_\_\_\_\_ \$ \_\_\_\_\_

6. Pennsylvanian Coal Geology, E. Ky.—Sat., April 6

(406) \$ 50 \_\_\_\_\_ \$ \_\_\_\_\_

7. Military/Cultural History—Sat., April 6

(407) \$ 55 \_\_\_\_\_ \$ \_\_\_\_\_

8. Pound Gap, Pine Mtn., E. Ky.—Tues., April 2

(408) \$ 50 \_\_\_\_\_ \$ \_\_\_\_\_

9. Ordovician Seismites, Cent. Ky.—Fri., April 5 (p.m.)

(409) \$ 40 \_\_\_\_\_ \$ \_\_\_\_\_

10. Ordovician Stratigraphy, Cent. Ky.—Sat., April 6

(410) \$ 45 \_\_\_\_\_ \$ \_\_\_\_\_

11. Ordovician Combo—Fri. & Sat., April 5-6

(411) \$ 60 \_\_\_\_\_ \$ \_\_\_\_\_

## WORKSHOPS

1. Data Collection with PDA/GPS—Tues., April 2

(601) \$ 50 \_\_\_\_\_ \$ \_\_\_\_\_

2. Earth Science Education—Sat., April 6

(602) \$ 20 \_\_\_\_\_ \$ \_\_\_\_\_

3. Review for Prof. Geology Exams—Tues., April 2

(603) \$ 50 \_\_\_\_\_ \$ \_\_\_\_\_

4. Introduction to ArcView GIS—Tues. & Wed., April 2-3

(604) \$ 75 \_\_\_\_\_ \$ \_\_\_\_\_

5. Using RockWorks/2002—Sat., April 6

(605) \$ 10 \_\_\_\_\_ \$ \_\_\_\_\_

6. Subsurface Exploration Techniques—Sat., April 6

(606) \$ 20 \_\_\_\_\_ \$ \_\_\_\_\_

## GUEST ACTIVITIES

1. Lexington Walking Tour—Wed., April 3

(101) \$ 8 \_\_\_\_\_ \$ \_\_\_\_\_

2. Antique Gallery, Luncheon—Thurs., April 4

(102) \$ 20 \_\_\_\_\_ \$ \_\_\_\_\_

3. Thoroughbred Workout, Tour—Fri., April 5

(103) \$ 10 \_\_\_\_\_ \$ \_\_\_\_\_

4. Thoroughbred Racing—Fri., April 5

(104) \$ 10 \_\_\_\_\_ \$ \_\_\_\_\_

5. (Field Trip 7) Military/Cultural History—Sat., April 6

(407) \$ 55 \_\_\_\_\_ \$ \_\_\_\_\_

## STUDENT WORKSHOP

1. Shlemon Mentor Program—Thurs., April 4

(650) FREE \_\_\_\_\_ FREE

Fri., April 5

(651) FREE \_\_\_\_\_ FREE

(Meeting registration is not required to attend this workshop.)

Subtotal \$ \_\_\_\_\_

Registration Fees \$ \_\_\_\_\_

TOTAL FEES REMITTED \$ \_\_\_\_\_

# SOUTH-CENTRAL SECTION, GSA



36th Annual Meeting · Alpine, Texas · April 11–12, 2002

The South-Central Section Meeting of GSA is sponsored by the Department of Earth and Physical Sciences, Sul Ross State University. It will be held in the University Center, Sul Ross State University. The center is compliant with the Americans with Disabilities Act.

## LOCATION

Located in the southern foothills of the Davis Mountains, the campus of Sul Ross State University in Alpine, Texas, is ideally situated for the 2002 GSA South-Central meeting and celebrates the geology of Texas's only two National Parks.

Proterozoic metamorphic rocks that represent the Grenville orogeny in Trans-Pecos Texas are exposed in the Sierra Diablo and Van Horn Mountains, less than 100 miles to the northwest. Folded and thrust strata ranging in age from Cambrian to Pennsylvanian that were deformed during the Ouachita-Marathon orogeny are well exposed in geologically classic areas like the Marathon Basin, 30 miles to the east, and in the Solitario, 75 miles to the south. The world-famous Permian Reef forms several nearby mountain ranges, including the Guadalupe Mountains, 150 miles to the north, the Apache Mountains, 100 miles to the north, and the Glass Mountains, 30 miles to the east. Like much of central and west Texas, very thick sequences of Cretaceous limestone crop out throughout the Trans-Pecos area. In and near Big Bend National Park, 80 miles to the south, important fossil discoveries, including the pterosaur *Quetzalcoatlus* and the largest *Alamosaurus* ever found, have been excavated from these Cretaceous strata. Volcanic activity dominated the Trans-Pecos area in the middle Tertiary, resulting in the creation of several large mountain ranges. These include the Davis Mountains, which represent the largest contiguous outcrop of alkaline rocks in the United States, the Chinati Mountains, the Bofecillos Mountains in Big Bend Ranch State Park, and the Chisos Mountains in Big Bend National Park; all are within 100 miles of Alpine. The Trans-Pecos area is also situated in the easternmost part of the Basin and Range province in the United States.

One goal of this meeting is to focus on recent research in the National Parks and to discuss opportunities for acquisition of funding for continued work, including possibilities for revising the existing geologic maps of the parks.

## Getting to Alpine

Alpine is located in the heart of the Big Bend region of western Texas. The nearest commercial airport is Midland International Airport, located approximately 10 miles west of Midland and 10 miles east of Odessa, 150 miles to the northeast of Alpine. El Paso is 220 miles to the west (see map). Meeting participants traveling by air are encouraged to fly in to the Midland International Airport. If you need assistance in traveling from Midland International Airport to Alpine, contact Kevin Urbanczyk. Driving time to Alpine from major Texas cities: approximately 6 to 7 hours from Austin, San Antonio, and Lubbock; 7 to 8 hours from Waco; 8 to 9 hours from Dallas–Fort Worth; 9 to 10 hours from Houston; 3 to 4 hours from El Paso; and 2 to 3 hours from Midland–Odessa. Amtrak serves Alpine approximately twice a week.

## ACCOMMODATIONS

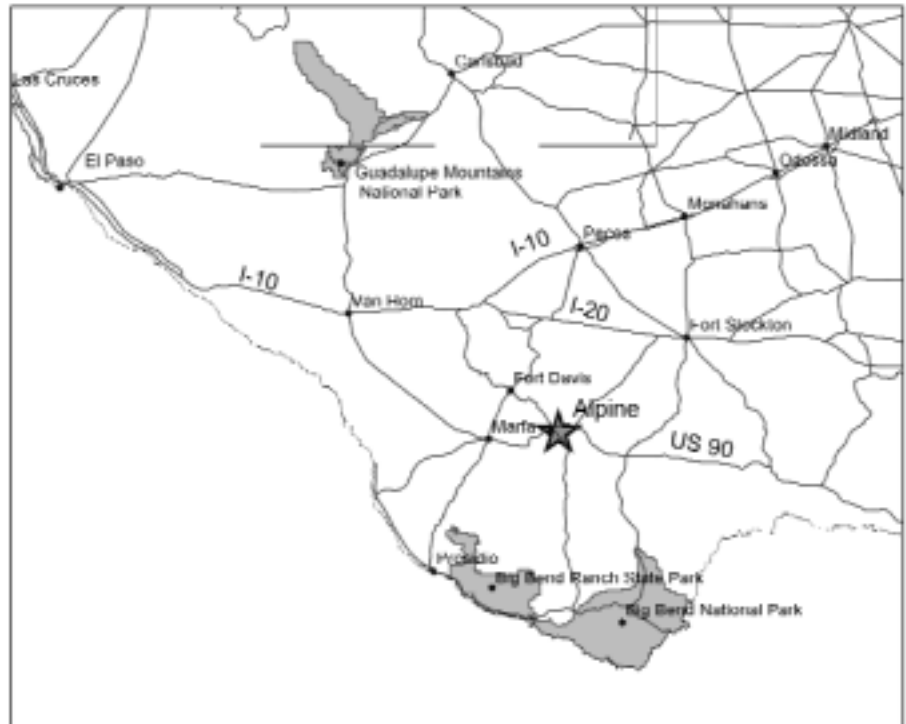
Participants are encouraged to reserve lodging in Alpine as soon as possible. Rooms are blocked for the meeting at the Best Western, (915) 837-1530, for \$60 (double occupancy), and at the Ramada Inn, (915) 837-1100, for \$60 (double occupancy). Other lodging opportunities can be found at the Alpine, Texas, Chamber of Commerce Web site [www.alpinetexas.com](http://www.alpinetexas.com).

## REGISTRATION

**Preregistration deadline: March 1, 2002**  
**Cancellation deadline: March 8, 2002**

Participants are encouraged to preregister online at [www.geosociety.org](http://www.geosociety.org) to assist the local committee with scheduling details. You may also use the form printed on page 29. Registration is required for all who attend technical sessions, guest activities, or the exhibit area.

For additional information about the meeting—field trips, registration, and more—visit the meeting Web site at [www.geosociety.org/sectdiv/southc/02scmtg.htm](http://www.geosociety.org/sectdiv/southc/02scmtg.htm) or [www.sulross.edu/~geology/gsa/gsa.html](http://www.sulross.edu/~geology/gsa/gsa.html).



## FIELD TRIPS

Premeeting and postmeeting field trips are scheduled. All trips will begin and end in Alpine. For details of scheduled trips, contact the field trip leaders listed below or the field trip chair, John White, [jwhite@sulross.edu](mailto:jwhite@sulross.edu).

### Premeeting

1. **Middle Permian Stratotypes of the Guadalupe Mountains National Park.** Wed., April 10. (Trip begins and ends in Alpine.) Dave Rohr, [drohr@sulross.edu](mailto:drohr@sulross.edu); Bruce Wardlaw, [bwardlaw@usgs.gov](mailto:bwardlaw@usgs.gov); Lance Lambert. The Guadalupian Series is perhaps the best stratigraphically studied unit in the world and was recently adopted as the Middle Permian international standard. The succession is represented by well-exposed shelf-to-basin sections in Guadalupe Mountains National Park, Texas. The trip will visit the stratotypes of the Guadalupian and the component Roadian, Wordian, and Capitanian stages. The Guadalupian in the type area is correlated by conodonts, fusulinds, ammonoids, as well as volcanic ash beds. Cost: \$20 (includes transportation and lunch). Max.: 25.

### Postmeeting

2. **Geology of Big Bend National Park: What Have We Learned Since Maxwell and Others?** Sat. and Sun., April 13–14. (Trip begins and ends in Alpine.) John White, [jwhite@sulross.edu](mailto:jwhite@sulross.edu). This trip is intended to provide an interdisciplinary overview of the diverse geology of Big Bend National Park (BBNP) and the surrounding region, with an emphasis on the research done since the geology of BBNP was first mapped and described by Ross Maxwell, John Lonsdale, Roy Hazzard, and John Wilson. Stops will include as many aspects of the park as possible, including paleontology, stratigraphy, volcanology, geomorphology, and hydrogeology. Contact John White for more details or if you have done or directed geologic research in or near BBNP and would like to contribute a stop talk. Cost: \$100 (includes transportation to and from Alpine, lodging, and lunch) with a limit of 16; or, \$30 for students and faculty who provide their own transportation and lodging (no maximum). Note: Those who provide their own transportation are not covered by GSA insurance while in their vehicles.

## SYMPOSIA

The following symposia are planned for the Alpine meeting. Anyone interested in proposing an additional symposia topic should contact Kevin Urbanczyk, [kevinu@sulross.edu](mailto:kevinu@sulross.edu).

1. **Geology of Big Bend National Park: What Have We Learned Since Maxwell and Others, 1967?** Kevin Urbanczyk, [kevinu@sulross.edu](mailto:kevinu@sulross.edu); Robert Scott, [rbscott@usgs.gov](mailto:rbscott@usgs.gov). A symposium designed to bring together researchers from various disciplines to discuss recent research results in the park. Researchers working in areas near the park (including northern Mexico) are also encouraged to participate.
2. **The Permian of the Southwest.** Dave Rohr, [drohr@sulross.edu](mailto:drohr@sulross.edu); Bruce Wardlaw, [bwardlaw@usgs.gov](mailto:bwardlaw@usgs.gov); Lance Lambert, [llambert@utsa.edu](mailto:llambert@utsa.edu). Permian stratigraphy, paleontology, and paleogeography of the region, including presentations on the Guadalupian Series, which was recently adopted as the Middle Permian international standard.
3. **Water Resource Frontiers.** Andrew Chastain-Howley, [WaterProspecting@cs.com](mailto:WaterProspecting@cs.com); Diane Doser, [doser@sleman.geo.utep.edu](mailto:doser@sleman.geo.utep.edu). A variety of water-related topics, with an emphasis on Texas' Senate Bill 1 and research associated with the Regional Water Planning groups. Both surface water and groundwater research accepted.
4. **Long-Term Biogeochemical Responses to Global Change.** Bob Stottlemeyer, [Robert\\_Stottlemeyer@usgs.gov](mailto:Robert_Stottlemeyer@usgs.gov); John Zak, [zyjoz@ttacs.ttu.edu](mailto:zyjoz@ttacs.ttu.edu). A variety of topics expected, including effects of anthropogenic atmospheric inputs on biogeochemical cycles.
5. **Precambrian Geology of Southern Laurentia.**
6. **Geoarchaeology.** (*Cosponsored by the Sul Ross State University Center for Big Bend Studies.*) Bob Mallouf, [mallouf@sulross.edu](mailto:mallouf@sulross.edu).
7. **Issues in Earth Science Education.** (*Cosponsored by the National Association of Geoscience Teachers.*) Kent Nielsen, [knielsen@utdallas.edu](mailto:knielsen@utdallas.edu). This symposium is designed to include issues in earth science education in the K–12 and secondary levels. A part of the session will concentrate on how the State of Texas has recently de-emphasized earth science in the K–12 curriculum. We also encourage participants to present techniques for utilizing field trips

into areas such as the Big Bend Region for earth science education.

## THEME SESSION

**Undergraduate Research Poster Session.** (*Sponsored by the Geology Division of the Council on Undergraduate Research.*) Jeff Connelly, [jconnelly@ualr.edu](mailto:jconnelly@ualr.edu), University of Arkansas at Little Rock, (501) 569-3543. This session is designed to allow undergraduate students to present research results. A student must be listed as the lead author and be the major preparer of the poster.

## SHORT COURSE

**Introduction to GIS/GPS for Geologic Field Studies.** Tues. and Wed., April 9–10. A short course (2 days) designed to introduce students to basic geographic information system fundamentals and the acquisition and manipulation of field Global Positioning System data. The course is designed for, but not limited to, undergraduate students, and will be taught by ESRI instructor Eric Rieken. Funding for student travel, lodging, and course fee is available via a grant from the Brown Foundation. Max.: 20. Contact Kevin Urbanczyk, [kevinu@sulross.edu](mailto:kevinu@sulross.edu), for details. Indicate your interest on registration form.

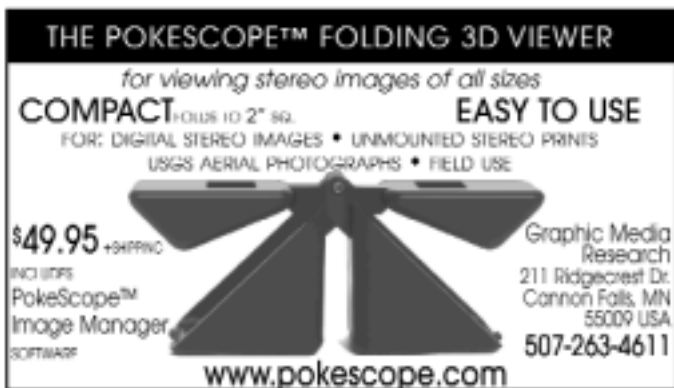
## WORKSHOP

**Mineralogy for Secondary Teachers: A Gem of a Unit.** Fri., April 12, 1–5 p.m. Aileen Duc and Bob Nierste, Plano Independent School District. Instruction in basic mineralogy, including a complete unit on disk (or CD) with all class notes, teacher background information, lab set-up information, video viewer guides for some mineralogy videos, tests, and Internet activities. Between them, Duc and Nierste have about 35 years of teaching experience, particularly at the middle school level, and represent some of the best in earth science education in Texas. Cost: \$25 (includes materials).

## STUDENT SUPPORT

Travel grants are available from the South-Central Section of GSA, in cooperation with the GSA Foundation. These grants are available for GSA Student Associates who are presenting oral or poster papers. Students must be currently enrolled as GSA members to be eligible. Please check the South-Central Section Web page, [www.geosociety.org/sectdiv/southc/travel](http://www.geosociety.org/sectdiv/southc/travel), for details regarding application instructions for these grants. Also, see Brown Foundation support in the short course section above.

Awards for the best oral and poster student papers will be given. These awards



will be based upon the quality of research and presentation. Eligible students must be the lead author and presenter of the work, and the abstract must be clearly identified as a student paper.

For more information, please contact Elizabeth Y. Anthony, [eanthony@geo.utep.edu](mailto:eanthony@geo.utep.edu). **Application deadline: March 21, 2002.**

#### EXHIBITS

Exhibit space is available in the meeting building. Any exhibitor interested in presenting information should contact Kevin Urbanczyk, [kevinu@sulross.edu](mailto:kevinu@sulross.edu).

#### SOCIAL ACTIVITIES

**Welcoming Party.** Wed., April 10, 5–8 p.m. Kokernot Lodge, near the Sul Ross State University campus. Free welcoming party

for all registered meeting participants and their guests.

**South-Central Meeting Banquet.** Thurs., April 11, 6–9 p.m. Kokernot Lodge. West Texas BBQ and Hawaiian Shirt Party. All registered meeting participants and their guests are invited to attend and are encouraged to wear a Hawaiian shirt—a Sul Ross tradition! Cost: \$10.

**Paleontological Society Luncheon.** Fri., April 12, noon. University Center. Cost: \$10.

**National Association of Geoscience Teachers.** Informal luncheon, date and time to be scheduled. Contact Kent Nielsen, [knielsen@utdallas.edu](mailto:knielsen@utdallas.edu), for details.

#### BUSINESS MEETINGS

**South-Central Section Management Board Meeting.** Thurs., April 11, 4 p.m.

**South-Central Section Business Meeting.** Thurs., April 11. Kokernot Lodge. Held in conjunction with the banquet.

**South-Central Section of the Paleontological Society.** Fri., April 12, noon. University Center. Held in conjunction with the Paleontological Society luncheon.

#### STUDENT WORKSHOP

**Roy Shlemon Mentor Program in Applied Geology Workshop.** Fri., April 12, 11:30 a.m.–1:30 p.m. Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org), GSA Program Officer. Workshop for graduate and advanced undergraduate students about professional opportunities and challenges in the real world. Cost: free (lunch provided). *Meeting registration is not required to attend only this workshop.*

#### ADDITIONAL INFORMATION

Additional information concerning the meeting can be found at the GSA Web page, [www.geosociety.org/sectdiv/south/02scmtg.htm](http://www.geosociety.org/sectdiv/south/02scmtg.htm) or at the Sul Ross State University's Department of Earth and Physical Sciences Web page [www.sulross.edu/~geology/gsa/gsa.html](http://www.sulross.edu/~geology/gsa/gsa.html). Requests for additional information or suggestions should be addressed to general chair Kevin Urbanczyk, [kevinu@sulross.edu](mailto:kevinu@sulross.edu), (915) 837-8110.

GSA is committed to making all events at the 2002 meeting accessible to all people interested in attending. You can indicate special requirements (wheelchair accessibility, dietary concerns, etc.) on the registration forms.

[www.geosociety.org](http://www.geosociety.org)

You can link to many information resources from our home page.

**Professional Development:** Apply for GeoCorps America™ positions online.

■  
**Denver 2002:** Submit a session proposal for Science at the Highest Level Annual Meeting in Denver.

**Deadline is January 17.**

■  
**2002 Section Meetings:** Check the final announcements, submit abstracts, and preregister online.

# Preregistration Form

GSA SOUTH-CENTRAL SECTION MEETING

ALPINE, TEXAS • APRIL 11-12, 2002

Preregistration deadline: March 1, 2002 Cancellation deadline: March 8, 2002  
Register online at [www.geosociety.org](http://www.geosociety.org).

GSA Mbr # \_\_\_\_\_

First Name \_\_\_\_\_ Last Name \_\_\_\_\_  
 Mailing address Is this a permanent address?  Yes  No Is this home  or work   
 City \_\_\_\_\_ State or Province \_\_\_\_\_ ZIP or Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
 E-mail \_\_\_\_\_ Daytime Phone \_\_\_\_\_ Fax \_\_\_\_\_

## Badge Information

First Name/Nickname \_\_\_\_\_  
 School/Company \_\_\_\_\_ City/State/Prov. \_\_\_\_\_  
 Spouse/Guest First Name/Nickname \_\_\_\_\_ Last Name \_\_\_\_\_ City/State/Prov. \_\_\_\_\_

 Do you or your guest require any special considerations?  Yes  No

Check member affiliation(s) (to qualify for registration member discount):  (a) GSA  (b) AWG  (c) NAGT  (d) NGWA  (e) PS

Preregistration Fees (US\$)	Full Meeting	US\$ Amt.	One Day	US\$ Amt.
Professional Member*	..... (10) \$75	\$ _____	(11) \$40	\$ _____
Professional Nonmember	..... (14) \$80	\$ _____	(15) \$40	\$ _____
Student Member or Student Associate*	..... (30) \$25	\$ _____	N/A	\$ _____
Student Nonmember	..... (32) \$30	\$ _____	N/A	\$ _____
Guest or Spouse**	..... (90) \$15	\$ _____	N/A	\$ _____
K-12 Professional	..... (60) \$25	\$ _____	N/A	\$ _____
			<b>Total</b>	<b>\$ _____</b>

\*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed above. Discount does not apply to guest registrants. \*\*Guest or Spouse registration fee does not allow access to technical sessions.

FAX TO: 303-357-1071 or 303-357-1072

MAIL TO: 2002 GSA SOUTH-CENTRAL SECTION MEETING  
P.O. BOX 9140, BOULDER, CO 80301-9140

Remit in U.S. funds payable to 2002 GSA South-Central Section Meeting

(All preregistrations must be prepaid. Purchase orders not accepted.)

Payment by (check one):  Check # \_\_\_\_\_  American Express  VISA  MasterCard  
 Discover

Card Number \_\_\_\_\_ Expires \_\_\_\_\_

Signature \_\_\_\_\_  
GSAAT

## TICKETED EVENTS

1. South-Central Banquet—Thurs., April 11
2. PS Luncheon—Fri., April 12

	Qty	Amount
(301) \$ 10	_____	\$ _____
(302) \$ 10	_____	\$ _____

## FIELD TRIPS

1. Permian Stratotypes—Wed., April 10
- 2a. Big Bend National Park: Standard—Sat. and Sun., April 13-14
- 2b. Big Bend National Park: Budget—Sat. and Sun., April 13-14

(401) \$ 20	_____	\$ _____
(402a) \$100	_____	\$ _____
(402b) \$ 30	_____	\$ _____

## WORKSHOP

1. Mineralogy for Secondary Teachers—Fri., April 12

(601) \$ 25	_____	\$ _____
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## SHORT COURSE

- Students: Check here if interested in the GIS/GPS Short Course \_\_\_\_\_  
 Introduction to GIS/GPS for Geologic Field Studies

(501) FREE	_____	FREE
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## STUDENT WORKSHOP

1. Shlemon Mentor Program—Fri., April 12

(650) FREE	_____	FREE
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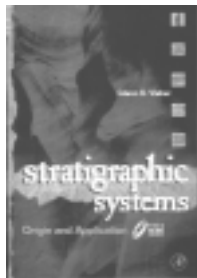
(Meeting registration is not required to attend this workshop.)

Subtotal	\$ _____
Registration Fees	\$ _____
<b>TOTAL FEES REMITTED</b>	<b>\$ _____</b>

# BOOK REVIEW

## Stratigraphic Systems—Origin and Application

Glenn S. Visher, Academic Press, 1999, 700 p., includes CD-ROM, \$79.95, hardcover.



This book aims to help the reader analyze deposition of stratigraphic sequences accurately and objectively. A complete understanding is probably not possible, because many of the controlling depositional factors, such as details of climate, oceanic conditions, regional settings and morphology, are not now recoverable. Visher's next-best approach provides access to a large data bank of sedimentary attributes of multiple stratigraphic examples beyond the reach of most practicing workers, and a computer-driven multivariant comparison (DE-XPERT system on accompanying CD-ROM). This broad-based approach should minimize the bias of limited personal experience and geologic lore and maximize a more objective approach.

According to Visher, Holocene examples are best for comparison because they include more complete climatic, regional environmental, and geomorphic data. Thoroughly studied ancient examples are also included in the data bank. The DE-XPERT system is supposed to determine relative probabilities of possible origins for a given stratigraphic interval.

Most of the book is a valuable summary and organization of ancient and Holocene examples into depositional systems and settings. Tectonic controls and basin settings of stratigraphic sequences are discussed. Depositional systems are then organized into fifteen siliciclastic and six bioclastic and evaporitic systems, ranging through nonmarine, fluvial, deltaic, coastal, shelf, and deepwater systems. Each of these systems is thoroughly discussed and many examples are summarized, with lists of attributes for

each depositional system to help with comparisons.

As a textbook, this book is strictly for the graduate level, or for workers in the field, because it presupposes a rather complete background of tectonic and stratigraphic concepts and terminology. It is very valuable as a reference and historic resume for a wide variety of tectonic and basinal settings, depositional systems, and stratigraphic examples. Abundant illustrations are mostly taken directly from references, with very succinct summary discussions in the text. Most of the examples are from studies published in the 1960s, 1970s, and 1980s, when many of the depositional systems were being described in the literature. The book suffers from inclusion of only a bare minimum of papers from the early 1990s, and practically none from the later 1990s. Especially missing are seismic and well-log examples of deepwater depositional systems such as those in the Gulf of Mexico, offshore Brazil, South African outcrops and offshore examples, or the Delaware Basin outcrops. Three-dimensional displays of seismic attributes such as amplitude, frequency, and continuity can be helpful in analyzing sedimentary attributes. These deepwater systems are the bread and butter of the oil industry today.

The book contains numerous annoying typographic errors, grammatical mistakes, and mislabeled figures. Many of the figures are reprinted at such small scales that texts and legends are practically illegible.

In spite of the above, this book contains much valuable stratigraphic information and provides a good reference for examples. I thoroughly enjoyed being reminded of a wide range of long-forgotten stratigraphic sequences.

This book gives a new dimension to the science of stratigraphic analysis. I hope the system it advocates can be used to spark new enthusiasm where it is much needed.

Robert M. Mitchum  
(Mitchum is a consulting geologist in Houston.)

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## Alternates Receive 2001 Student Research Grants

Each year, when members of the Committee on Research Grants selects student grant recipients, they also select an alternate group of recipients. In the event that some of the grantees return part or all of their funds because they have received funding elsewhere or have changed their research plans, returned funds are re-awarded by the Research Grants Program Officer to these named alternates.

In 2001, 14 alternates received funding following the initial awarding of grants. They are: Soyini Baten, Northern Arizona University; Carlos A. Zulu-

aga, University of Alabama—Tuscaloosa; Astrid Makowitz, University of Texas—Austin; Regan E. Dunn, University of Wyoming; Alison Rust, University of Oregon; Markus Kienast, University of British Columbia; Richard A. Peters, Loma Linda University; Erwin A. Melis, University of Maine; Michael E. Bulteri, Boston University; Melissa Boysun, University of Southern California; Cynthia M. Liutkus, Rutgers University; Jason P. Downs, Yale University; Subhotosh Banerjee, University of Oklahoma; and James Wild, University of Calgary.

# COMMENTARY

## What's Wrong with Shortening?

A.M.C. Şengör, İTÜ Maden Fakültesi, Jeoloji Bölümü, Ayazaga 80626 Istanbul, Turkey

When Bertrand Russell returned to the United States just before World War II to teach, he offered to lecture about "Words and Facts" as he had done in Oxford. In his famous *Autobiography*, he wrote later, "But I was told that Americans would not respect my lectures if I used monosyllables, so I altered the title to something like 'The Correlation between Oral and Somatic Motor Habits.' Under this title, or something of the sort, the seminar was approved," (Russell, 1975, p. 459).

Reading modern American geological literature frequently reminds me of Lord Russell's experience. In it, complicated foreign-sounding words are preferentially—and often unsuitably—used where simple English words would be perfectly adequate and often more suitable. There are undoubtedly cases where entirely new words are necessary. I myself have been responsible for introducing a number, now in current use. But there is no excuse whatsoever for using an unusual word when one from the everyday language will do equally well. The situation becomes more intolerable if the concept to be described is **better** represented by the

common and simple word than by the uncommon and complex.

The word *contraction* is an example that may potentially lead to misunderstanding if improperly used. It is substituted increasingly more commonly in the American geological literature for *shortening*. This substitution rose to prominence in the 1980s as some editors objected to *compression* being used both as a stress and as a strain term. Contraction was then suggested as a strain counterpart of compression, as *extension* is the strain counterpart of *tension*. (That was when I regretfully used it once to mean shortening, yielding to editorial pressure! Subsequently, I have avoided it.) Some have judiciously objected to this choice, because contraction has a widely known connotation of volume loss in physics. Even if one leaves out the usage in physics, a perusal of the examples in the new edition of the *Oxford English Dictionary* (1989) makes clear that contraction always has a connotation of drawing together to a central point, or line, or surface—i.e., some kind of shrinkage.

Mud cracks, for example, which are extensional structures, form by contraction of the drying mud, as basalt (or andesite) columns form by extensional parting as a consequence of the contraction of the cooling lava. Some extensional joint sets in plutons come into being as a consequence of the contraction of the cooling intrusive. Until the early 1960s, it was thought that the contraction of our planet was the primary cause of the formation both of orogenic and taphrogenic belts (e.g., see Wilson, 1954, or the disclaimer in the 1957 and 1964 reprint editions by

Hafner Press of Walter Bucher's *Deformation of the Earth's Crust*). Some still believe that contraction plays a role—albeit a subordinate one—in the tectonics of Earth (e.g., Solomon, 1987). Folds commonly form by shortening, which may result from contraction only in some instances.

There is no need to proliferate examples; they are ample and familiar. Whereas shortening is indeed one of the connotations of contraction, according to the *Oxford English Dictionary*, in none of the examples of that particular meaning that are cited in it can one substitute shortening for contraction without creating a feeling of uneasiness on the part of the reader. It is exactly the other way around in much of the American geological literature: In most places where contraction is written, if shortening is substituted, reading—and meaning—are improved. (Note that shortening can be used both as a noun and as an adjective.)

### References Cited

- Russell, B., 1975, *Autobiography*: London, Routledge, 750 p.  
Solomon, S.C., 1987, Secular cooling of the Earth as a source of intraplate stress: *Earth and Planetary Science Letters*, v. 83, p. 153–158.  
Wilson, J.T., 1954, The development and structure of the crust, in Kuiper, G.P., ed., *The Earth as a Planet*: Chicago, Chicago University Press, p. 138–214.

Comments on this issue may be sent to [jhammann@geosociety.org](mailto:jhammann@geosociety.org) or GSA Today, P.O. Box 9140, Boulder, CO 80301-9140.

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# LETTERS

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The GSA position statement on evolution ("Council Approves Two Position Statements," *GSA Today*, October 2001, p. 32) reviews the tenets of "creation science," i.e., the literal interpretation of the Book of Genesis as a scientific account of the origins of the earth and life. The statement provides an excellent summary of the overwhelming geologic evidence refuting such an interpretation. Few geologists, religious or otherwise, would disagree with the statement on this issue.

The position statement goes somewhat beyond this, citing the intelligent design theory as also unworthy of mention in a science classroom. But while it is exhaustive in its refutation of creation science, the statement is silent on intelligent design theory, except for its unqualified dismissal. The scientific evidence cited by proponents of that theory (some of whom are scientists of international repute) is not reviewed, and no opposing arguments, geologic or otherwise, are offered. A proposal to exclude a widely cited interpretation of scientific data from science classrooms is a serious matter—one that should hardly be offered, in the name of a major scientific organization, with no supporting argument.

It would be disheartening to think that the Society's research into these matters was so cursory as to confuse intelligent design theory with creation science, and disheartening indeed to think that GSA's attitude toward the intelligent design question is a matter of adherence to, for lack of a better word, dogma.

Gordon D. Bennett  
Melbourne Beach, Florida

As a longstanding member of GSA and several other professional geological organizations and as a practicing geological scientist with over 30 years experience and a strong interest in paleontology, I have finally become annoyed and now insulted by the panel-generated statement of position on the issue of evolution ("Council Approves Two Position Statements," *GSA Today*, October 2001, p. 32). Webster's dictionary defines evolution as "a process of change" and I have no problem with that concept because it is readily apparent all around us and in the fossil record.

The panel's conclusion apparently is that they are better scientists than am I, and therefore their conclusions are the only ones to be accepted because they are following conventional wisdom and that which is politically correct. Let me simply remind you of the problems Galileo found himself in when he went against the conventional wisdom of the arrangement of our solar system with the earth at the center. I would suggest that it is easy to teach geology and biology within the context of change and adaptation without muddying the water by adding the concept of evolutionary change. Charles Darwin's 142 year old idea of one species giving rise to another is not a provable hypothesis and has apparently risen out of one man's anger toward God. Where is there **any** evidence that something simple has "evolved" into something more complex?

I suggest that Mr. Darwin has become the god of those misled scientists who simply cannot merge the created order of the universe and the Creator God. Are we as scientists smarter than God Almighty? No, however the only way many scientists justify their professional credibility and reason for scientific study and free teaching in our society is to deny the role of the Creator God in

the process because God cannot be proven to their satisfaction. I am offended that my views are put down as trivial and non-scientific. If the facts prove beyond reasonable doubt the validity of the evolutionary species progression concept, then why are we still debating the subject and why are organizations like ours and others putting out official statements 142 years later?

My evaluation of the fossil record shows that we see only a small portion of what life has lived on this planet. In fact Simpson (1952) estimated 982 million species have existed since the beginning of the Cambrian, Grant (1963) estimated at least 1.6 billion species since the beginning of the Cambrian and Durham (1967) estimated 10 million species of marine organisms alone compared to the total known fossil species of 130,000 in 1971. Regardless of which estimate we accept, we must agree that paleontologists have discovered only a tiny fraction of the species that have lived. Furthermore, if the fossils that we have to work with reflect a random sample of the plants and animals that have lived our study would be somewhat less difficult, however we know that it is not a random sample but rather a record of those most likely to be preserved or represented by the largest population. It seems obvious to me that we see the past life record through a mere pinhole (or through a glass darkly) and from that limited viewpoint have made major leaps in our understanding and explanation of the story of life.

My point in closing: "Get off the divisive evolutionary bandwagon and let's teach the joy of the study of science, the gathering of information, the formulation of hypotheses, within the understanding that science is nothing more than the accumulated knowledge of man (how small an accumulation) and is always subject to change as new information is *revealed*." Mr. Darwin's ideas are still nothing more than a theory and let's not be so closed minded to other possible scientific conclusions. If this organization or anyone else wants to assert that I (we) "evolved" from nothing more than pond scum, then we really have created a breach of the public trust (ethics?) and have been deceived by the educational system that taught us since Mr. Darwin showed up as we continue to deceive our education system and the public. Is this possibly one of those *geological hazards* that we need to protect the public from? The teaching of evolution in fact does nothing to improve the human condition or contribute any substance to society as a whole! Evolution cannot even begin to explain why we have males and females throughout the animal kingdom. Using legal jargon, *Acquit and Drop the Position Statement due to lack of evidence*.

Mark Hostetter  
Onalaska, Wisconsin

Letters to *GSA Today* should be sent to *GSA Today*, P.O. Box 9140, Boulder, CO 80301-9140, fax 303-357-1070, jhammann@geosociety.org. *GSA Today* reserves the right to edit for space.

**Note:** Comments on lead science articles must be received within two to three weeks of publication of the articles and must not exceed 300 words in order to be considered for publication.





# MARKETING GEOLOGY TO CONGRESS

**Rachel Sours-Page, 2000–2001**  
*GSA–USGS Congressional Science Fellow*

With this, my final report to GSA, I think it important to relate the most significant thing I learned from my year in Congress: the importance of marketing. If you've spent any time in business, you know that marketing is key to a product's success. Marketing convinces people they can't live without something they never knew they needed. And yet, even though those of us in geology know that the world cannot live without knowledge of earth systems and processes—that it's a life-and-death matter to understand how earthquakes, volcanoes, and landslides work—we fail to adequately convey this need to the public, and perhaps more critically, to Congress. In order to secure adequate funding for geologic research and credibility and respect for our profession, we must learn to promote the value of our work.

Geoscientists often lament the lack of funding for the National Science Foundation and the U.S. Geological Survey (USGS). I believe that low funding levels reflect the perceived lack of importance geoscience has in people's lives. Geoscientists have done a poor job of educating legislators. Most important, they've done a poor marketing job. If the general public perceived a need for the geosciences, it would be outraged whenever funding was threatened.

There are many ways to convey awareness and understanding of geology—as well as its importance—to Congress. Geology societies are already taking the first step by funding congressional science fellowships, which place geologists in key positions to inform legislators before decisions are made. However, the fellows' influence is limited to the few offices with which they come into contact.

Congressional offices are typically bombarded with information, funding requests, and lobbyists. In order to be heard, the geology community needs to participate in the information game. Geologic institutions (university geology departments, state geologic surveys, industries that employ geologists) could send periodic updates to their local representatives and senators. Newsletters could discuss current projects, how they pertain to the local community, and why they are important to society as a whole. Individuals from these institutions could follow up with visits to their congressional members' staffs. (Congressional offices value information coming from their own constituents.) By developing a relationship with each office, geologists are sending the message that they are important and that they want to help when specific information is needed.

Our planet provides ample opportunity for geologists to prove their worth. When natural disasters occur, especially within the borders of the United States, legislators seek reliable information. At such times, geologists should meet with legislators, provide clear, concise information about the events, and express the importance of research programs that study such phenomena.

Nearly all of the work I did in Congressman Earl Blumenauer's office was connected to geology. Much of it involved natural disasters and/or earth systems. Because natural disasters are both relatively common and inevitable, we have an ongoing opportunity to educate Congress about geologic processes and the need for funding specific geologic research programs. As morbid as it might sound, targeting particular congressional offices representing districts and/or states hit by disasters with information about the phenomena is very helpful in the hours and days after an event. GSA, the

USGS, or any other group could keep packets of information about earthquakes, landslides, coastal erosion, etc., on hand. These could be supplemented with specific information—such as the size of an earthquake, its epicenter, the likelihood for aftershocks, and the estimated affected area—and sent out in the event of a disaster.

Whose job is it to market the geosciences? It's yours, your colleagues', and mine. It's the responsibility of the largest concentrations of geoscientists in the nation: the professional societies, academic institutions, state surveys, and the USGS itself. With a little money and know-how, GSA and other geological organizations could lobby Congress in the same way that other special interest groups do. Some might say that we can't afford to spend money on something so frivolous as marketing. I would argue that we can't afford not to. For too long, the geologic community and the physical sciences in general have taken a backseat to flashier fields such as medical research. It's time for geology to be recognized for the important role it plays in everyone's lives.

I would like to once again thank GSA for providing me with the opportunity to work in Congress for the 2000–2001 fellowship year. It was a tremendous experience, both personally and professionally, that I recommend to anyone. I encourage anyone from GSA or the geologic community at large to contact me ([rachelsourspage@aol.com](mailto:rachelsourspage@aol.com)) with any questions or comments they might have about my fellowship year and/or my ideas for ways to increase public awareness of the geosciences.

*Submitted for publication by Rachel Sours-Page, 2000–2001 GSA–USGS Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one-year fellowship is supported by GSA and by the USGS, Dept. of the Interior, under Assistance Award No. 1434-HQ-97-GR-03188. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. government.*

# ANNOUNCEMENTS

## MEETINGS CALENDAR

### 2002

- March 3–6 (new date) The Society for Organic Petrology (TSOP), 18th Annual Meeting, (postponed from September 2001), Houston, Texas, USA. Information: Coleman Robison, ChevronTexaco, Energy Research Technologies Company, 4800 Fournace Place, Bellaire, TX 77401-2324 USA, (713) 432-6828, fax 713-838-4628, ColeRobison@chevrontexaco.com, www.tsop.org.
- Aug. 31–Sept. 4 Canadian Society for Coal Science and Organic Petrology (CSCOP)–The Society for Organic Petrology (TSOP) Joint Annual Meeting, Banff, Alberta, Canada. Information: Martin Fowler, Geological Survey of Canada, 3303–33rd Street NW, Calgary, Alberta T2L 2A7 Canada, (403) 292-7038, fax 403-292-7159, Mfowler@nrcan.gc.ca, www.cscop-tsop2002.com.
- Sept. 28–Oct. 3 The XXII International Mineral Processing Congress, Cape Town, South Africa. Information: www.impc2003.org.za. (*Abstracts due January 31, 2002.*)
- October 27–30, GSA 2002 Annual Meeting and Exhibition, Denver, Colorado, USA. Information: GSA, P.O. Box 9140, Boulder, CO 80301-9140, (303) 447-2020, fax 303-357-1070, meetings@geosociety.org, www.geosociety.org/meetings/2002/. (*Symposia and session proposals due January 17, 2002; abstracts due July 16, 2002.*)

## Attention Student Members of the Engineering Geology Division: Scholarships Available

Roy J. Shlemon Scholarship Awards are available for graduate students who have the best research proposals within the broad field of engineering geology. Four scholarships will be awarded in 2002; two \$1,000 awards and two \$500 awards for both master's-level and doctoral-level research.

Applications and more information are available on the "Download" page of the Engineering Geology Division's Web

site at <http://rock.geosociety.org/egd/index.html> or from the GSA Web site at [www.geosociety.org/profdev/grants/index.htm](http://www.geosociety.org/profdev/grants/index.htm).

The program is competitive and there is no guarantee of funding. The Scholarship Awards Committee strongly encourages women, minorities, and persons with disabilities to participate fully in this program. Eligibility is restricted to student members of the Engineering Geology Division.

All applications must be postmarked on or before March 1, 2002. Actions taken by the Roy J. Shlemon Scholarship Awards Committee will be reported to each applicant by letter or e-mail in April. Results will not be given by telephone. Funds for the Roy J. Shlemon Scholarship for Engineering Geology are administered through the GSA Foundation.

## In Memoriam

### **Andrew D. Baillie**

Calgary, Alberta  
September 26, 2001

### **Nora I. Colburn**

Tucson, Arizona  
October 21, 2001

### **Robert V. Cushman**

Middlebury, Vermont  
October 29, 2001

### **A. Gordon Everett**

Scottsdale, Arizona

### **J. Osborn Fuller**

Columbus, Ohio  
October 26, 2001

### **Merrill Wilber Haas**

Houston, Texas  
April 21, 2001

### **Robert E. Hafemeister**

Barneveld, Wisconsin

### **David M. Hopkins**

Menlo Park, California  
November 2, 2001

### **George A. Kiersch**

Tucson, Arizona  
October 19, 2001

### **H.D. Klemme**

Bondville, Vermont  
August 9, 2001

### **Russell A. Paige**

Las Vegas, Nevada  
October 8, 2001

### **Lloyd W. Staples**

Eugene, Oregon  
September 18, 2001

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For every car sale recognized under this program, Subaru of America will donate \$150 to the GSA Foundation to further support the Subaru Distinguished Earth Science Educator program and the Doris Curtis Women in Science Fund.

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*"We purchased a new Subaru Outback wagon from John Elway Subaru West yesterday evening. The price was excellent and the experience was about the easiest ever. Thanks for your help with the VIP program; this is definitely a good member benefit."*

*—Brian  
Denver, Colorado*



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## Position Announcement

The following employer was among the 40 that participated in GSA's Employment Interview Service at the GSA Annual Meeting in Boston. For information about this year-round service, contact Nancy Williams, [nwilliams@geosociety.org](mailto:nwilliams@geosociety.org).

### **TWO TENURE-TRACK POSITIONS: SEDIMENTOLOGY/STRATIGRAPHY/ PALEONTOLOGY/BASIN ANALYSIS/ TECTONICS/STRUCTURE**

The Department of Geological Sciences at the University of Minnesota Duluth seeks to fill two tenure-track positions in the general areas of sedimentology, stratigraphy, paleontology, basin analysis, tectonics, or structure. The subdiscipline is open. We seek individuals to complement existing departmental strengths. Both positions will be at the assistant professor level and begin as early as September 2002. Essential qualifications are: a Ph.D. in the geosciences required at time of appointment; evidence of potential for achievement in research and teaching. We seek versatile geoscientists who may collaborate with faculty in the Geosciences Department (<http://www.d.umn.edu/geology>), the Large Lakes Observatory (<http://www.d.umn.edu/llo>), the Natural Resources Research Institute (<http://www.nrri.umn.edu>), or the Water Resources Sciences graduate program (<http://wrs.coafes.umn.edu>). The successful applicants will be expected to develop active externally funded research programs, supervise M.S. and Ph.D. students, and teach appropriate undergraduate and graduate courses in their disciplines. Teaching load is flexible depending upon research activities and departmental teaching needs. Applicants should send a letter of application including a statement of research and teaching experience, philosophy and interests, a curriculum vitae, reprints of significant publications, a summary of relevant coursework, and the names and addresses of at least three references to: Dr. Howard Mooers, Search Committee Chair, University of Minnesota, Department of Geological Sciences, 230 Heller Hall, 1114 Kirby Dr., Duluth, MN 55812. Review of completed applications will begin January 1, 2002, and continue until the positions are filled. Prospective candidates with questions regarding this position may contact Howard Mooers by e-mail at [hmoors@d.umn.edu](mailto:hmoors@d.umn.edu). The University of Minnesota is an equal opportunity educator and employer.

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## Positions Open

### GEOSCIENCE FACULTY SLIPPERY ROCK UNIVERSITY

Slippery Rock University is seeking applicants for a tenure-track position in the Department of Geography, Geology, and The Environment at the assistant professor rank starting August 2002. The department is a diverse group of 14 faculty and approximately 150 undergraduate students and offers programs in geography, geology, and environmental science and studies.

Teaching responsibilities include introductory geoscience courses, historical geology, stratigraphy/sedimentology, paleontology and potential development of courses in area of expertise. The successful candidate is expected to demonstrate excellence in teaching, to maintain an active program of research and peer-reviewed publication, to mentor student research in appropriate geoscience and environmental areas, and to participate in college service and student advising. The department is strongly committed to student field experiences and active participation is expected as a faculty member. Contribution to the geology and environmental programs is also expected.

A Ph.D. in geosciences is required. Classroom and field teaching experience is desired. Applicants should be broadly trained with expertise in stratigraphy/sedimentology, historical geology and paleontology. Successful performance in an on-campus interview, including a teaching presentation, is required.

Send a letter of interest, curriculum vitae, statement of research and teaching interests, graduate and undergraduate transcripts (official transcripts will be needed before hiring) and the names, addresses (postal and e-mail) and phone numbers of three references to: Michael G. Stapleton, Ph.D., Geoscience Search Committee, Department of Geography, Geology and The Environment, Slippery Rock University, Slippery Rock, PA 16057; phone: (724) 738-2495; fax: 724-738-4807, e-mail: michael.stapleton@sr.u.edu.

Review of applications will begin immediately and continue until position is filled. AA/EOE.

### HUMBOLDT COUNTY FIRM SEEKS GEOTECHNICAL ENGINEER/LICENSED GEOLOGIST

**WB Sweet, Inc.** of Arcata, CA, is seeking a licensed geologist (CEG or RG) or geotechnical engineer (civil GE) with materials testing and soils laboratory experience. Field engineering experience a plus. Stimulating office environment with opportunity to grow. Work includes management of testing lab, site investigations, and geological report preparation.

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### SEDIMENTARY GEOLOGIST SOUTHERN OREGON UNIVERSITY

The Geology Department at Southern Oregon University invites applications for a tenure-track position at the assistant professor level, beginning fall 2002. We are interested in a broadly trained, field-oriented geologist who can effectively participate in our upper division teaching and complement current faculty strengths. Demonstrable dynamic and enthusiastic teaching skills in introductory courses are also of importance to our department. Expertise in GIS applications and the ability to develop a class in soils or geomorphology will be looked on favorably, as will interest in participating in a summer field course.

For a complete position description, please visit our Web site at: [www.sou.edu/personnel/Jobs/JobSearch/jobsearch.html](http://www.sou.edu/personnel/Jobs/JobSearch/jobsearch.html). For more information about our department, please visit our Web site at: [www.sou.edu/geology](http://www.sou.edu/geology).

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### UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL PALEOCLIMATOLOGY/PALEOCEANOGRAPHY

The Department of Geological Sciences at the University of North Carolina at Chapel Hill invites applications for a tenure-track faculty position in paleoclimatology/paleoceanography at the assistant professor level to begin July 1, 2002.

We seek applicants with a broad range of research interests, including one or more of the following: (1) application of inorganic and organic geochemical proxies to reconstruct marine and terrestrial environments in Earth's past; (2) atmospheric, oceanic, and geochemical/geophysical modeling; (3) linkages between the atmosphere, biosphere, hydrosphere, and lithosphere including climate change on short and long time scales, ancient ocean circulation, biogeochemical cycling, paleoecology, or evolution. Scientists who work on records from marine, lake and ice cores, and land sections are encouraged to apply.

We seek a versatile scientist whose expertise will interface with existing departmental research programs, and who will advance educational programs in earth systems science through developing cross-disciplinary ties with other units on campus including the Departments of Marine Sciences and Geography and the Carolina Environmental Program.

The department houses state-of-the-art laboratories including scanning electron microscope, thermal ionization mass spectrometer, DCP and has access to ICP-MS and electron microprobe at Duke University. The Department of Marine Sciences houses a GC-C-isotope ratio mass spectrometer. Additionally, UNC-CH and Duke University jointly operate the R/V Cape Hatteras, a part of the UNOLS oceanographic research fleet. The university offers access to several in-house supercomputing facilities as well as to the NC Supercomputing Center ([www.ncsc.org/](http://www.ncsc.org/)), whose environmental science group conducts extensive research on climate modeling.

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

Applicants must submit a letter of application, names, addresses, e-mail and phone numbers of four references, statements of teaching and research interests, and their vitae to Chair, Search Committee for Paleoclimatology/Paleoclimatology, Department of Geological Sciences, University of North Carolina, Chapel Hill, NC 27599-3315. Review of applications will begin on January 20, 2002, and will continue until the position is filled. For more information on the department and the university please visit our Web page at [www.geosci.unc.edu](http://www.geosci.unc.edu).

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

### UNIVERSITY OF WASHINGTON, SEATTLE DEPT. OF EARTH AND SPACE SCIENCES ENVIRONMENTAL EARTH SCIENCE/ GEODYNAMICS/SPACE PHYSICS

The Department of Earth and Space Sciences at the University of Washington anticipates that a number of faculty positions will be filled during the next several years. We currently seek to fill two tenure-track faculty positions. Appointment is anticipated at the assistant professor rank but candidates with exceptional qualifications may be considered for appointment at the rank of associate professor or professor.

The successful applicant must hold the Ph.D. by the start of the appointment, will be expected to develop a vigorous, externally funded research program and have a full commitment to both undergraduate and graduate teaching. Expertise in field research programs and experiential learning at all levels, as well as an interest in courses equipping students for professional careers is desirable. Candidates from the following fields are encouraged to apply:

**1. Environmental earth science:** We are searching for individuals having interest in the physical, chemical and/or biological processes occurring at or near Earth's surface. This includes, but is not limited to, biogeochemistry, environmental geochemistry, environmental geophysics, geobiology, hydrogeology. The ideal candidate will complement existing departmental strengths in glaciology, geomorphology, and Quaternary research and will interact with the new interdisciplinary program in climate change.

**2. Geodynamic processes and evolution of crust or mantle:** We are searching for an innovative earth scientist with broad research interests in the dynamic, physical or chemical processes within the crust or mantle. Specific field of interest is open, but should include a field or observational component. We are particularly interested in individuals with research interests in seismology, space-based geodesy, geodynamics, volcanology, or petrology.

**3. Experimental space physics:** We seek someone with a strong record in the design and conduct of in situ or

ground-based experiments associated with solar, planetary, magnetospheric, ionospheric or aeronautical physics.

Applicants should send a curriculum vitae, bibliography, description of research and teaching interests, and include the names of four references, at least one of whom can address the candidate's teaching experience or potential. All materials should be sent to: Search Committee, c/o D. Ellen McDannald, Department of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310. Preference will be given to applications received by 1 February 2002.

For information about the Department of Earth and Space Sciences, please visit our Web site at <http://www.ess.washington.edu>.

The University of Washington is building a culturally diverse faculty and strongly encourages applications from women and minority candidates. The university is an equal opportunity and affirmative action employer.

### EASTERN KENTUCKY UNIVERSITY SEDIMENTARY GEOLOGIST

The Department of Earth Sciences ([www.earthscience.eku.edu](http://www.earthscience.eku.edu)) invites applications for a tenure-track position at the assistant professor level beginning August 12, 2002. We seek a colleague with academic training and practical experience in the broad field of sedimentary geology, who will complement the department's existing strengths in hydrogeology and environmental science. Preference will be given to those with experience in clastic sedimentology, stratigraphy, and coal geology. Candidates must exhibit a commitment to excellence in teaching, and will be responsible for general education science courses, courses for undergraduate and graduate geology majors, and will supervise master's degree candidates. We expect the incumbent to involve students in his/her research. Ph.D. preferred; ABD required. Eastern Kentucky University ([www.eku.edu](http://www.eku.edu)) is a large, comprehensive, regional university located in the Bluegrass region of Kentucky 25 miles south of Lexington. Candidates should submit a letter of application, curriculum vitae, copies (unofficial) of transcripts, statement of teaching and research interests, and arrange to have three letters of recommendation sent to Dr. Malcolm P. Frisbie, Chair, Department of Earth Sciences, Eastern Kentucky University, Richmond, KY 40475-3102. Review of applications will begin 1 February 2002; position will remain open until filled. Address questions to [malcolm.frisbie@eku.edu](mailto:malcolm.frisbie@eku.edu). Eastern Kentucky University is an equal opportunity/affirmative action employer and encourages applications from minority and female candidates.

### ENVIRONMENTAL SCIENCE GUSTAVUS ADOLPHUS COLLEGE

Gustavus Adolphus College invites applications for a tenure-track position as assistant professor (or associate, with appropriate credentials) in environmental science, to begin September 1, 2002.

Responsibilities will consist of teaching the Environmental Studies Program's introductory and senior seminar courses, which entail the study of environmental issues and problems from interdisciplinary perspectives, including humanities and social sciences. Teaching other environmentally related courses in his/her areas of expertise, developing an ongoing program of scholarly research, and directing the program in the near future will also be expected.

We seek candidates who will have completed the Ph.D. by August 2002. The successful candidate must demonstrate a strong commitment to interdisciplinary teaching and research in a liberal arts setting. Preference may be given to applicants from a physical science; the appointment will be in the department of the successful candidate's discipline and in Environmental Studies.

To apply, send letter of application, curriculum vitae, statements of interdisciplinary teaching philosophy and research interests, and three to five letters from professional references (one of which must address teaching capabilities) to: Dr. Don Scheese, Director, Environmental Studies Program Search, Gustavus Adolphus College, 800 West College Avenue St. Peter, MN 56082-1498. Web site: [http://gustavus.edu/oncampus/facservices/Human\\_Resources/Employment/#academic](http://gustavus.edu/oncampus/facservices/Human_Resources/Employment/#academic).

Review of applications will begin on January 31, 2002, and continue until the position is filled. Equal Opportunity Employer.

### WITTENBERG UNIVERSITY VISITING ASSISTANT PROFESSOR STRUCTURAL GEOLOGY

The Department of Geology invites applications for a visiting appointment at the assistant professor rank beginning

August 19, 2002. Applicants should be broadly trained in the geosciences with expertise in structural geology. The primary teaching responsibilities include introductory geology and structural geology. The successful candidate will be expected to demonstrate excellence in teaching and to involve students in research in the candidate's area of expertise. An integral field component in both teaching and research is essential. Current faculty expertise in the department includes mineralogy, igneous and metamorphic petrology, economic geology, paleontology, process geomorphology, and process sedimentology. Geology faculty members are encouraged to contribute to interdepartmental programs in environmental studies, field studies, and, if interested, the college's first-year interdisciplinary course. This appointment is renewable for up to three years; it offers the successful entry-level candidate an opportunity to gain experience in teaching and advising student research while participating fully in university benefits, including faculty development opportunities.

Wittenberg University is a small, private, residential undergraduate institution firmly committed to the liberal arts and sciences. Interested applicants are encouraged to visit our Web site ([www.wittenberg.edu](http://www.wittenberg.edu)) for details about the college and department. Wittenberg participates in AA/EOE/ADA. We encourage women and minority applicants to apply as we are committed to creating an ethnically and culturally diverse community. Review of applications will begin January 7, 2002, and continue until the position is filled.

Applications should include a curriculum vita, a brief statement about teaching in a liberal arts and sciences setting, and your thoughts on involving research and field experience in your teaching. Send these materials and a list of at least three references (with phone numbers and e-mail addresses) to Dr. John B. Ritter, Associate Professor and Chair, Geology Department, Wittenberg University, Springfield, 45501-0720, [jritter@wittenberg.edu](mailto:jritter@wittenberg.edu).

**ENVIRONMENTAL SCIENTIST/CLIMATOLOGIST  
SUSQUEHANNA UNIVERSITY**

Susquehanna University invites applications for a tenure-track position in the Department of Geological and Environmental Sciences. Priority will be given to candidates who can teach upper-level, undergraduate courses in atmospheric sciences, air quality, and remote sensing. Additional teaching includes general education courses in climate and weather or environmental hazards. Successful applicants will demonstrate excellence in teaching and enthusiasm for supervising undergraduate research projects. Individuals with field-based, interdisciplinary teaching and research interests extending to geology, hydrology, and ecology are encouraged to apply. Ph.D. by September 2002 is required.

A selective, residential, undergraduate institution of over 1,800 full-time students, Susquehanna University is located in the scenic Susquehanna valley, one hour north of Harrisburg, one hour east of State College and three hours from New York, Philadelphia, and Washington, D.C. More information is available at [www.susqu.edu/geology](http://www.susqu.edu/geology). Applications should include curriculum vitae, statement of teaching objectives and research interests, copies of transcripts, and three letters of reference to Dr. Benjamin R. Hayes, Search Committee Chair, Department of Geological and Environmental Sciences, Susquehanna University, Selinsgrove, PA 17870. Review of applications begins January 15, 2002, and continues until the position is filled. SU is an affirmative action/equal opportunity employer committed to fostering diversity in its faculty, staff, and student body.

**TENURE-TRACK FACULTY POSITION  
EDINBORO UNIVERSITY OF PENNSYLVANIA**

The Department of Geosciences seeks applications for a tenure-track instructor/assistant professor beginning August 2002. Responsibilities: Teach structural geology, introductory geology courses, and additional upper level courses in candidate's area of expertise that complement the existing program. Qualifications: Ph.D. in geology preferred (ABD considered). Preference will be given to candidates who emphasize field-based instruction and research involving undergraduate students. Salary and benefits are competitive. Application deadline: February 15, 2002.

In accordance with the terms of the collective bargaining agreement between the State System of Higher Education and APSCUF, you may be assigned to perform work at off-campus sites and/or provide instruction through distance education.

Specify Position #170-1085 and submit a letter of application, CV, copies of transcripts and names/addresses/telephone numbers of three current references to Dr. Eric Randall, Dean of Science, Management and Technology, Department GSA, Edinboro, PA 16444. Contingent upon enrollment. Fluency in the English language for final candidates will be assessed.

Edinboro University of Pennsylvania is building a diverse academic community and encourages people of



**The University of Texas at Austin**

**Two Faculty Positions**

The Department of Geological Sciences at the University of Texas at Austin seeks to fill two faculty positions. Whereas appointments at the tenure-track assistant professor levels are anticipated, candidates at all ranks will be considered.

**Hydrogeology.** This position is in the general area of hydrology to complement our growing program in physical, biological, and chemical hydrogeology. The specific area of research is open, but we are interested in a scientist with a research background in (1) groundwater/surface water interactions or (2) reaction-transport modeling on a variety of scales. The successful candidate will be expected to teach an undergraduate course in surface water hydrology and to help with the hydrogeology field methods course, as well as courses in his/her own specialty.

**Remote Sensing.** This position is the second of three faculty positions in Global Change/Earth System Science. We are seeking an individual who uses remotely sensed observations to study surface processes linked to the hydrological cycle and relationships with global change. Examples of research areas include surface water hydrology, soil moisture, groundwater, sedimentation and erosion, biosphere-atmosphere interaction, and ice sheet processes.

These new faculty will join the newly formed Jackson School of Geosciences with a large and diverse community of geoscientists and superb research facilities and support. The successful candidates will be enthusiastic teachers, direct the research of M.S. and Ph.D. students, and conduct vigorous externally funded research programs. The anticipated starting date is August 2002; a Ph.D. is required at the time of appointment. Please see <http://www.geo.utexas.edu> for additional information. To apply, please send a curriculum vitae, statements of research and teaching interests, and the names and contact information for four references to: Faculty Searches, (Designate Hydrogeology or Remote Sensing Search), Department of Geological Sciences, The University of Texas at Austin, Austin, Texas 78712. Review of applications will begin December 1, 2001, and will continue until positions are filled. The University of Texas at Austin is an Equal Opportunity/Affirmative Action employer.

color, women, veterans and persons with disabilities to apply. AA/EOE. Visit our home page at <http://www.edinboro.edu>, Offices & Services, Employment Opportunities.

**CARNEGIE MUSEUM OF  
NATURAL HISTORY, SECTION OF  
INVERTEBRATE PALEONTOLOGY**

Applications from Ph.D.-level invertebrate paleontologists are invited for a CURATORIAL POSITION (rank open). The museum seeks an individual demonstrating excellence in collection-based research addressing major conceptual issues in systematics, evolution, biogeography, or paleoecology. Desirable qualifications include external research funding and experience in curation and public programs. The collection consists of more than 500,000 specimens with strengths in the Upper Paleozoic and in brachiopods, gastropods, and trilobites. Send curriculum vitae, up to five reprints, a statement of professional goals, and three letters of reference to: John R. Wible, Dean of Science, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, PA 15213, by January 31, 2002.

**FACULTY POSITION IN  
STRUCTURAL GEOLOGY  
UNIVERSITY OF WISCONSIN—MADISON**

The Department of Geology and Geophysics at the University of Wisconsin—Madison seeks a structural geologist for a tenure-track, assistant professor position. A starting date of August 2002 is anticipated. We are seeking an individual in the broad area of structural geology. This includes, but is

not limited to, geomechanics, tectonics, tectonophysics, continental dynamics, geodynamics, rock deformation, and quantitative geomorphology. We anticipate that this person will interact with existing groups in geology and geophysics; opportunities also exist for interaction with the geological engineering program.

A Ph.D. is required at the time of the appointment. The successful candidate is expected to develop an active research program, including supervision of graduate students. Teaching responsibilities include courses at the undergraduate and graduate levels.

Applicants should submit a resume, statement of research and teaching interests, and the names and addresses of at least three references to Dr. Basil Tikoff, Structural Geology—Search Chair, Dept. of Geology & Geophysics, University of Wisconsin—Madison, 1215 W. Dayton St., Madison WI 53706-1692. The application deadline is February 1, 2002.

For additional information, please visit [www.geology.wisc.edu](http://www.geology.wisc.edu). UW—Madison is an equal opportunity/affirmative action employer and encourages applications from women and minorities. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

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**ASSISTANT PROFESSOR, HYDROGEOLOGY  
DEPT. OF GEOLOGY AND GEOPHYSICS  
AND LOUISIANA GEOLOGICAL SURVEY**

The Department of Geology and Geophysics and the Louisiana Geological Survey (LGS), both at Louisiana State University, invites applications for a joint tenure-track faculty position in hydrogeology at the assistant professor level. Required qualifications: Ph.D. in geology or related field at the time of appointment in fall 2002. Additional qualifications desired: postdoctoral or professional experience in hydrogeology; outstanding, quantitative scientist with demonstrated teaching ability and research interests in the development of water resources, field methods and equipment, subsurface transport, groundwater flow and aquifer characterization; working knowledge of computer modeling software and techniques used in hydrogeology.

Responsibilities: contributes to the teaching programs in the Department of Geology and Geophysics; develops courses in his/her area of specialization; develops a strong research program, including supervision of graduate student research, publication in peer-reviewed journals, and LGS technical reports and generation of external funding; participates actively in ongoing research and development of new LGS research projects on the subsurface water resources of Louisiana.

The Department of Geology and Geophysics consists of 20 faculty members covering a wide range of expertise. In support of our faculty and students, we have many well-equipped analytical and computational laboratories. Geology and Geophysics has strong support from the LSU administration as evidenced by our selection as one of the 12 priority departments at LSU. For more information about our department, see our Web site at: <http://www.geol.lsu.edu>.

The Louisiana Geological Survey (LGS) consists of a staff of 22, including faculty and research associates. It has a number of ongoing funded research projects in hydrogeology, environmental geology, GIS, geologic mapping and oil and gas projects, with necessary equipment and support. Visit the LGS Web site at: <http://www.lgs.lsu.edu>.

The review process will begin January 31, 2002, and will continue until candidate is selected. Interested persons should send a copy of their vitae, statement of their research and teaching interest, and the names, addresses, and phone numbers of at least three references to: Chair, Hydrogeology Search Committee, Department of Geology and Geophysics, E235 Howe Russell Geoscience Complex, Louisiana State University, Ref: Log #0523, Baton Rouge, LA 70803.

LSU is an Equal Opportunity/Equal Access Employer.

**GEOLOGY, WHITMAN COLLEGE**

The Department of Geology at Whitman College seeks to fill a one-year sabbatical leave replacement beginning fall 2002. Teaching responsibilities include mineralogy, igneous and metamorphic petrology, and two other courses. Ideally, applicants should have a Ph.D. by the time of appointment. Please submit a letter of application, curriculum vita, transcripts, suggested course offerings, and three letters of reference to Dr. Kevin Pogue, Chair, Department of Geology, Whitman College, Walla Walla, WA 99362. Further information about the college and the department can be found on our home page: [http://www.whitman.edu/offices\\_departments/geology/](http://www.whitman.edu/offices_departments/geology/). Complete applications must be postmarked by February 1, 2002. Whitman College is a small, selective liberal arts college in the Pacific Northwest that is building a diverse academic community that encourages women, minorities and people with disabilities to apply. Candidates must be lawfully employable in this country as a result of citizenship, visa, or resident alien status.

**VULCAN MATERIALS COMPANY  
CORPORATE OFFICE,  
BIRMINGHAM, ALABAMA  
MINING ENGINEER, II, III OR SENIOR  
GRADE: 03/ 11, 12 OR 13  
DEPARTMENT: GEOLOGIC SERVICES**

Summary Description of Position: Performs mining engineering services involving plans and recommendations for open pit construction aggregate quarries (stone and sand and gravel). Such plans include project layout, short and long-term mining sequences, haul road design, drainage, protective berms, overburden disposal, volume calculations, and identification of various grades of material. Coordinates with outside experts on underground mine plans, permitting requirements and various geological issues.

Education, Experience, Skills Required: M.S. in mining engineering with a B.S. in mining engineering or an associated technical field such as geology, geological engineering, or hydrogeology and significant in-field summer work or intern/co-op experience, or a B.S. in mining engineering with 5 or more years experience specifically designing mine plans by using computer design programs. Working

knowledge of AutoCAD, Release 14 or higher and Land Development. Knowledge of additional mine planning and database management programs is a plus. Knowledge of mining/quarrying operations. Excellent interpersonal skills, including oral and written, and the ability to listen and assimilate ideas into plans.

Vulcan offers excellent advancement opportunities and a highly competitive compensation and benefits package. For confidential consideration, forward your resume, with salary history, to: Vulcan Materials Company, Corporate Human Resources, P. O. Box 385014, Birmingham, AL 35238-5014. Or you may e-mail your resume to [jobs@vmcmail.com](mailto:jobs@vmcmail.com). Or fax to: (205) 298-2924.

**EVOLUTIONARY PALEOBIOLOGIST  
UNIVERSITY OF WISCONSIN—MILWAUKEE**

The Department of Geosciences at the University of Wisconsin—Milwaukee seeks to hire an evolutionary paleobiologist at the tenure-track assistant professor level. Applicants must hold a Ph.D. in geology or related field, and have demonstrated field and research experience in evolutionary paleobiology. Postdoctoral experience is desirable. The successful candidate is expected to conduct an active research program, and teach undergraduate and graduate courses in paleontology, historical geology and related subject areas. Information is available online regarding the department at <http://www.uwm.edu/Dept/Geosciences/>.

Candidates must mail a curriculum vitae with a research plan, a statement of teaching philosophy, and three letters of reference postmarked by January 30, 2002, to Norman P. Lasca, Chair, Department of Geosciences, University of Wisconsin—Milwaukee, P. O. Box 413, Milwaukee, WI 53201 (fax: 414-229-5452; e-mail: [nplasca@uwm.edu](mailto:nplasca@uwm.edu)). The University of Wisconsin—Milwaukee is an Equal Opportunity/Affirmative Action Employer.

**FACULTY POSITION, HYDROGEOLOGY  
UNIVERSITY OF ALABAMA  
DEPARTMENT OF GEOLOGICAL SCIENCES**

The Department of Geological Sciences invites applications for a tenure-track position in hydrogeology beginning August 2002. The position will be filled at the assistant professor level. We seek an outstanding individual who combines field-based research with theoretical studies. The successful applicant will be expected to establish a rigorous, externally funded research program in one or more of the following areas: groundwater microbiology, vadose zone hydrology, basin-scale fluid flow, and reactive transport modeling, and to teach introductory geology and graduate-level courses in specialized topics. The position will build on the Environmental Geology Program's existing strengths in contaminant transport modeling, environmental geochemistry, and global climate change. Applicants must hold a Ph.D. degree in hydrogeology or a related field at the time of appointment. Please send a curriculum vitae, statements of research and teaching interests, and contact information for 5 referees to Dr. Chunmiao Zheng, Hydrogeology Search Committee Chair, The University of Alabama, Department of Geological Sciences, Box 870338, Tuscaloosa, AL 35487-0338. The Department of Geological Sciences is housed in a modern research facility that provides laboratory space as well as state-of-the-art analytical instrumentation and computing equipment. Further information is available on our Web site at <http://www.geo.ua.edu>. Review of applications will begin on January 15, 2002, and continue until the position is filled.

The University of Alabama is an Equal-Opportunity, Affirmative-Action Employer. Applications are solicited from women and minority candidates.

**FACULTY POSITION  
CARBONATE SEDIMENTOLOGY/  
SEISMIC STRATIGRAPHY  
UNIVERSITY OF ALABAMA  
DEPARTMENT OF GEOLOGICAL SCIENCES**

The Department of Geological Sciences invites applications for a tenure-track faculty position in carbonate sedimentology/seismic stratigraphy beginning August 2002. The position will be filled at the assistant professor level. Candidates must have a strong record of research and a Ph.D. in geology, geophysics, or a related field. The candidate will be expected to teach graduate courses in carbonate sedimentology and multichannel seismic methods, to attract and supervise master's and doctoral students, and to obtain external research funding. Experience with geologic and geophysical software used to construct 3-D earth models and geographic information systems is desired. This position complements programs in basin analysis, geophysics, tectonics, coastal geology and petroleum systems. Equipment available includes a seismic data acquisition system and a state-of-the-art computing facility supporting seismic data processing, interpretation, and subsurface mapping. Applicants should send a vita, statements of research and teaching interests, copies of transcripts, and contact information for five referees to Dr. Ernest Mancini, Carbonate/Seismic Search Committee

Chair, The University of Alabama, Department of Geological Sciences, Box 870338, Tuscaloosa, AL 35487-0338. Further information is available on our web site at <http://www.geo.ua.edu>. Review of applications will begin on January 15, 2002, and continue until the position is filled.

The University of Alabama is an Equal-Opportunity, Affirmative-Action Employer. Applications are solicited from women and minority candidates.

**IGNEOUS PETROLOGIST/MAGMATIC AND  
HIGH TEMPERATURE  
SOLID-STATE PROCESSES  
BROWN UNIVERSITY**

The Department of Geological Sciences at Brown University (see <http://www.geo.brown.edu>) invites applications for a tenure track position in the general area of physics and chemistry of magmatic and high temperature solid-state processes. Research interests might include, but are not limited to, partial melting, magma generation, melt migration, magma chamber and volcanic eruption processes, diffusion in minerals, transport and/or reaction at grain boundaries and at crystal-melt interfaces. Both experimental and/or theoretical approaches to describing geological observations and processes are of interest. Candidates with research interests in Earth and planetary problems are encouraged to apply. We are interested in hiring the best candidate in the broad area indicated above. Preference will be given to candidates whose strengths complement existing departmental research directions and who demonstrate a commitment to excellence in undergraduate and graduate education. A Ph.D. degree or equivalent is required, and postdoctoral experience is considered important. The position will be filled at either the assistant or possibly the associate professor level, depending on experience and demonstrated achievement.

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

Applications received by February 15, 2002, 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, 2002.

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

**UNIVERSITY OF NEW ORLEANS  
ENVIRONMENTAL SIMULATIONS  
IT INITIATIVES POSITIONS**

**Deltaic Framework Geology and Subsidence Processes Assistant Professor.** The Department of Geology and Geophysics within the College of Sciences at the University of New Orleans (UNO) seeks qualified applicants for a tenure track position at the rank of assistant professor. This position will hold a joint appointment in the multidisciplinary Pontchartrain Institute for Environmental Sciences also within UNO's College of Sciences. This position is supported by the Louisiana Board of Regents Information Technology Initiative within the UNO College of Sciences for the Targeted Research Area of Environmental Simulation. The successful candidate must have a proven track record in the environmental simulation of subsidence processes at time scales ranging from the Quaternary through the Tertiary. Special preference is given to qualified applicants with environmental simulation experience in subsidence processes and the geologic framework of the Mississippi River delta plain. The successful applicant is expected to develop a research and educational program focused on the evolution and subsidence of the Mississippi River Delta plain as it relates to New Orleans, the Pontchartrain Basin, Louisiana's coastal land loss crisis, and the economic development of this region. The salary is budgeted for 9 months and start-up funds are negotiable. A full benefits package is provided by UNO, which is a member of the Louisiana State University System. UNO is an equal opportunity employer.

Send Resume and 3 letters of recommendation to: Department Chair, Dept. of Geology & Geophysics, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148. Application closing date: March 15, 2002.

**UNIVERSITY OF NEW ORLEANS  
ENVIRONMENTAL SIMULATIONS  
IT INITIATIVES POSITIONS**

**Coastal Processes: Waves, Tides, and Storm Surges Assistant Professor.** The Department of Geology and Geophysics within the College of Sciences at the University of New Orleans (UNO) seeks qualified applicants for a tenure track position at the rank of assistant professor. This position will hold a joint appointment in the

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## Executive Director

Division of Hydrologic Sciences  
Desert Research Institute  
Position #40-001

The Desert Research Institute (DRI), an internationally recognized environmental research institution and component of the University and Community College System of Nevada (UCCSN), seeks an Executive Director of its Division of Hydrologic Sciences (DHS). DRI offers outstanding faculty, the opportunity to build new research programs, opportunities for interdisciplinary collaboration, and a team-oriented environment.

**Position description:** The Executive Director provides scientific direction for DHS through interactions with all DHS faculty. Key responsibilities include research and business development, personnel, and financial management. The DHS Executive Director reports to the President of DRI and holds a rank equivalent to a university dean. The Executive Director promotes the needs of all divisions, serves as faculty mentor and collaborator, fosters collaboration in teaching and research, and interacts directly with current and potential sponsors to further strategic goals.

**Division scope:** DHS has a unique mix of research grants and contracts with a total annual budget of approximately \$7 million. Fifty faculty and support staff, as well as 40 graduate research assistants and hourly employees, are divided between DRI campuses in Reno and Las Vegas. Approximately 15 DHS faculty teach in graduate programs within the UCCSN. Faculty engage in basic and applied research in global environmental hydrology; climate change; watershed hydrology; groundwater hydrology and hydraulics; hydraulic engineering and surface water hydrology; contaminant transport; aqueous geochemistry; and snow, ice, and unsaturated zone hydrology. Sponsors include federal agencies, state and local governments, private industry, and foundations.

**Qualifications:** Candidates should have a Ph.D or equivalent graduate degree in a relevant field and must bring proven leadership, communication, administrative, and personnel skills to the position.

**Compensation:** The starting salary for this state funded position is expected to be \$120,000-\$140,000 with an excellent fringe benefits package.

**Additional information:** For a detailed position description, application procedures, and more about DRI, please visit [www.dri.edu](http://www.dri.edu). Review of applications will begin on March 1, 2002. The desired start date is July 1, 2002.

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multidisciplinary Pontchartrain Institute for Environmental Sciences, also within UNO's College of Sciences. This position is supported by the Louisiana Board of Regents Information Technology initiative within the UNO College of Sciences for the Targeted Research Area of Environmental Simulation. The successful candidate must have a proven record in the environmental simulation of modern coastal processes. Special preference is given to qualified applicants with environmental simulation experience as it relates to storm surges and coastal hydrodynamics within the Mississippi River delta plain. The successful candidate is expected to develop a research and education program focused on the hurricane risk to New Orleans and the coastal land loss and water quality crisis as it relates to the Pontchartrain Basin and the Mississippi River delta plain, and the economic development of this region. The salary is budgeted for 9 months and start-up funds are negotiable. A full benefits package is provided by UNO, which is a member of the Louisiana State University System. UNO is an equal opportunity employer. Send Resume and 3 letters of recommendation to: Department Chair, Dept. of Geology & Geophysics, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148. Application closing date: March 15, 2002.

#### TENURE TRACK POSITION IN ENVIRONMENTAL SCIENCE BINGHAMTON UNIVERSITY

The Department of Geological Sciences and Environmental Studies will hire a tenure-track Earth scientist for the 2002-2003 academic year (fall or spring). We are interested in applications from interdisciplinary, research-oriented geoscientists who have obtained the Ph.D., at the assistant professor level, who can contribute to departmental growth in one of the following areas:

**Environmental Science:** concerned with tracking the fate and transport of organic pollutants in soil and groundwater from geochemical and/or geobiologic perspectives.

**Global Change:** with research interests in one or more of the following: development of methods to analyze records of global changes in climate, modern or ancient; modeling of present-day ocean-atmosphere-biosphere interactions; predicting future climate and ocean circulation.

**Geobiology:** emphasizing the importance of the biotic component of Earth systems, particularly the origins and evolution of life on Earth and the microbial influence on all aspects of physical and chemical reactions at and below the Earth's surface.

Submit curriculum vitae, statement of research and teaching interests, and the names of three people willing to supply letters of reference to Dr. Tim Lowenstein, Chair, Search Committee, Department of Geological Sciences, Binghamton University (SUNY), Binghamton, New York 13902-6000. Binghamton University is an equal opportunity/affirmative action employer.

#### ASSISTANT PROFESSOR STRUCTURAL GEOLOGY/TECTONICS UNIVERSITY OF CALIFORNIA, DAVIS

The Department of Geology at the University of California, Davis, has an opening for a full-time tenure-track faculty position at the assistant professor level in structural geology/tectonics. We seek applicants with interests in one or more of the following: tectonics, especially neotectonics, analytic structural geology, regional structural geology/tectonics. The successful candidate will be expected to develop a vigorous program of research, participate actively in our undergraduate and graduate teaching programs, including our strong field geologic teaching program, and mentor graduate students. We seek someone to complement existing strengths in structure/tectonics, petrology, geophysics, and environmental geology. For more information about the U.C. Davis Geology Department, visit our Web page at <http://www-geology.ucdavis.edu>.

A Ph.D. in the geological sciences with an emphasis in structural geology/tectonics is required at the time of appointment. Applicants should send a curriculum vitae, a statement of research and teaching interests, and names, addresses, phone numbers and e-mail addresses of at least three people who can be contacted for recommendations to: Chair, Structural Geology/Tectonics Search Committee, Department of Geology, One Shields Avenue, University of California, Davis, CA 95616, Phone: (530) 752-0350, Fax (530) 752-0951, [StruTectsearch@geology.ucdavis.edu](mailto:StruTectsearch@geology.ucdavis.edu).

The position will be effective starting July 1, 2002. To ensure full consideration, applications should be received by February 1, 2002. The position will remain open until filled.

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

#### ASSISTANT PROFESSOR SOLID EARTH GEOPHYSICS UNIVERSITY OF CALIFORNIA, DAVIS

The Department of Geology is seeking an individual for a full-time tenure-track faculty position at the assistant professor level. This person must have the background to establish a vigorous research program in the area of solid earth geophysics. Preference will be given to candidates who complement the research and teaching programs in the department. We are interested in candidates in a variety of fields, including, but not limited to: earthquake seismology, mathematical geophysics, modeling and observing deformation in the lithosphere, physical processes associated with volcanism, and structural seismology. Applicants are expected to have a strong interest and ability in undergraduate and graduate teaching, and will be expected to supervise graduate students. A Ph.D. or equivalent degree in geophysics, geology with an emphasis in geophysics, or a closely related field is required. The appointment is 100% in the Department of Geology and the College of Letters and Science. For more information about the U.C. Davis Geology Department, visit our Web page at <http://www-geology.ucdavis.edu>. The position will be effective starting July 1, 2002. To ensure full consideration, applications should be received by February 1, 2002. The position will remain open until filled.

Applicants should send a curriculum vitae, a statement of research interests, a statement of teaching interests, and the names, addresses, phone numbers and e-mail addresses of at least three people who can be contacted for recommendations to: Chair, Geophysics Search Committee, Department of Geology, One Shields Avenue, University of California, Davis, CA 95616, Phone: (530) 752-0350, Fax (530) 752-0951, [Geophys-search@geology.ucdavis.edu](mailto:Geophys-search@geology.ucdavis.edu).

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

#### GEOPHYSICIST KNOXVILLE, TENNESSEE

Geophysicist needed for location in Knoxville, TN. Responsible for developing technical approach, conducting field investigations using magnetic, EM induction, CSAMT, GPR and seismic methods, data analysis and interpretation; manage technical aspects of project and prepare technical reports. Req. MS or equivalent in Geophysics. Proficiency in SEISMIC, GPR, and CSAMT techniques. 40 hrs/week, 9-5, 45K/yr. Please send resume to IT Corporation, Dept. RJ/IMC, 2790 Mosside Blvd., Monroeville, PA 15146.

## Opportunities for Students

**Graduate Student Research Assistantships, University at Buffalo.** Research assistantships (tuition plus 12 month stipend) are now available through the Department of Geology. Assistantships are currently available in the following areas: (1) Simulation and visualization of gravity-driven flows: field work and supercomputer modeling and visualization of flows, some interaction with civil protection officials in developing an interface. (2) Volcanic-related avalanches: field work, experiments and computer modeling of volcanic avalanches. (3) Hydrogeology: integration of remote sensing with groundwater flow modeling. (4) Macroevolution: field work in Nevada, quantitative analysis of graptolite species ranges, turnover rates, and phylogenetic patterns. (5) Structural Geology: fracture patterns and their relation to deep faults and remote sensing lineaments in Finger Lakes region and elsewhere in NYS and the northeast. (6) Near-surface geophysics: using near-surface geophysics (seismic & GPR) for improved environmental site characterization, Alaska. (7) Geoscience Education: aid in enhancing diversity in the geosciences through recruiting, mentoring, and new-program development at a city community college. Interested candidates should contact Dr. Michael Sheridan, [mfs@geology.buffalo.edu](mailto:mfs@geology.buffalo.edu), and visit [www.geology.buffalo.edu](http://www.geology.buffalo.edu). Applications are due February 15 with official GRE score.

**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 \$2,400 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, 2002. For information/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](mailto:pbi@geo.umass.edu). Tel (413) 545-3223. An Equal Opportunity/Affirmative Action Employer.

**Graduate Fellowship in Sedimentary Geology, MIT.** Potential Ph.D. students are invited to apply for a three-year Graduate Research Fellowship in the Department of Earth Atmospheric and Planetary Sciences, Massachusetts Institute of Technology. Student stipend and tuition are fully supported. The research focus will center on quantification of facies scaling relationships, in an effort to evaluate sedimentologic process and stratigraphic response. The successful candidate should have a keen interest in stratigraphically-oriented field mapping of carbonate rocks and a desire to work with digital acquisition technologies. Field sites will include the Canning Basin (Devonian, Western Australia) and Oman (Cretaceous, Proterozoic). Graduate admissions applications should be submitted to MIT, along with a letter of intent to be copied to Professor John Grotzinger ([grotz@mit.edu](mailto:grotz@mit.edu)). John Grotzinger, MIT, Department of Earth, Atmospheric, and Planetary Sciences, 77 Massachusetts Avenue, 54-816, Cambridge, MA 02139, (617) 253-3498.

**Kottlowski/Bureau Fellowship, New Mexico Bureau of Geology & Mineral Resources, New Mexico Tech.** The New Mexico Bureau of Geology & Mineral Resources (a division of New Mexico Tech) is seeking candidates for the newly established Kottlowski/Bureau Fellowship. The fellowship, for an incoming Ph.D. candidate in the earth sciences at NMTech, offers a 12-month \$18,000 salary plus actual tuition costs (guaranteed for 1 year, renewable for 3 years). Additional funding is available to cover some field and laboratory expenses. Applicants can have interests in any earth or environmental science specialty, but will be expected to do a project that is either within the state or of particular interest to the state in conjunction with advisors from both the Bureau and the Department. Application deadline is February 1, 2002. Applicants will automatically be considered for other forms of support through the Department. NMTech is a highly rated science and engineering school, located in Socorro, NM, with 1,600 students and more than 60 professional earth-science faculty and staff shared between the academic division and the Bureau. A more complete description of the fellowship, NMTech and the Bureau is available on Departmental and Bureau Web pages (<http://www.ees.nmt.edu> and <http://geoinfo.nmt.edu>). In addition to applying for graduate admission to the department, a letter indicating your interest in this fellowship should be addressed to: Director, Bureau of Geology & Mineral Resources, New Mexico Tech, 801 Leroy Place, Socorro, NM 87801.

**Graduate Student Opportunity in Sedimentology/Stratigraphy at Washington State University.** The Department of Geology at Washington State University is pleased to offer an NSF-funded Ph.D. graduate assistantship to study how eustasy and/or climate fluctuations influenced the early evolution of metazoans in Early Cambrian carbonate and siliciclastic rocks. The field area, in the Northwest Territories, Canada, is rugged and remote, so the successful candidate must be in good physical shape and enjoy working in small groups in such areas. The WSU Geology Department offers expertise in sedimentology/stratigraphy/paleoclimatology, hydrogeology, volcanology, economic geology, structural geology, and mineralogy. The Geoanalytical Laboratory (<http://www.wsu.edu/~geology/Pages/Services/Geolab.html>) housed in our department is well equipped for quantitative analysis of sediments. For more information about this opportunity, contact Dr. Mike Pope, Dept. of Geology, Washington State University, Pullman, WA 99164-2812, (509) 335-5989, [mcpope@wsu.edu](mailto:mcpope@wsu.edu).

**Research and Teaching Assistantships, Geology Department at California State University, Bakersfield.** Geology Department at California State University, Bakersfield has two research and four teaching assistantships available for students wishing to pursue an M.S. in geology. The research assistantships are for (1) development of the stratigraphy of the Kern Water Bank through core analysis and correlation of well logs and geologic mapping using state of the art petroleum industry software (funded by USDA), and (2) study of a topic relevant to exploration or development of petroleum in the San Joaquin Valley (funded by Occidental Petroleum and Chevron). Appointments carry tuition waiver and salary. Department strengths are in the areas of sedimentary geology, petroleum geology, geophysics, hydrogeology, aqueous geochemistry, and structural geology. Bakersfield is located in the heart of California's petroleum and agricultural areas and abundant opportunities exist for industry-supported thesis projects. Applications accepted year-round but receipt by Feb. 15, 2002, will assure full consideration. For additional information and application materials contact: Dirk Baron, Graduate Coordinator, Department of Geology, CSU Bakersfield, Bakersfield CA 93311-1099, (661) 664-3044, [dbaron@csusb.edu](mailto:dbaron@csusb.edu) or visit the department's Web site at <http://www.cs.csusbak.edu/Geology/>.



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Photo by Judy Pelkey.

## GeoTrips

GSA is offering two GeoTrips to Iceland: one designed for professionals and the other for full-time students. Both offer expert leadership, instruction, and—of course—the spectacular geology and scenery of Iceland.

### Iceland: Fire and Ice

August 1–15, 2002

**Scientific leader:** Haraldur Sigurdsson, Graduate School of Oceanography, University of Rhode Island. A native of Iceland and professor of oceanography, Sigurdsson is a leading volcanologist with an international reputation for his research on many aspects of volcanism in Iceland, Mexico, Colombia, the United States, and Indonesia, among others.

**Guest Lecturer:** Haukur Johannesson, Natural History Institute, Reykjavík, Iceland. Johannesson has devoted most of his career to the geologic mapping of the uncharted volcanic regions of Iceland. He is an expert in the tectonic structure and origin of the Iceland basalt plateau and is also very knowledgeable about the natural history of Iceland in general.

### Description

This trip will reveal many unaltered and fresh geologic features that can be seen nowhere else on land. Expect to acquire a newly expanded understanding of volcanoes, hotspots and rifts. There will be great views of steep-walled and flat topped hyaloclastite ridges derived from subglacial eruption,

young hyaloclastite islands produced by submarine eruptions, great explosion craters, tephra cones, calderas, blocky obsidian flows, waterfalls descending into the rift valley and, of course, extraordinary glacial panoramas.

### Fees and Payment

\$3,400 for GSA members; \$3,500 for nonmembers. A \$400 deposit is due with your reservation and is refundable (less \$100) through May 15. Fee is based on double occupancy. The single supplement, based on availability, is an additional \$486.

Total balance is due May 15. Min.: 20; max.: 40.

Included: Classroom programs and materials; field trip transportation, lodging, all meals, guidebook and map. Not included: Airfare to and from Reykjavík, alcoholic beverages, and other expenses not specifically included.

## Iceland: A Student Only–Oriented GeoTrip

August 1–15, 2002

**Scientific leader:** James Reynolds, Brevard College, Brevard, North Carolina. Reynolds is a magnetostratigrapher with interests in Neo-



Photos by Judy Pelkey.



Cape Neddick Lighthouse on the Nubble Island, York, Maine. The lighthouse sits on the contact between Silurian-age metasedimentary rocks of the Kittery Formation, and Cretaceous-age explosion breccia and gabbro of the Cape Neddick complex. Photo by Arthur M. Hussey II.

gene volcanism and foreland basins who has been leading international field trips since 1996.

### Description

Designed for students *only*, this GeoTrip will visit classical geological localities of Iceland on a low-frills budget. Participants will camp and prepare meals in a group kitchen tent. Eighty kilometers of hikes will take us through spectacular volcanic and glacial scenery. The trip begins in Baltimore and will fly to Reykjavik to make a 12-day loop around the country, starting at Thingvellir, Gullfoss waterfall, and Geysir geothermal area near the capital. Next, we'll head to Myvatn, in northeastern Iceland, where we'll hike through Krafla caldera and investigate other

volcanic areas. After passing steep table mountains to get to Askja caldera, we'll swim in the acidic water of the 1912 Viti crater. We'll spend several days in southeastern Iceland around Vatnajokull, visiting the valley glaciers descending from the large ice cap. Hikes at Skaftafjell National Park lead to several spectacular overlooks of the ice. We'll continue across southern Iceland to the Lakigigar craters from the 1783 eruptions and proceed to the hot springs at Landmannalauger, where a slowly cooling obsidian flow heats the water. Upon returning to Reykjavik, we'll have a free day and night in the city with the final stop at the Blue Lagoon on our way to the airport.

### Fees and Payment

\$2,700 for GSA student members; \$2,800 for nonmembers. A \$200 deposit is due with your reservation and is refundable (less \$100) through May 15. Total balance is due May 15. Min.: 20; max.: 35. Included: Roundtrip airfare to Reykjavik from Baltimore (currently the gateway city), classroom programs and materials, field trip transportation, lodging, all meals, guidebook and map. Not included: Airfare to and from Baltimore, camping equipment (tent and sleeping bag), alcoholic beverages, and other expenses not specifically included.

### GeoHostel

Experience five days of scenic geologic excursions in southwestern Maine.

### Geology of Coastal Southern Maine

July 13–18, 2002

**Scientific Leaders:** Arthur M. Hussey II, Bowdoin College (retired), and Walter Anderson, Maine Geological Survey (retired). Hussey, a Pennsylvania native, received a B.S. in geology from Penn State in 1954 and a Ph.D. in geology from the University of Illinois in 1960. He is professor of geology, emeritus at Bowdoin College, where he taught for 39 years. His research, supported by the Maine Geological Survey, has been on the stratigraphy, structure, plutonic intrusive activity, and tectonic evolution of the coastal region of southwestern Maine.

A native of Massachusetts, Anderson received a B.S. in geology from the University of Massachusetts, Amherst, in 1954, and an M.S. in 1956 from the University of Rochester, New York. His experience includes 12 years as an exploration geologist, 11 years as assistant state geologist, and 16 years as state geologist with the Maine Geological Survey, Department of Conservation. Anderson teaches part-time at the University of Southern Maine, is a consultant, and serves on the management board (past chair) of the GSA Northeastern Section.

**Co-leaders:** Joseph T. Kelley, University of Maine, Orono; Thomas Weddle, Maine Geological Survey; and David West, Middlebury College. A Maine native, Kelley received a B.A. in geology from Boston University in 1973 and a master's and Ph.D. in geology from Lehigh University in 1976 and 1980. He is a professor of marine geology at the University of Maine and specializes in sedimentology and coastal zone management—specifically,

*continued on p. 44*

continued from p. 43

the response of shorelines and people to changes in sea level.

Weddle, a Massachusetts native, now resides with his family in Brunswick, Maine. He holds a B.S. in education from Boston University (1975), an M.S. in geology from the University of Massachusetts (1979), and a Ph.D. in geology from Boston University (1991). He has worked for environmental geology and geotechnical consulting firms in Massachusetts and Georgia. He has worked for the Maine Geological Survey since 1986 conducting detailed surficial geology mapping and hydrogeological studies, and he is the director of the Applied Geology Division at the survey.

West is a native of North Carolina and received a B.S. in geology from Appalachian State University in 1986. He moved to Maine in the summer of 1986 and received a master's and Ph.D. in geological sciences from the University of Maine in 1988 and 1993. West is an assistant professor of geology at Middlebury College, and he specializes in structural geology and the tectonic evolution of the northern Appalachians.

**Description**

Field trips will lead us to localities where we'll examine Ordovician to Cretaceous-age meta-

morphic and igneous rocks, Late Pleistocene and Early Holocene sediments and landforms, modern sand systems of the scenic beaches of southwestern Maine, and three of the most photographed lighthouses along the New England coast.

We'll visit a layered gabbro complex along the shore at Cape Neddick to examine and argue over the origin of its spectacular layering and wall-rock structures. We'll visit bedrock exposures of rocks of at least three separate tectonic terranes and discuss the timing and effects of Devonian and later deformation and metamorphic events, including the evolution of the controversial Norumbega Fault Zone. Gravel pits and shoreline exposures of surficial materials will provide insight into Late Wisconsinan glaciation and deglaciation and the consequent sea level changes that have resulted from this. Visits to the beaches of southwestern Maine will emphasize the origin, evolution, and consequences of recent human occupation and alteration of these dynamic sand systems.

Time will be available for participants to relax in the sun and swim in our "warm" ocean waters, shop in places like Freeport and the Old Port part of Portland, savor lobster and other seafood in the fine restaurants of the area, cruise around Portland's Casco Bay, or even take a three-mile ride on a charming two-foot narrow gauge railroad.

**Fees and Payment**

\$1,000 for GSA members; \$1,100 for nonmembers. A \$100 deposit is due with your reservation and is refundable through June 1, less a \$20 processing fee. Total balance is due June 1. Min.: 15; max.: 32. Included: Classroom programs and materials; field trip transportation; lodging for six night (all single occupancy sleeping rooms; quad-style dormitory rooms with shared bath and living room); all meals; and welcoming and farewell events. Not included: Airfare to and from Portland, Maine, transportation during hours outside field trips, alcoholic beverages, and other expenses not specifically included.

**Registrants with Special Needs**

GSA is committed to making GeoVentures accessible to all. If you require special arrangements or have special dietary concerns, please contact Edna Collis, GSA Headquarters, (303) 357-1034, [ecollis@geosociety.org](mailto:ecollis@geosociety.org).

**REGISTER TODAY!**

Send a deposit to hold your reservation; please pay by check or credit card. You will receive further information and a confirmation of your registration within two weeks after your reservation is received.

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## GSA Science and Outreach

### GeoCorps America™ Participants Reveal the Geology of Our National Lands

Julie Sexton, Program Officer, GSA

#### A BIG FIND

*The whirring of a helicopter sounded in the distance. Dust and air started to spin and blow. Suddenly, the helicopter was hovering above Meghan Hicks and the rest of the crew. After millions of years, their delicate and ancient bundle would move from its resting place.*

*As a participant in GSA's GeoCorps America Program in Big Bend National Park last summer, Hicks participated in a monumental event when a helicopter transported ten dinosaur neck bones, each weighing up to 1,000 pounds, out of the backcountry in the park. Hicks helped excavate the well-preserved bones, which probably belong to the species Alamosaurus. This is the first intact spinal column found for an adult of this species.*

*"In the wake of this history-making event, I was called on to educate park visitors," Hicks said. She created an exhibit for the visitor's center and wrote an article for the Big Bend National Park newspaper. Evenings, Hicks presented a slide show entitled "Unearthing Alamosaurus," in which she chronicled the dinosaur's life and explained how the bones were discovered, excavated, and airlifted.*

Through GeoCorps America™, GSA strives to increase the number of geoscientists on public lands, enhance the knowledge and management of natural resources, mitigate geologic hazards, and raise public awareness of geologic resources on public

lands. GeoCorps America places all levels of geoscience professionals and college students in temporary 10- to 12-week positions during summer months with the National Park Service and U.S. Forest Service. Participants are chosen by a competitive selection process.

GeoCorps America grew out of a partnership between GSA and the National Park Service in

1996. That year, two geoscientists were placed in national parks. GSA will send 50 or more geoscientists to different national parks and forests in 2002, and intends to continue to expand the program.

#### GEOCORPS AMERICA 2001

The 32 GeoCorps America participants in 2001 represented many disciplines and career and educational levels, including undergraduate and graduate students, professors, earth science teachers, consultants, and retired geoscientists. The participants were placed in national parks and forests around the country in areas such as resource management, research, and interpretation and edu-



Clockwise from top left: Peter Rose works with visitors in the Fossil Butte Scientific-Interpretive Quarry; Brittina Argow on a trip to collect andesite samples below Paradise Glacier, Mount Ranier National Park; Eric Butler analyzes Dewey Lake sandstone at Chimney Hollow, Lake Meredith National Recreation Area.

cation. Following are examples of the diverse projects undertaken by GeoCorps America participants.

### **Lake Meredith National Recreation Area, Texas**

**Eric Butler's** goal was to expand the understanding of the geology of Lake Meredith National Recreation Area. He conducted field studies and a literature review and used this knowledge to develop a visitor's guide to the geology of Lake Meredith. He also wrote a comprehensive report on the local geology for park staff. As an interpretive ranger, Butler taught lessons and led visitors on tours of the recreation area. He taught about the geology and diverse Native American history of the region, the lifestyles of the tribes, and the techniques the tribes used to adapt to climate change. To enrich his lessons, Butler learned how to knap flint and throw spears with an atlatl.

### **Mount Rainier National Park, Washington**

**Brittina Argow's** main project at the park was to develop a volcanic hazards curriculum guide for K-12 students. She also taught geology to at-risk high school students, organized a teacher's workshop, and collected rock samples to create an educational geology kit. "Being a GeoCorps participant isn't something you do for the hours...and certainly not for the pay," Argow said. "It's something you do because it's such a thrill to share your love of geology with other people in our nation's best natural laboratories, in a place where it's easy to get excited about the processes that shape Earth."

### **Sunset Crater Volcano National Monument, Arizona**

**Sarah Hanson** educated visitors, researched volcanic processes, and initiated the creation of a roadside geology guide. As part of her research on volcanic processes, Hanson collected rock samples and mapped fumarole deposits near the summit of Sunset Crater. The information that she collected will be used to characterize the last stages of volcanic activity there. "Sharing my knowledge of the area with the park staff and visitors was a very rewarding experience," she said.

### **Zion National Park, Utah**

**Stacie Hartung's** primary goal was to enhance interpretive presentations about the park by developing a geology curriculum that included activities and descriptions of landforms and geologic processes in the park. "In this work environment, I was expected to work independently and discover opportunities for myself," Hartung said. And she certainly did! Her accomplishments during her summer at Zion included designing signs for an interpretive trail, creating a geology curriculum for rangers to use with elementary school children, helping Cub Scouts earn badges, increasing her personal geologic knowledge, and climbing the highest peak in the park.

### **Inyo National Forest, California**

**Linda Centano's** main project was to conduct an abandoned mine inventory, which included



Devin Helfrich performs stream gauging in New Mexico's Rio Grande River.

field and office work. She compiled characteristics about the abandoned mines that may pose hazards to the environment and people visiting the forest. "I went to Inyo National Forest for adventure and with the expectation to enjoy myself and to learn the geology of the eastern Sierras," said Centano. "However, I gained so much more. This experience has helped me in my career-making decisions and has opened the door to numerous types of career opportunities through the Forest Service and with the U.S. government. My internship at the Inyo National Forest has been the best experience of my life."

### **Ozark National Scenic Riverways, Missouri**

**Clay Partain** contributed to cave research at Ozark National Scenic Riverways, which contains more than 300 known caves. He mapped cave locations using a Global Positioning System and monitored and photographed the caves. The field work was physically challenging, and the problems he faced were intellectually stimulating. "My experiences have been educational, enlightening, and fascinating," Partain said.

For more information about GeoCorps America and how to apply, visit [www.geosociety.org/science/intnshp.htm](http://www.geosociety.org/science/intnshp.htm), or contact Julie Sexton, [jsexton@geosociety.org](mailto:jsexton@geosociety.org), or Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org). Applications for summer 2002 are due February 4, 2002.

## **BRIDGE PROGRAM REVEALS INTERESTING PATHS**

*Karlon Blythe, Program Officer, GSA*

Because of the high interest on the part of interns who have benefited from GSA mentor programs, GSA established a new applied geoscience mentored internship with partners from industry in 2001. GSA is proud to recognize its first partner in this endeavor, S.S. Papadopoulos & Associates, and

its admirable mentor staff, who served as excellent professional role models for the BRIDGE interns.

The BRIDGE program bridges the gap between graduation and finding that first job for GSA student members. It enables those members to apply both theory and learned skills prior to completing their degrees. This mentor program, which targets advanced undergraduates, graduate students, and recent graduates (within two years of graduation), offers its professional partners numerous benefits, including access to a temporary workforce and the opportunity to recruit, develop working relationships with, and screen potential new hires.

This summer's interns included Lauren Cooper, Marlene Duffy, Devin Helfrich, and Peter Lang. GSA's corporate partner for this round of internships, S.S. Papadopoulos & Associates, has multiple offices across the United States. Cooper and Duffy were in San Francisco, California, Lang was in Boulder, Colorado, and Helfrich was in Albuquerque, New Mexico.

The interns found the world of consulting to be interesting, varied, and dynamic. They learned remarkable lessons in resourcefulness, independence, teamwork, and responsibility. Plus, they gleaned an appreciation for sound business practices as applied in today's competitive consulting world.

Lang worked in three areas: data manipulation and maintenance, field investigations, and office support. Two of the larger projects he helped with included an investigation and evaluation of New Mexico surface waters and a litigation support case in Utah. He learned the harsh business realities involved for consultants when projects are cancelled mid-stream.

Cooper and Duffy worked on different though related projects in the same office in San Francisco. While Cooper's experiences covered the gamut of legal, community, hazardous waste, and field is-

sues, her main summer project involved a Superfund site where remediation is under way. Her direct involvement at the site dealt with a new phytoremediation area and the preliminary assessment of the slurry wall as a barrier to groundwater flow. Cooper deftly handled numerous responsibilities related to the process of planting 150 new trees near the slurry wall. She also analyzed the efficiency of the slurry wall and learned about decontamination practices for people as well as instruments. Cooper notes, "It was a great feeling being able to apply skills that I learned in my undergraduate coursework. My internship was an exceptional experience."

Duffy's summer experiences enabled her to learn MathCAD and AutoCAD and then apply these tools. She also assisted with duties related to the installation of a barrier wall along part of the perimeter of an arsenic-contaminated site and a phytoremediation study. She speaks in awe of a "cool machine" that could churn up the soil and mix it in place with bentonite or with cement and bentonite, leaving behind a barrier wall. Duffy and Cooper spent time in the field measuring water levels in various wells to check whether the wall was working as anticipated. Duffy also got a taste of the consultant's role in litigation. She learned a resolution is not easily nor quickly reached.

Devin Helfrich had a bonus lesson in politics due to the fact that his summer's work related to water rights in arid New Mexico. Helfrich undertook a geographic information system project to delineate irrigation canal service areas or determine the extent of land (area) potentially serviceable by major canals used for irrigation in the Middle Rio Grande Valley. Much of his work found him in the offices of the Middle Rio Grande Conservancy District, where he had a temporary workstation and access to the necessary data.

For more information on this mentoring program, visit [www.geosociety.org/science/brigdesc.htm](http://www.geosociety.org/science/brigdesc.htm), or contact Julie Sexton at [jsexton@geosociety.org](mailto:jsexton@geosociety.org).

GSA is actively soliciting corporate partners to participate in the BRIDGE Program. If your firm is interested in more details, give Sexton a call at (303) 357-1005.

## ADVENTURE GEOLOGY: EARTH SCIENCE WEEK 2001

Earth Science Week provides an opportunity for geoscientists to share their knowledge and enthusiasm about Earth. GSA and Recreation Equipment Incorporated (REI) of Denver hosted four presentations on Adventure Geology during Earth Science Week, October 7-13.

Ronal C. Kerbo, National Cave Management Coordinator, National Park Service, took participants on a voyage via slide show to some of the great cave areas of the world—from the lava tube caves in the Azores to southeastern New Mexico and the wonders of Lechuguilla Cave.

Russell Dubiel, U.S. Geological Survey, helped

his audience discover the origins of Colorado's diverse geologic features—high mountains, deep canyons, and steep cliffs—that attract climbers, mountaineers, and other outdoor enthusiasts.

Halsted Morris, Colorado Avalanche Information Center, examined the anatomy of an avalanche, talked about avalanche accidents and rescues in Colorado, and helped participants discover ways to enjoy Colorado's backcountry safely during the winter.

Greg McDonald, Paleontology Program Coordinator, National Program Coordinator, presented slides on the variety of fossils preserved through the National Park System. From Precambrian algae to pygmy mammoths of the Ice Age, fossil fish to petrified forests and even dinosaurs, our national parks preserve and protect outstanding parts of the fossil record.

GSA sent more than 2,200 Earth Science Week posters that celebrate Colorado geology to Colorado public and private school librarians. The librarians were encouraged to create displays using the poster and books from the GSA member-recommended reading list, and they had the opportunity to be reimbursed up to \$50 for purchases of geology books or books with geology as a major story line. GSA has received 115 requests for reimbursement to date. The reading list is posted at [www.geosociety.org](http://www.geosociety.org) and is updated as members suggest additional titles.

## GEOINDICATOR INITIATIVE CONTINUES IN 2001 WITH THIRD WORKSHOP

Through the Institute for Earth Science and the Environment and the GSA Foundation, GSA has provided funds for a series of Geoindicator Initiative workshops. The product of an international working group—the Commission on Geological Sciences for Environmental Planning (COGEOENVIRONMENT) of the International Union of Geological Sciences (IUGS)—the Geoindicator Initiative aims to improve the integration of rapid geological processes into environmental and ecological assessment and reporting.

Presentations at the 2001 workshop, held in Lusaka, Zambia, focused on the relative roles of natural and anthropogenic contributions to geologic processes and phenomena occurring at or near Earth's surface over periods of 100 years or fewer. Participants described and discussed the rate of change and the ability to monitor geoindicators. The Lusaka conference drew 35 participants from 16 countries. For more information, contact Karlon Blythe, [kbllythe@geosociety.org](mailto:kbllythe@geosociety.org).

## INTEGRATION IS KEY TO GSA-SUPPORTED FIELD COURSE

*Katie KellerLynn*

The goal of "Geology and Ecosystem Field Course" is integration, in both natural and human terms. During the course, attendees investigate, an-

alyze, and discuss geology, soils, and vegetation in tandem. Geologist Melody Holm, soil scientist Jerry Freeouf (from the Rocky Mountain Region of the USDA Forest Service), and botanist Klara Varga teach an integrated approach toward identification of the subtle and complex relationships within an ecosystem. This approach is applied to the ecosystem surrounding the Judson Meade Geologic Field Station of Indiana University in the northern Tobacco Root Mountains near Whitehall, Montana.

Financial and administrative support from GSA allows the National Minerals Training Office of the USDA Forest Service, which coordinates the course, to provide professional development to an integrated audience of government agencies, scientific disciplines, and professions.

Thanks in part to GSA's support, this course, popular among USDA Forest Service employees, has become available to those from the National Park Service, the Bureau of Land Management (BLM), and the Natural Resources Conservation Service. GSA also sponsors Outstanding Earth Science Teachers (OEST), nominated by the National Association of Geoscience Teachers, and invites a science journalist to attend the course. Hence, geologists, biologists, soil scientists, foresters, ecologists, hydrologists, geoscience information system specialists, teachers, and a member of the media study and work together during the two five-day sessions, forming connections that can lead to long-lasting communication and future collaboration.

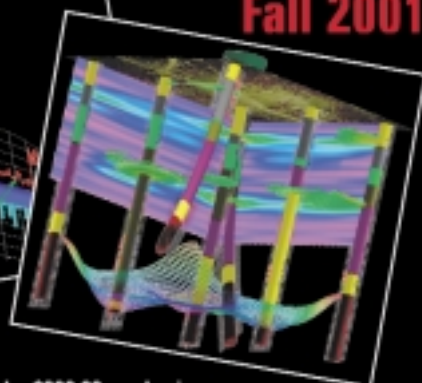
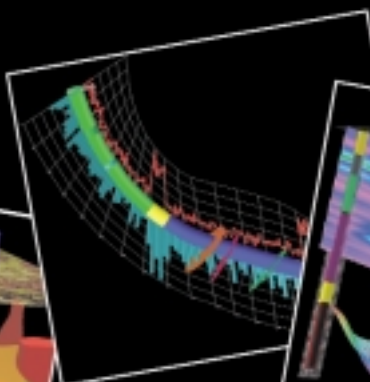
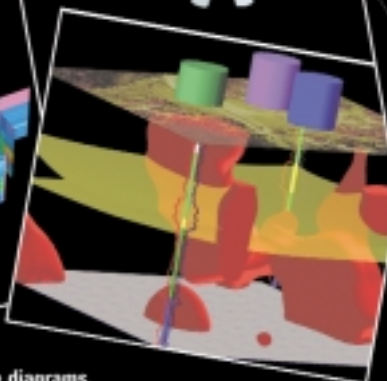
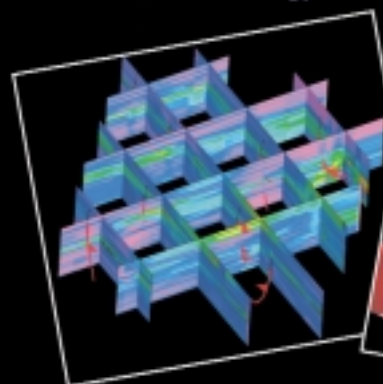
Thomas Arnold, an OEST awardee from State College, Pennsylvania, is considering developing a field program for talented high school juniors for the summer of 2002 in Wyoming or southern Montana, where scientists who were fellow participants would be guest instructors. OEST awardee Julie Ann Hugick from Cortlandt Manor, New York, collaborated with soil scientist Terry Hardy from the Boise National Forest on lesson plans that use infrared images to locate fire lines and hotspots. This fits nicely with Hugick's electromagnetic unit as well as with Fire Prevention Week. This course prompted Paula Waggy, an OEST awardee from Franklin, West Virginia, to contact the West Virginia Geological Survey about developing a similar course for teachers in West Virginia. Joseph Kruczcuk, an OEST awardee from Philadelphia, Pennsylvania, is going to spend some time riding the range with BLM fisheries biologist David Gilbert to get a better understanding of how the BLM manages its Wetlands Program.

GSA's continued support of this course and similar endeavors will promote integrated ecosystem management, which includes human activities, on public lands. For more information on the field course, contact Julie Sexton, [jsexton@geosociety.org](mailto:jsexton@geosociety.org), (303) 357-1005.

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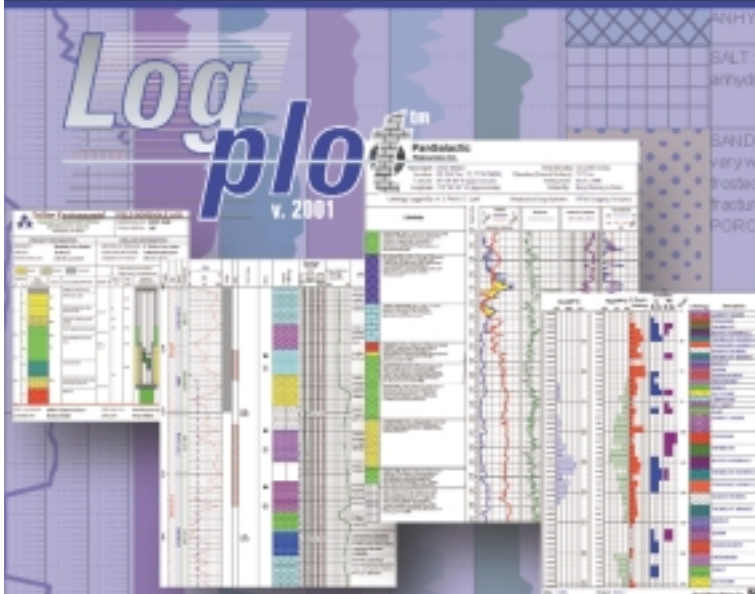


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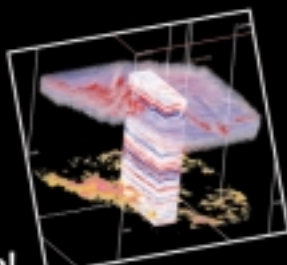
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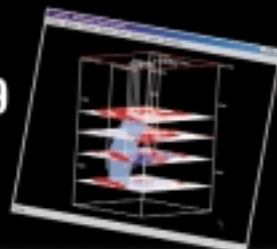
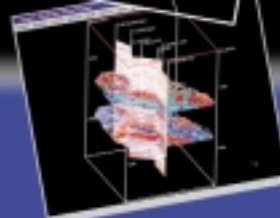
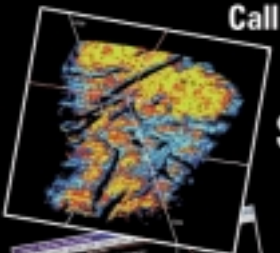
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