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## **New evidence for abrupt climate change in the Cretaceous and Paleogene:**

An Ocean Drilling Program expedition to Shatsky Rise, northwest Pacific



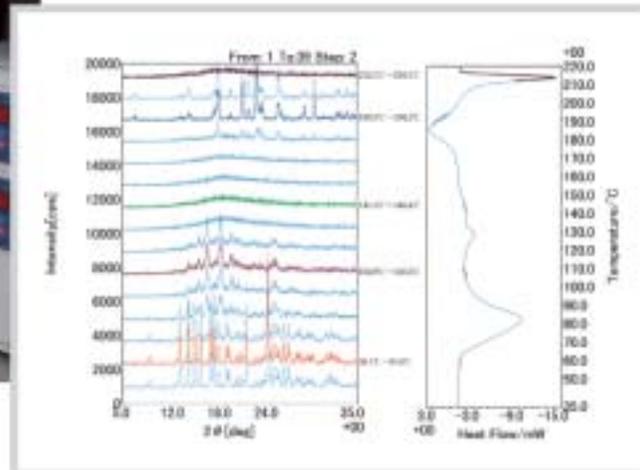
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**On the cover:** The drillship *JOIDES Resolution* in port before a recent leg. Image courtesy of the Ocean Drilling Program. See "New evidence for abrupt climate change in the Cretaceous and Paleogene: An Ocean Drilling Program expedition to Shatsky Rise, northwest Pacific," by T.J. Bralower et al., p. 4–10.

# New evidence for abrupt climate change in the Cretaceous and Paleogene: An Ocean Drilling Program expedition to Shatsky Rise, northwest Pacific

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Scientific Participants of Leg 198\*

## ABSTRACT

Sediments recovered during an Ocean Drilling Program Leg on Shatsky Rise in the northwest Pacific hold clues to a number of abrupt climate events that took place during the Cretaceous and early Paleogene. These transient events caused major upheaval in marine communities and profoundly altered biogeochemical cycling. Shatsky Rise cores contain organic carbon-rich strata deposited during a brief interval of open ocean dysoxia or anoxia in the early Aptian (120 Ma). Analyses of exceptionally preserved organic compounds suggest that bacterial activity helped sequester organic carbon in these strata. Graphic evidence exists in Shatsky cores for the mid-Maastrichtian (ca. 69 Ma) extinction of the inoceramids, a long-ranging, widespread group of bottom-dwelling clams. This extinction is a global event that was likely related to a profound change in deep ocean circulation. Stratigraphically expanded records of the Cretaceous-Tertiary boundary extinction event (65 Ma) were recovered at four different sites. The cores contain evi-

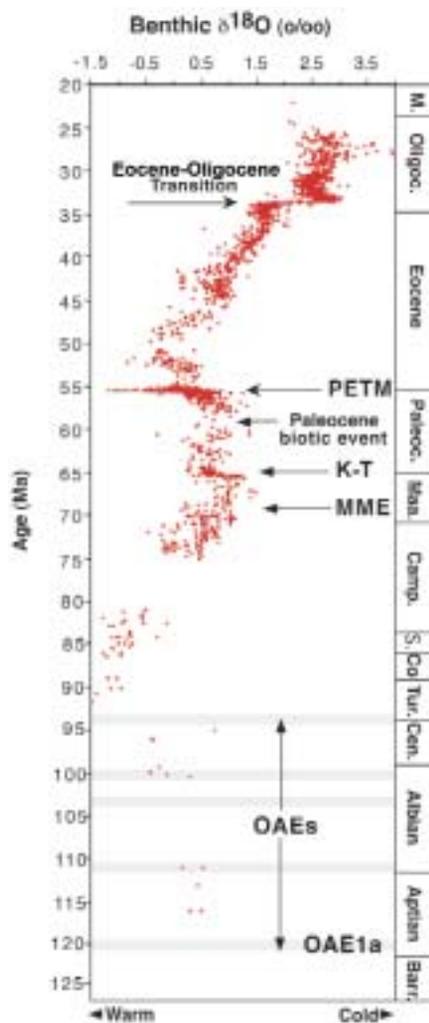
\* Michel A. Arthur, Kristen Averyt, Simon C. Brassell, Paul R. Bown, James E.T. Channell, Leon J. Clarke, Andrea Dutton, Jason W. Elson, Tracy D. Frank, Susanne Gylesjö, Haidi Hancock, Harumasa Kano, R. Mark Leckie, Kathleen M. Marsaglia, Jennifer McGuire, Kyaw Thu Moe, Maria Rose Petrizzo, Stuart Robinson, Ursula Röhl, William W. Sager, Kotaro Takeda, Deborah Thomas, Trevor Williams, and James C. Zachos.

dence of the response of biogeochemical cycling and the recovery of oceanic plankton in the wake of this catastrophe. A new biotic event of major evolutionary significance was found in the early late Paleocene (ca. 58.4 Ma) associated with a change in deep-water circulation, possibly as a result of a brief pulse of warming. Abundant evidence of the Paleocene-Eocene thermal maximum (PETM; ca. 55 Ma), an abrupt warming event associated with major reorganization of benthic and planktonic communities, was recovered in cores from five sites along a depth transect. PETM warming is thought to have been induced by methane derived from dissociation of methane hydrates. The Shatsky Rise depth transect shows evidence of the predicted response of such methane input: pronounced, short-term shoaling of the lysocline and calcite compensation depth (CCD).

Shatsky Rise cores record the response of the tropical Pacific to a rapid cooling event near the Eocene-Oligocene boundary (ca. 33.5 Ma) marking the transition to glacial climates that characterized the remainder of the Cenozoic. This event is reflected by a marked increase in carbonate content of the sediment preserved on Shatsky Rise, which signifies a profound drop in the CCD and markedly changed deep-sea circulation patterns.

## INTRODUCTION

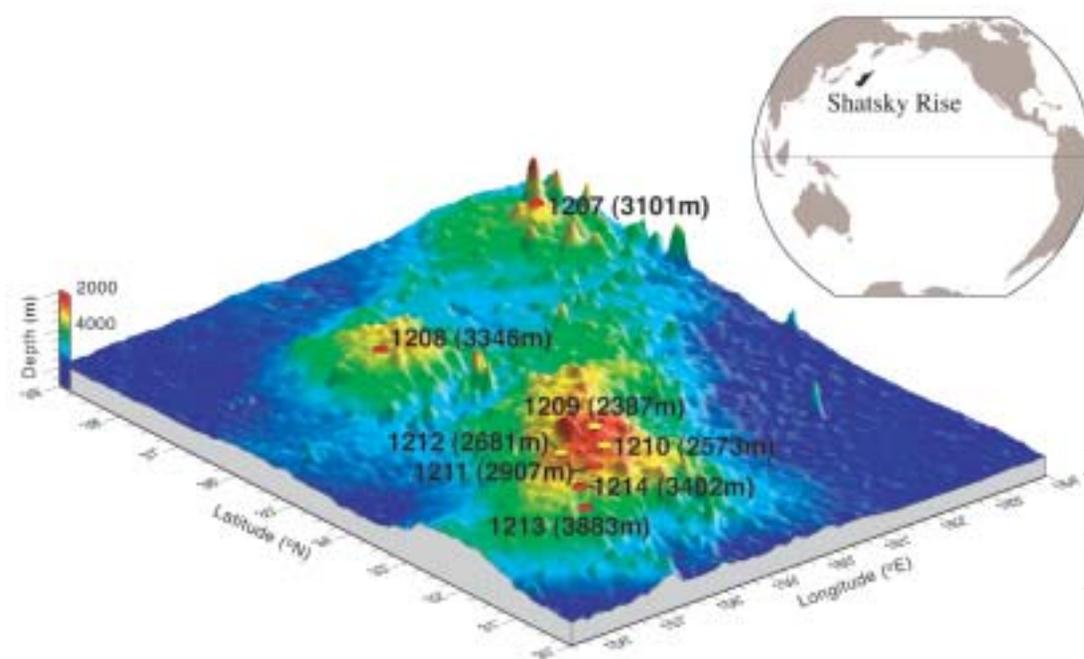
Predictions for modern global warming resulting from increased CO<sub>2</sub> levels have caused a heightened interest in the mechanics of ancient warm climates and especially of geologically abrupt warming events. The mid-Cretaceous (ca. 80–120 Ma) and early Paleogene (ca. 45–60 Ma) were characterized by some of the most equable climates of the Phanerozoic (Fig. 1). In addition, these “greenhouse” intervals contain significant abrupt and transient warming events that led to major changes in oceanic environments, profound turnover in marine communities, including extinction, and perturbations to global chemical cycles. Examples include the



**Figure 1.** Generalized climate curve for the Cretaceous and Paleogene derived from deep-sea benthic oxygen isotope data (from Zachos et al., 1993, and unpublished). Also shown are locations of events discussed including: Eocene-Oligocene (E-O) transition, PETM—Paleocene-Eocene thermal maximum, late Paleocene biotic event, K-T—Cretaceous-Tertiary boundary, MME—mid-Maastrichtian event, OAE1a—early Aptian oceanic anoxic event.

Paleocene-Eocene thermal maximum (e.g., Kennett and Stott, 1991) and Cretaceous oceanic anoxic events (e.g., Jenkyns, 1980).

Among the largest obstacles facing our understanding of the climate of the Cretaceous and Paleogene is that many good stratigraphic sections on land and in the oceans have been buried at depths where diagenetic alteration has obscured interpretations of stable isotope and other climate proxies. In many oceanic sequences, spot-coring, coring gaps, drilling disturbance, and hiatuses hinder detailed studies of ancient climate. Site coverage is



**Figure 2.** Bathymetric map of Shatsky Rise showing location of Leg 198 sites. Site 1207 is located on the Northern High, Site 1208 is on the Central High, and Sites 1209 to 1214 are on the Southern High.

uneven and almost nonexistent in some regions, especially the tropics and the Pacific Ocean. The aerial extent and importance of the Pacific in global circulation, however, make this a critical target for investigation of warm climatic intervals.

One of the most promising locations in the Pacific for recovering Cretaceous and Paleogene sediments at relatively shallow burial depths is Shatsky Rise (Fig. 2). This feature, a medium-sized large igneous province in the west-central Pacific was formed in the Late Jurassic and Early Cretaceous between 147 and 135 Ma (Nakanishi et al., 1989). Shatsky Rise was the target of three Deep Sea Drilling Project (DSDP) expeditions: Legs 6, 32, and 86. The latter leg drilled one site on Shatsky Rise (Site 577), which was limited to the Paleogene and uppermost Maastrichtian. Some sites in the older legs were spot-cored, and chert lowered recovery in others, especially in the Cretaceous. Yet even with an extremely patchy record, analyses of Shatsky Rise sediments have provided key data in our understanding of Cretaceous and Paleogene climate; these data are especially significant given that the rise was located in tropical latitudes during this time period.

Ocean Drilling Program (ODP) Leg 198 in August–October, 2001 was designed to understand the causes, nature, and mechanics of the long-term Cretaceous and Paleogene “greenhouse,” as well as of transient but critical climate events during this period. A key aspect of the drilling

plan was to locate sites along depth and latitudinal transects to provide additional dimensions to reconstructions of the paleoenvironment through time (Fig. 2). Intermediate- and deep-water chemistry (i.e., carbonate solubility, oxygenation) and circulation are sensitive to changes in climate and can be reconstructed using depth transects. One site each was drilled on the North and Central High of Shatsky Rise (Sites 1207 and 1208, respectively) and six were drilled on the Southern High (Sites 1209–1214) (Bralower et al., 2002).

An impressive 140 m.y. package of pelagic sediment was recovered at depths between 170 and 623 m below the sea floor (Fig. 3). The Cretaceous and Paleogene section recovered at sites across the depth transect provides a unique opportunity to understand long-term climate change on a warm Earth. However, the key success of the drilling was the abundant evidence for short-lived (<1 m.y.) warming events, and other major intervals of rapid climate and environmental change.

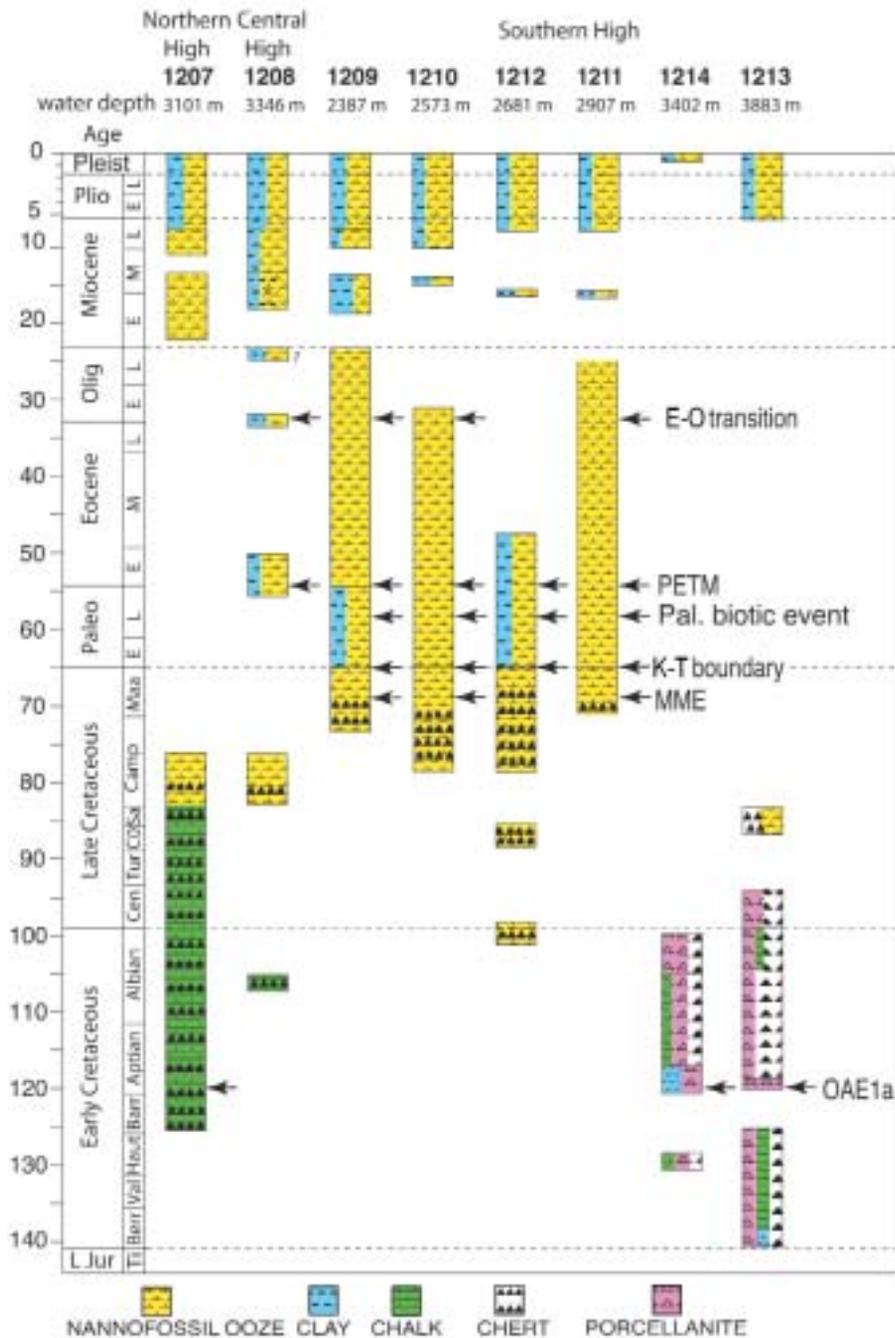
#### A CLASSIC RECORD OF THE EARLY APTIAN OCEANIC ANOXIC EVENT

The beginning of greenhouse climate conditions in the mid-Cretaceous was associated with widespread deposition of organic-carbon ( $C_{org}$ )-rich sediments, informally known as black shales, in the oceans. These  $C_{org}$ -rich deposits were the result of fundamental oceanographic changes that drastically affected biogeo-

chemical cycling and marine ecosystems, resulting in geographically extensive or global oxygen-deficient water masses.  $C_{org}$ -rich sediments are known to occur primarily in specific stratigraphic intervals that have been termed oceanic anoxic events (OAEs: Schlanger and Jenkyns, 1976). The ultimate trigger(s) of OAEs, however, remain elusive.

$C_{org}$ -rich sedimentary rocks at Sites 1207 and 1213 (Fig. 4) are evidence for OAE1a during the early Aptian (120 Ma) (Arthur et al., 1990), an event that is well documented in Tethyan sections (Coccioni et al., 1992). At Site 1207, OAE1a is found within 45 cm of finely laminated, dark brown radiolarian claystone. The Site 1213  $C_{org}$ -rich units include clayey porcellanites and radiolarian porcellanites with associated minor tuff. At Site 1214, a black laminated claystone unit contains a distinctive radiolarian assemblage that suggests that the recovered sediments correlate to the OAE1a interval (e.g., Erbacher and Thurow, 1997), but low- $C_{org}$  contents indicate the peak of the event was not recovered.

In Tethys early Aptian OAE1a corresponds to prominent  $C_{org}$ -rich horizons that were deposited in open ocean environments; for example, the original Selli level in Italy is in a truly pelagic section (Coccioni et al., 1992). However, the same interval in the North Atlantic is not  $C_{org}$  rich (Bralower et al., 1994).  $C_{org}$ -rich horizons of OAE1a age have been found



**Figure 3.** Summary of stratigraphy and lithologic succession from Sites 1207 to 1214. Lithology is plotted against time to show duration of periods of deposition and location of unconformities. Southern High Sites 1209–1214 are ordered by water depth. Arrows show stratigraphic position of transient events discussed (see Fig. 1 for abbreviations).

in a number of other locations in the Pacific Ocean, but only DSDP Site 463 (Mid Pacific Mountains) and ODP Site 866 (Resolution Guyot) have good recovery (Sliter, 1989; Jenkyns, 1995). Both of these sites have a shallow-water influence: Site 866 is located in shallow-water carbonates and Site 463 has a considerable fraction of material derived from shallow-water carbonate environments. Thus the

Leg 198  $C_{org}$ -rich units represent the most pelagic records of OAE1a outside of Tethys, and provide important information about the nature of environmental change during the event.

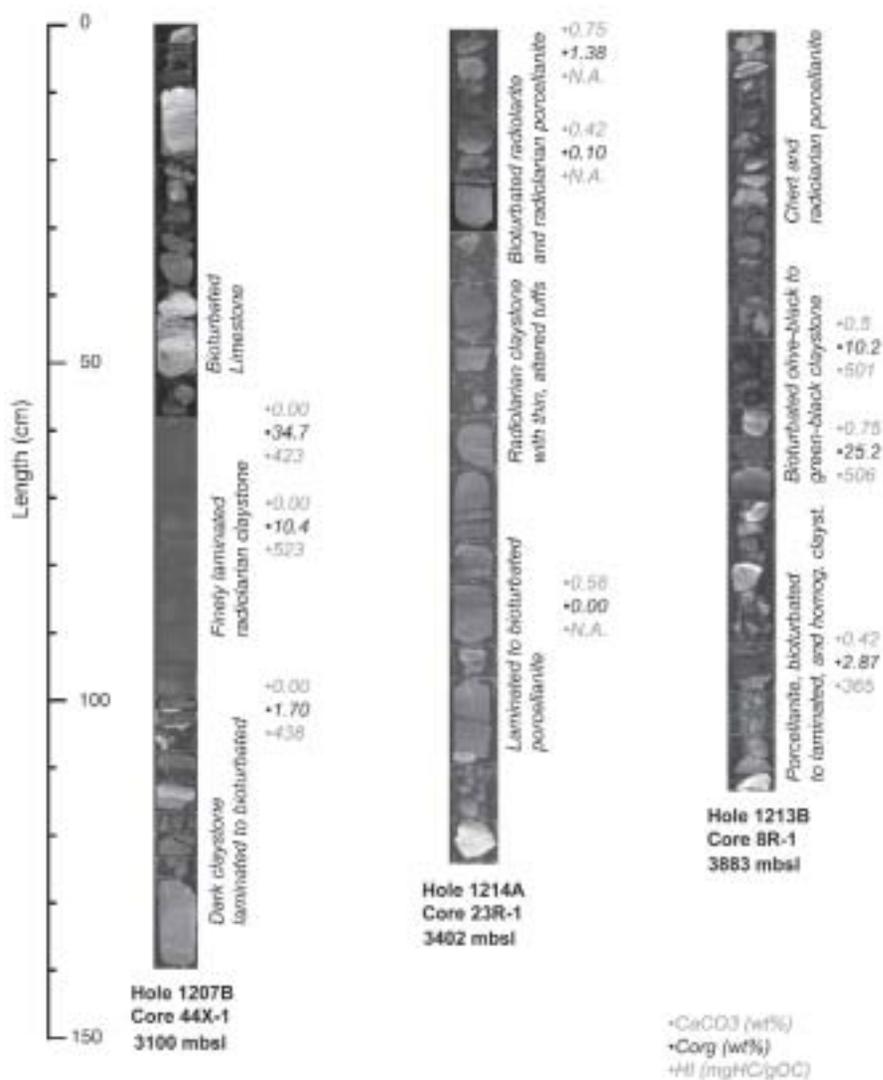
The  $C_{org}$  contents of lower Aptian intervals from Sites 1207 and 1213 (Fig. 4) are among the highest ever recorded in pelagic Cretaceous sequences. They attest to the extraordinary nature of the deposi-

tional conditions that led to enhanced sequestration of organic matter. Exceptional preservation of organic compounds, combined with lamination in sediments at Site 1207, indicate that conditions were highly dysoxic or anoxic at the time of deposition. Rock-Eval analyses and gas chromatography–mass spectrometry (GC-MS) of extractable hydrocarbons and ketones indicate that the organic matter is almost exclusively algal and bacterial in origin. GC-MS data show biomarkers associated with cyanobacteria. The prevalence and character of bacterial biomarkers suggest the existence of microbial mats at the time of deposition. Compounds identified in Leg 198 sediments also include the oldest known alkenones, a signature of haptophyte algae (S.C. Brassell, 2002, personal commun.). Thus, biomarker data indicate that profound changes in prokaryote and protistan populations were intimately associated with processes that led to sequestration of  $C_{org}$  during OAE1a. Further studies of the well-preserved organic compounds are planned to elucidate these processes.

At Sites 1207 (~1.3 km paleodepth during OAE1a) and 1213 (~2.8 km paleodepth), the  $C_{org}$ -rich units lack carbonate, but calcareous sediments occur directly underneath the  $C_{org}$ -rich sediments at Site 1213, indicating that the calcite compensation depth (CCD) shoaled by at least 1.5 km during the event. The magnitude of the change in the CCD during OAE1a was at least partially a result of increased rates of  $CO_2$  outgassing that may also be directly responsible for global warmth at this time (e.g., Arthur et al., 1985; Larson, 1991).

### EXTINCTION EVENTS IN THE MID-MAASTRICHTIAN AND AT THE CRETACEOUS-TERTIARY BOUNDARY

Stable isotope evidence indicates that cooling in the Late Cretaceous was interrupted by a significant event in the mid-Maastrichtian at 69 Ma when the source of deep waters changed abruptly from low to high latitudes (e.g., MacLeod and Huber, 1996). This event appears to have coincided with the extinction of the *Inoceramus* bivalves (MacLeod et al., 1996). Growing evidence, however, suggests that the *Inoceramus* extinction is diachronous. Moreover, the magnitude and direction of stable isotope changes are quite variable at different sites (Frank and



**Figure 4.** Cores of early Aptian OAE1a interval recovered on Leg 198. Core photo, % carbonate, % C<sub>org</sub>, and hydrogen indices for lower Aptian sedimentary rocks recovered at Sites 1207, 1213, and 1214. Note that Sites 1207 and 1213 recovered C<sub>org</sub>-rich intervals that represent OAE1a.

Arthur, 1999), possibly as a result of uncertainties in stratigraphic correlation or of true differences in deep-water properties. Thus the relationship between the extinction event and changing deep-water properties is not firmly established.

An unusual record of the mid-Maastrichtian event was observed in the sedimentary record at two sites on the Southern High of Shatsky Rise. At Sites 1209 and 1210, large *Inoceramus* shell fragments are common for several meters, but disappear abruptly. This disappearance is in the same stratigraphic position at both sites. Furthermore, isolated *Inoceramus* prisms were recovered in foraminiferal separates at relative levels at Site 1211. The significance of the short range of visible specimens in this

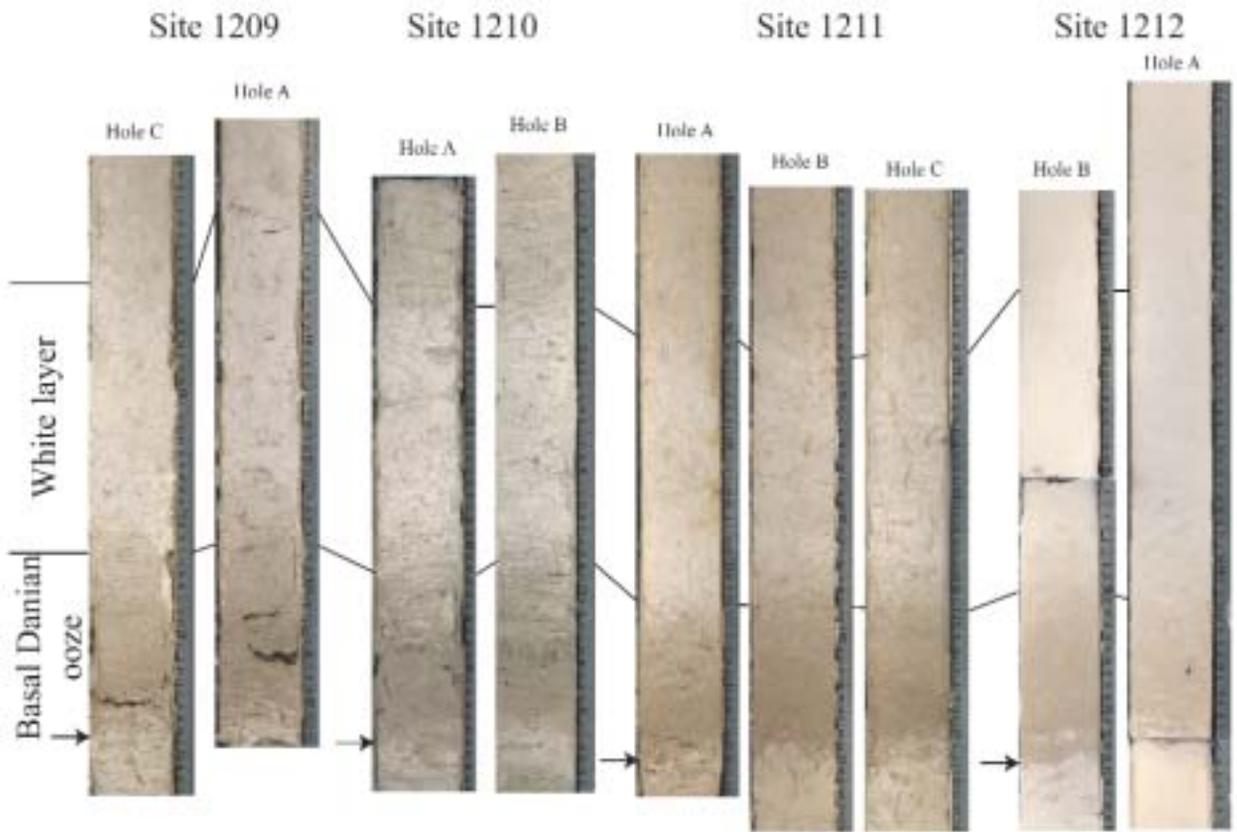
open ocean setting is not currently understood. However, such occurrences have previously been noted in the Pacific (MacLeod et al., 1996) and the stratigraphic position suggests they are related to the *Inoceramus* extinction and deep-water changes in the mid-Maastrichtian determined at other deep-sea locations (e.g., Barrera et al., 1997; Frank and Arthur, 1999). Benthonic and planktonic foraminiferal isotope and assemblage data from Shatsky Rise will help characterize changes in deep- and surface-water properties as well as constrain the timing and origin of the extinction.

The origin of extinctions at the K-T boundary (65 Ma) is well understood, however, the effect of the event on biogeochemical cycling and marine ecosys-

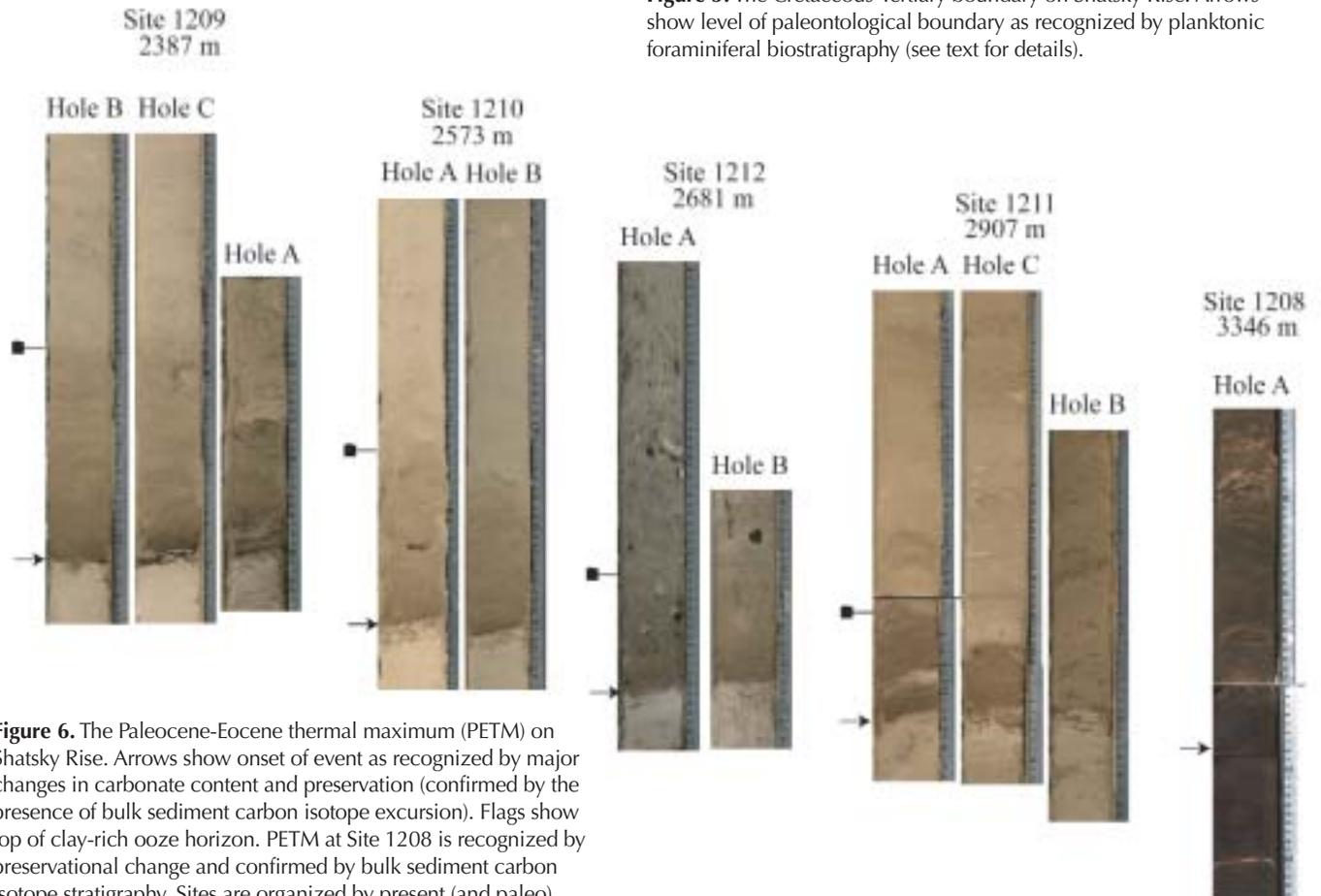
tems is still not completely constrained. A remarkable set of cores was taken across the K-T boundary on the Southern High at Sites 1209, 1210, 1211, and 1212 (Fig. 5).

The lithologic sequence in the K-T boundary interval is similar at all of these sites (Fig. 5). The boundary succession includes uppermost Maastrichtian (nannofossil Zone CC26) white to very pale orange, slightly indurated, nannofossil ooze overlain by an 8–12-cm-thick layer of basal Paleocene (foraminiferal Zone P $\alpha$ ) grayish orange foraminiferal ooze. This layer grades into 19–23-cm-thick white foraminiferal nannofossil chalk, then into grayish orange nannofossil ooze. The boundary between the uppermost Maastrichtian and the lowermost Paleocene is clearly bioturbated as shown by the irregular nature of the contact and the pale orange burrows that extend as much as 10 cm down into the white Maastrichtian ooze (Fig. 5). Sampling of the deepest sections of the burrows of Paleocene ooze within the uppermost Maastrichtian yields highly abundant, minute planktonic foraminiferal assemblages that are dominated by *Guembelitra* with rare *Hedbergella holmdelensis*, suggesting a possible Zone P0 age (Smit, 1982). Burrows also contain common light brown to amber spherules up to 100–150  $\mu$ m in diameter with textures similar to the spherules composed of glauconite and magnetite from the K-T boundary in other locations (Smit and Romein, 1985).

The substantial thickness of the uppermost Maastrichtian *M. prinsii* (CC26) Zone and the lowermost Danian *P. eugubina* (P $\alpha$ ) Zone indicates that the K-T boundary is expanded compared to the majority of deep-sea sites (the P $\alpha$  Zone is either unrecovered or poorly preserved at most other deep-sea sites). Moreover, the Zone P $\alpha$  interval in Shatsky cores bears similarities to other sites such as ODP Site 1049 (western North Atlantic), where the correlative interval corresponds to a dark, burrow-mottled clay underneath 5–15-cm-thick white foraminiferal nannofossil ooze (Norris et al., 1998). A similar white unit is found directly above the boundary at DSDP Site 536 (Gulf of Mexico; Buffler et al., 1984), and ODP Sites 999 and 1001 (Caribbean; Sigurdsson et al., 1997). The ultrafine micrite in this oceanwide white layer may be related to the collapse of the



**Figure 5.** The Cretaceous-Tertiary boundary on Shatsky Rise. Arrows show level of paleontological boundary as recognized by planktonic foraminiferal biostratigraphy (see text for details).



**Figure 6.** The Paleocene-Eocene thermal maximum (PETM) on Shatsky Rise. Arrows show onset of event as recognized by major changes in carbonate content and preservation (confirmed by the presence of bulk sediment carbon isotope excursion). Flags show top of clay-rich ooze horizon. PETM at Site 1208 is recognized by preservational change and confirmed by bulk sediment carbon isotope stratigraphy. Sites are organized by present (and paleo) water depth.

marine biosphere and inorganic production of carbonate in the surface ocean (e.g., Kump, 1991), a hypothesis that requires further testing. The Leg 198 sections represent some of the best-preserved and least-disrupted deep-sea records of the K-T extinction event and the subsequent biotic radiation.

### KEY EVIDENCE FOR ABRUPT, TRANSIENT WARMING EVENTS IN THE PALEOGENE

An abrupt warming event is well documented at the Paleocene-Eocene boundary (the Paleocene-Eocene thermal maximum [PETM; 55 Ma]). However, a number of other intervals of rapid temperature increase, or hyperthermals, akin to the PETM although smaller in magnitude, may also exist in the midst of the warm early Paleogene (Thomas et al., 2000). Leg 198 discovered a new transient climate event of evolutionary significance in the early late Paleocene at ca. 58.4 Ma. A prominent clay-rich ooze found at Sites 1209, 1210, 1211, and 1212 coincides with the evolutionary first occurrences of *Heliolithus kleinpellii* and primitive discoasters, both of which are important, and often dominant, components of late Paleocene and younger nannoplankton assemblages. Planktonic foraminifers in the clay-rich layer are characterized by a low diversity, largely dissolved assemblage dominated by representatives of the genus *Igorina* (mainly *I. pusilla* and *I. tadjikistanensis*). The clay-rich layer contains common crystals of phillipsite, fish teeth, and phosphatic micronodules. The abundance of phillipsite and fish teeth suggests either very slow sedimentation or intervals of seafloor exposure, possibly resulting from pervasive dissolution of carbonate. Even though microfossil assemblages are clearly altered by dissolution, they appear to record a significant environmental perturbation in surface waters as the underlying cause of the biotic event. We speculate that the event was a hyperthermal, an abrupt warming that possibly caused a brief switch in the source of deep waters bathing Shatsky Rise.

Sediments cored on Shatsky Rise show evidence of a strong deep-ocean response to warming in the PETM. The PETM interval was cored in nine holes at Sites 1209, 1210, 1211, and 1212 on the Southern High (Fig. 6). The Paleocene-Eocene boundary interval was also recov-

ered at Site 1208 on the Central High. At the Southern High sites, the PETM corresponds to an 8–23-cm-thick layer of yellowish brown clayey nannofossil ooze with a sharp base and a gradational upper contact. The clay-rich layer is often bioturbated into the underlying sediment. A thin (1 mm) dark brown clay seam lies at the base of the PETM in several holes.

Preliminary biostratigraphy and stable-isotope stratigraphy suggest that the PETM is complete. This biostratigraphy also shows that the PETM interval at the Southern High sites is condensed compared to continental-margin records from the Atlantic and Tethys (e.g., Kennett and Stott, 1991), but somewhat expanded compared to other deep-sea sites. At the relatively deep Site 1208, biostratigraphic and bulk stable isotopic data confirm that the recovered PETM is a highly condensed (~3 cm) record.

The PETM interval at all of the sites contains a clear record of nannofossil and planktonic foraminiferal assemblage transformation at this time of environmental upheaval. One of the dominant nannolith genera, *Fasciculithus*, is replaced by *Zygrhablithus bijugatus*, a holococcolith species that is often a highly abundant component of Eocene assemblages. The genus *Discoaster* is highly abundant, likely as a result of warming or increased oligotrophy (Bralower, 2002). Also found are abundant calcispheres, which are possibly calcareous resting cysts produced by dinoflagellates at times of environmental perturbation. Planktonic foraminiferal assemblages contain an ephemeral group of ecophenotypes or short-lived species of the genera *Acarinina* and *Morozovella* (Kelly et al., 1996).

The depth transect strategy of Leg 198 was specifically designed to address the response of the ocean to the greenhouse forcing mechanism proposed for the PETM. This warming is generally thought to have resulted from a massive release of methane from clathrates into the ocean-atmosphere system (e.g., Dickens et al., 1997). Methane can explain the magnitude of the warming and the rate of carbon isotopic change at the onset of the event. The oceanic response to this methane input has been predicted but is currently untested (e.g., Dickens, 2000). Regardless of how the transfer to the ocean took place, oxidation of methane

would generate CO<sub>2</sub>, which would lower the saturation state of seawater with respect to calcite and cause a dramatic shoaling in the depth of the lysocline and CCD. This response should be recorded in changes in carbonate content and preservation in sections below the mid-slope. Shallower sections should show less change in dissolution and carbonate content than deeper sections. The range of present water depths (PETM paleodepths were broadly similar), from 2387 m at Site 1209 to 3346 m at Site 1208, provides a significant transect to observe changes in dissolution at the PETM as a function of depth.

Nannofossil preservation is moderate to good below the PETM at all of the Southern High sites, indicating that they were located in the upper part of the lysocline. All sites show a short-lived deterioration in nannofossil preservation at the onset of the event. Carbonate contents have been measured in detail across the PETM at Site 1210. These data record a decrease from ~96 to ~86 wt% CaCO<sub>3</sub> at the base of the event, a change that would involve a substantial increase in dissolution, indicating a shoaling of the lysocline. Shallower sites (Sites 1209, 1210, 1212) show less lithologic and fossil preservational change at the base of the PETM than deeper sites (Sites 1208, 1211) (Fig. 6); changes in carbonate solubility at the onset and the termination of the event are more marked at the deep sites, suggesting that they were close to the CCD as it shoaled. The Shatsky Rise depth transect shows clear evidence for an abrupt rise in the level of the lysocline and CCD during the PETM, and thus supports the predicted ocean response to massive methane input.

### THE END OF THE GREENHOUSE: EOCENE-OLIGOCENE BOUNDARY COOLING IN THE TROPICAL PACIFIC OCEAN

The Eocene-Oligocene (E-O) boundary interval recovered on Shatsky Rise records the response of the tropical Pacific Ocean to a major global cooling event when ice sheets developed on Antarctica and cold water circulated throughout the deep ocean (e.g., Shackleton and Kennett, 1975). This cooling that signaled the end of the warm Paleogene occurred largely in a rapid step in the earliest Oligocene at ca. 33.5 Ma

(Zachos et al., 1996; Fig. 1). The boundary interval was identified at four sites across a large depth range. At the Southern High sites (Sites 1209, 1210, and 1211), a gradual change from light brown to tan nannofossil ooze with clay to a light gray to white nannofossil ooze, is observed over a 4–7.5 m interval of the uppermost Eocene to lowermost Oligocene. The E-O boundary interval at Site 1208 on the Central High is much more abrupt, corresponding to a 1–2 cm transition from a dark brown zeolitic claystone with extremely low carbonate content to a gray-orange nannofossil ooze.

The distinctive color change across the E-O boundary in all of the Leg 198 records reflects an increase in carbonate content as a result of a deepening of the lysocline and CCD. This interpretation is consistent with the observation that the lithologic change is more pronounced at the deepest site, Site 1208. Microfossil preservation in the interval above and below the transition suggests that the CCD dropped from just below the depth of Site 1211 to well below the depth of Site 1208, thus by at least 450 m. This significant change is observed in other ocean basins and possibly reflects an increase in mechanical and chemical weathering rates on continents associated with cooling (e.g., Zachos et al., 1996).

## CONCLUSIONS

Drilling on Leg 198 recovered diverse evidence for abrupt environmental changes in the Cretaceous and Paleogene warm climate interval. These changes include a short period of anoxia in the early Aptian (ca. 120 Ma) that led to deposition of highly carbonaceous sediments; an abrupt reorganization of oceanic circulation in the Maastrichtian (ca. 69 Ma) that caused extinction of a group of deep-sea mollusks; the extinction event at the K-T boundary (65 Ma); a prominent biotic event in the late Paleocene (ca. 58.4 Ma); the PETM (ca. 55 Ma) that shows lithologic and geochemical evidence consistent with methane outgassing; and changes in circulation and rapid cooling near the E-O boundary (ca. 33.5 Ma) that correspond to a sharp lithologic change.

## ACKNOWLEDGMENTS

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## REFERENCES CITED

- Arthur, M.A., Brumsack, H.-J., Jenkyns, H.C., and Schlanger, S.O., 1990, Stratigraphy, geochemistry, and paleoceanography of organic carbon-rich Cretaceous sequences, in Ginsburg, R.N., and Beaudoin, B., eds., *Cretaceous resources, events, and rhythms*: Kluwer Academic Publishers, p. 75–119.
- Arthur, M.A., Dean, W.E., and Schlanger, S.O., 1985, Variations in the global carbon cycle during the Cretaceous related to climate, volcanism, and changes in atmospheric CO<sub>2</sub>, in Sundquist, E.T., and Broecker, W.S., eds., *The carbon cycle and atmospheric CO<sub>2</sub>: Natural variations Archean to present*: Washington, D.C., American Geophysical Union Monograph 32, p. 504–529.
- Barrera, E., Savin, S.M., Thomas, E., and Jones, C.E., 1997, Evidence for thermohaline-circulation reversals controlled by sea level change in the latest Cretaceous: *Geology*, v. 25, p. 715–718.
- Bralower, T.J., 2002, Evidence for surface water oligotrophy during the Paleocene Eocene Thermal Maximum: Nanofossil assemblage data from Ocean Drilling Program Site 690, Maud Rise, Weddell Sea: *Paleoceanography*, v. 17 (in press).
- Bralower, T.J., Premoli Silva, I., Malone, M.J., et al., 2002, Proceedings of the Ocean Drilling Program, Initial Reports, Volume 198 [online]: College Station, Texas, Ocean Drilling Program ([www.odp.tamu.edu/publications/198\\_IR/198ir.htm](http://www.odp.tamu.edu/publications/198_IR/198ir.htm)).
- Bralower, T.J., Arthur, M.A., Leckie, R.M., Sliter, W.V., Allard, D.J., and Schlanger, S.O., 1994, Timing and paleoceanography of oceanic dysoxia-anoxia in the Late Barremian to early Aptian: *Palaios*, v. 9, p. 335–369.
- Buffler, R.T., Schlager, W., et al., 1984, Proceedings of the Deep Sea Drilling Project, Initial Reports, Volume 77: Washington, D.C., U.S. Government Printing Office, 747 p.
- Coccioni, R., Erba, E., and Premoli Silva, I., 1992, Barremian-Aptian calcareous plankton biostratigraphy from the Gorgo Cerbara section, Marche, central Italy, and implications for plankton evolution: *Cretaceous Research*, v. 13, p. 517–537.
- Dickens, G.R., 2000, Methane oxidation during the late Paleocene thermal maximum: *Bulletin de la Société Géologique de France*, v. 171, p. 37–49.
- Dickens, G.R., Castillo, M.M., and Walker, J.G.C., 1997, A blast of gas in the latest Paleocene: Simulating first-order effects of massive dissociation of oceanic methane hydrate: *Geology*, v. 25, p. 259–262.
- Erbacher, J., and Thurow, J., 1997, Influence of oceanic anoxic events on the evolution of mid-Cretaceous radiolaria in the North Atlantic and western Tethys: *Marine Micropaleontology*, v. 30, p. 139–158.
- Frank, T.D., and Arthur, M.A., 1999, Tectonic forcings of Maastrichtian ocean-climate evolution: *Paleoceanography*, v. 14, p. 103–117.
- Jenkyns, H.C., 1980, Cretaceous anoxic events: From continents to oceans: *Journal of the Geological Society of London*, v. 137, p. 171–188.
- Jenkyns, H.C., 1995, Carbon-isotope stratigraphy and paleoceanographic significance of the Lower Cretaceous shallow-water carbonates of Resolution Guyot, Mid-Pacific Mountains, in Winterer, E.L., Sager, W.W., Firth, J.V., and Sinton, J.M., eds., *Proceedings of the Ocean Drilling Program, Scientific Results, Volume 143*: College Station, Texas, Ocean Drilling Program, p. 99–104.
- Kelly, D.C., Bralower, T.J., Zachos, J.C., Premoli-Silva, I., and Thomas, E., 1996, Rapid diversification of planktonic foraminifera in the tropical Pacific (ODP Site 865) during the late Paleocene thermal maximum: *Geology*, v. 24, p. 423–426.
- Kennett, J.P., and Stott, L.D., 1991, Abrupt deep-sea warming, paleoceanographic changes, and benthic extinctions at the end of the Paleocene: *Nature*, v. 353, p. 225–229.
- Kump, L.R., 1991, Interpreting carbon-isotope excursions: Strangelove oceans: *Geology*, v. 19, p. 299–302.
- Larson, R.L., 1991, Geological consequences of superplumes: *Geology*, v. 19, p. 963–966.
- MacLeod, K.G., and Huber, B.T., 1996, Reorganization of deep-sea circulation accompanying a Late Cretaceous extinction event: *Nature*, v. 380, p. 422–425.
- MacLeod, K.G., Huber, B.T., and Ward, P.D., 1996, The biostratigraphy and paleobiogeography of Maastrichtian inoceramids, in Ryder, G., et al., eds., *The Cretaceous-Tertiary event and other catastrophes in Earth history*: Boulder, Colorado, Geological Society of America Special Paper 307, p. 361–373.
- Nakanishi, M., Tamaki, K., and Kobayashi, K., 1989, Mesozoic magnetic anomaly lineations and seafloor spreading history of the northwestern Pacific: *Journal of Geophysical Research*, v. 94, p. 15,437–15,462.
- Norris, R.D., Kroon, D., Klaus, A., et al., 1998, Proceedings of the Ocean Drilling Program, Initial Reports, Volume 171B: College Station, Texas, Ocean Drilling Program, 749 p.
- Schlanger, S.O., and Jenkyns, H.C., 1976, Cretaceous oceanic anoxic events: Causes and consequences: *Geologie en Mijnbouw*, v. 55, p. 179–184.
- Shackleton, N.J., and Kennett, J.P., 1975, Paleotemperature history of the Cenozoic and the initiation of Antarctic glaciation: Oxygen and carbon isotope analyses in DSDP Sites 277, 279 and 281: Initial Reports of the Deep Sea Drilling Project, v. 29: Washington, D.C., U.S. Government Printing Office, p. 743–755.
- Sigurdsson, H., Leckie, R.M., Acton, G., et al., 1997, Proceedings of the Ocean Drilling Program, Initial Reports, Volume 165: College Station, Texas, Ocean Drilling Program, 724 p.
- Sliter, W.V., 1989, Aptian anoxia in the Pacific Basin: *Geology*, v. 17, p. 909–912.
- Smit, J., 1982, Extinction and evolution of planktonic foraminifera after a major impact at the Cretaceous-Tertiary boundary, in Silver, L.T., and Schultz, H., eds., *Geological implications of impacts of large asteroids and comets on the Earth*: Boulder, Colorado, Geological Society of America Special Paper 190, p. 329–352.
- Smit, J., and Romein, A.J.T., 1985, A sequence of events across the Cretaceous-Tertiary boundary: *Earth and Planetary Science Letters*, v. 74, p. 155–170.
- Thomas, E., Zachos, J.C., and Bralower, T.J., 2000, Ice-free to glacial world transition as recorded by benthic foraminifera, in Huber, B.T., et al., eds., *Warm climates in Earth history*: Cambridge, UK, University of Cambridge, p. 132–160.
- Zachos, J.C., Lohmann, K.C., Walker, J.C.G., and Wise, S.W., Jr., 1993, Abrupt climate change and transient climates during the Paleogene: A marine perspective: *Journal of Geology*, v. 101, p. 191–213.
- Zachos, J.C., Quinn, T.M., and Salamy, K.A., 1996, High-resolution deep-sea foraminiferal stable isotope records of the Eocene-Oligocene climate transition: *Paleoceanography*, v. 11, p. 251–266.

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# UPCOMING DEADLINES

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## Committee Service

### Nominations Due January 15, 2003

Candidates are needed for service on the following GSA committees: Annual Program; Arthur L. Day Medal Award; Education; Geology and Public Policy; Honorary Fellows; Joint Technical Program; Membership; Minorities and Women in the Geosciences; Nominations; Penrose Conferences and Field Forums; Penrose Medal Award; Professional Development; Research Grants; and Young Scientist Award. Candidates are also needed for a GSA representative to the North American Commission on Stratigraphic Nomenclature (NACSN). Service begins July 2003 for all positions except NACSN, which begins November 1, 2003, and Joint Technical Program, which begins January 1, 2004.

For complete information on committee service, current vacancies, and required qualifications, see the October 2002 issue of *GSA Today*. Nomination form and instructions are available at [www.geosociety.org/aboutus/commtees/](http://www.geosociety.org/aboutus/commtees/).

## Officers and Councilors

### Nominations Due January 15, 2003

The GSA Committee on Nominations requests nominations for officers (vice president and treasurer) and councilors to serve on the GSA Council beginning in 2004. Each nomination should be accompanied by basic data and a description of the qualifications of the individual for the position recommended.

Send materials for committee, officer, and councilor nominations to Ruth Harrison, GSA, P.O. Box 9140, Boulder, CO 80301-9140, (303) 357-1000, ext. 0, 1-800-472-1988, ext. 0, [rharrison@geosociety.org](mailto:rharrison@geosociety.org).

## Congressional Science Fellowship

### Applications Due January 24, 2003

For application information for the 2003-2004 GSA-U.S. Geological Survey Congressional Science Fellowship, visit [www.geosociety.org/science/csf/](http://www.geosociety.org/science/csf/), or contact Karlon Blythe, Program Officer, GSA Headquarters, (303) 357-1036, [kblythe@geosociety.org](mailto:kblythe@geosociety.org).

## Medals and Awards

### Nominations Due February 1, 2003

Nominations of candidates are requested for the following medals and awards: Penrose Medal, Day Medal, Honorary Fellows, Young Scientist Award (Donath Medal), GSA Public Service Award, and Distinguished Service Award. For details on the awards and nomination procedures, see the October 2002 issue of *GSA Today*, go to [www.geosociety.org](http://www.geosociety.org), or call (303) 357-1037. Materials and supporting information for any of the nominations may be sent to GSA, Grants, Awards, and Medals, P.O. Box 9140, Boulder, CO 80301-9140.

## Student Research Grants

### Applications Must Be Postmarked by February 1, 2003

For information on 2003 Research Grant Program for Students, see the October issue of *GSA Today* or visit [www.geosociety.org](http://www.geosociety.org). Application forms are available online, at the geology departments of colleges and universities offering graduate degrees in earth sciences, or from Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301, [lcarter@geosociety.org](mailto:lcarter@geosociety.org).

## 2003 Doris M. Curtis Memorial Fund for Women in Science Award

(Sponsored in part by Subaru of America, Inc.)

### Nominations Due February 1, 2003

This award is given to a woman or group of women who have impacted the field of the geosciences in a major way based on their Ph.D. research. For nomination, eligibility, and award details, see the October issue of *GSA Today*, or visit [www.geosociety.org](http://www.geosociety.org). Send nominations and supporting material to Grants, Awards, and Medals, P.O. Box 9140, Boulder, CO 80301-9140.

## GSA Fellows

### Nominations Due February 15, 2003

The Committee on Membership requests nominations of members to be elevated to GSA Fellow status. Any GSA Fellow may nominate a member for this honor. Two other supporting signatures are needed, along with a letter stating the member's qualifications to be evaluated on the basis of eight established criteria. For more information, a list of the criteria, and a nomination form, please see [www.geosociety.org/members/fellow.htm](http://www.geosociety.org/members/fellow.htm) or contact Nancy Williams, (303) 357-1017, [nwilliams@geosociety.org](mailto:nwilliams@geosociety.org).

## John C. Frye Environmental Geology Award

### Nominations Due March 31, 2003

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

## National Awards

### Nominations Due April 30, 2003

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

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## Call for Geological Papers: 2003 GSA Section Meetings

South-Central–Southeastern  
Sections Joint Meeting  
March 12–14, 2003

University of Memphis, Memphis, Tennessee

**Abstract deadline: December 10, 2002**

**Information:** Dan Larsen, Dept. of Earth Sciences,  
University of Memphis, 421 J.M. Smith Bldg., Memphis,  
TN 38152, (901) 678-4358, [dlarsen@memphis.edu](mailto:dlarsen@memphis.edu).

Northeastern Section  
March 27–29, 2003

Westin Hotel, Halifax, Nova Scotia

**Abstract deadline: December 18, 2002**

**Information:** Jane Barrett, Dept. of Earth Sciences,  
Dalhousie University, Halifax, NS B3H 3J5, Canada,  
(902) 494-1473, [jmbarret@is.dal.ca](mailto:jmbarret@is.dal.ca).

Cordilleran Section  
April 1–3, 2003

Hotel NH Krystal, Puerto Vallarta, Mexico

**Abstract deadline: December 16, 2002**

**Information:** Elena Centeno-García, Instituto de  
Geología, Universidad Nacional Autónoma de México,  
(National Autonomous University of Mexico), Ciudad  
Universitaria, México, D.F. 04510, México,  
[centeno@servidor.unam.mx](mailto:centeno@servidor.unam.mx).

North-Central Section  
March 24–25, 2003

Kansas City Airport Hilton, Kansas City, Missouri

**Abstract deadline: December 10, 2002**

**Information:** Raymond M. Coveney Jr., Dept. of  
Geosciences, 420 Flarsheim Hall, University of Missouri,  
5110 Rockhill Rd., Kansas City, MO 64110-2499,  
(816) 235-2980, [coveneyr@umkc.edu](mailto:coveneyr@umkc.edu).



Rocky Mountain Section  
May 7–9, 2003

Fort Lewis College, Durango, Colorado

**Abstract deadline: January 30, 2003**

**Information:** James Collier, Dept. of Geosciences,  
Fort Lewis College, 1000 Rim Dr., Durango, CO 81301-  
3999, (970) 247-7129, [collier\\_j@fortlewis.edu](mailto:collier_j@fortlewis.edu).

1. Cordilleran Section  
2. Rocky Mountain Section

3. North-Central Section  
4. South-Central Section

5. Northeastern Section  
6. Southeastern Section

# Geoscience Horizons: Seattle 2003

## Call for Proposals for Keynote Symposia and Topical Sessions

Proposal deadline: January 16, 2003

Submit proposals at [www.geosociety.org](http://www.geosociety.org)

The 2003 GSA Annual Meeting returns to Seattle, hub of the Pacific Northwest. Seattle's geological landscape reminds us of the value of our annual meeting—the interplay of a tremendous range of geologic processes and their influence on both natural and human environments. This setting provides a fitting backdrop for the great variety of ongoing national and international geoscience investigations for which GSA provides the broadest forum.

At GSA's annual meeting, the topics presented are the topics you propose. If you have a special interest you would like to see scheduled, propose a topical session or Pardee Keynote Symposium.

### Program Opportunities

We welcome proposals for Pardee Keynote Symposia and topical sessions. Submit proposals electronically on or before **January 16, 2003**, via the link at [www.geosociety.org](http://www.geosociety.org).

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

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

**Topical sessions** promote the exchange of timely or state-of-the-art information with respect to a focused topic and allow scheduling

of interdisciplinary talks that bear on a specific topic. Organizers (advocates) may invite specific papers to ensure a successful and excellent session and are encouraged to solicit volunteered contributions. A maximum of four invited speakers may be allowed. An advocate may request more invitations if he or she can justify the larger number. However, sessions **must** include volunteered abstracts, which are solicited in *GSA Today* for all approved topical sessions. Advocates may request special formats. All requests are reviewed by the JTPC. All topical sessions must receive a minimum of 12 abstracts to be part of the technical program. Advocates are encouraged to submit their proposals as poster sessions to accommodate the growing technical program.

### Oral and Poster General Sessions

Consisting entirely of volunteered papers, these sessions remain an important component of the GSA Annual Meeting. The number of abstracts received determines the number of general sessions in each discipline. The goal of the Technical Program Chair and the JTPC representatives is to provide presenters the best possible opportunity for communicating new scientific information rather than to dictate what can or will be presented. Poster sessions have been expanded to allow presentation of more papers. To allow for well-attended, dynamic sessions, an effort will be made in scheduling to avoid overlap of poster and oral sessions in the same discipline.

### Hot Topics

The focus of these popular lunchtime forums held Sunday through Wednesday, is on discussion, with plenty of audience participation. Depending on the subject, a debate format is recommended, and panels are discouraged. Each session must have a moderator. Titles should be catchy and provocative. If you are interested in organizing a Hot Topic session, contact Hot Topics Chair Fred Schwab, [schwab.f@wlu.edu](mailto:schwab.f@wlu.edu).

### Make Yours the Session Everyone Talks About

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

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

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

### Technical Program Chair

David Bush, (770) 836-4597,  
[dbush@westga.edu](mailto:dbush@westga.edu)

### 2003 Local Committee Chair

Derek Booth, (206) 543-7923,  
[dbooth@u.washington.edu](mailto:dbooth@u.washington.edu)

### Seattle 2003 Dates and Deadlines

- Jan. 16 Proposals due by midnight, MST. Electronic submission required.
- April 1 Electronic abstract form posted at [www.geosociety.org](http://www.geosociety.org).
- April 1st announcement in April *GSA Today*.
- June 2nd announcement in June *GSA Today*.
- July 15 Abstracts due by midnight, MST.
- Aug. 4 Technical program schedule finalized.

Accepted abstracts with links to speakers and titles will be posted at [www.geosociety.org](http://www.geosociety.org) after Sept. 1.

### Propose a Session: Who Knows Where It Could Lead?

When you organize a session, you can help ensure that your area of expertise gets exposure through meeting attendees and the widely cited *Abstracts with Programs* volume. You'll also make valuable contacts, and you'll see your name in lights! (Well, on poster board.)

"I think it's a rewarding experience for session organizers to see their sessions unfold," says Nancy Carlson, GSA technical program officer. "As the abstracts come in, organizers are able to see what is being submitted for their sessions." And organizers aren't the only ones watching. GSA's marketing and communications staff keeps tabs on the sessions with an eye out for items the media may want to pick up, and GSA's publications staff is always looking for that next best-selling Special Paper.

# ROCKY MOUNTAIN SECTION, GSA

55th Annual Meeting • Fort Lewis College, Durango, Colorado • May 7–9, 2003



THE  
GEOLOGICAL  
SOCIETY  
OF AMERICA

The 55th Annual Meeting of the Rocky Mountain Section will be hosted by the Department of Geosciences, Fort Lewis College, and will be held on the campus of Fort Lewis College.

## ENVIRONMENT

Durango is located in southwestern Colorado, in an area commonly referred to as the Four Corners. Known for its spectacular natural beauty and outdoor recreation, Durango is a popular tourist destination. Durango is approximately six hours from Denver and three hours from Albuquerque by car. It is also served by a regional airport.

Fort Lewis College sits at an elevation of 6850 feet on a mesa of glacial outwash with spectacular views of the glacio-fluvial Animas River Valley and the historic mining districts of the La Plata and San Juan mountains. Approximately 16,000 feet of sedimentary rocks are exposed in the Durango area, representing a nearly complete stratigraphic column. Precambrian igneous and metamorphic rocks and Tertiary volcanic rocks can be reached by a short drive. Examples of virtually every type of geological phenomenon can be found within a short distance of Fort Lewis College. Of particular interest to this meeting is the San Juan Basin to the south, which has become one of the nation's largest coal-bed methane producing districts. Also, recent wildfires have created an opportunity to study the effects of fire on geologic processes (to the dismay of homeowners and the delight of geomorphologists).

## CALL FOR PAPERS

Papers are invited for technical sessions, theme sessions, and poster sessions. Authors interested in volunteering papers for symposia should contact the appropriate symposium convener before submitting abstracts. Technical sessions will generally be 12 minutes in length with three minutes for questions. Some sessions may use a longer format. Speakers will have access to two 35 mm slide projectors and screens (speakers must provide their own carousels), an overhead projector, and a PC and data projector. Speakers wishing to use digital media are restricted to PowerPoint presentations and must submit CDs prior to the meeting to test for compatibility. Speakers are not permitted to use their own laptops.

Poster space will be 4 × 8 feet. Authors will be required to be present for at least two hours.

## ABSTRACTS

**Abstract deadline: January 30, 2003**

Abstracts for all sessions should be submitted online at [www.geosociety.org](http://www.geosociety.org). If you cannot submit your abstract electronically, contact Nancy Carlson, (303) 357-1061, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

## REGISTRATION

Information on preregistration, including dates and fees, will appear in the January 2003 issue of *GSA Today*.

## ACCESSIBILITY

GSA is committed to making its meetings accessible to all people interested in attending. Indicate special requirements (wheelchair accessibility, etc.) on the registration form. Fort Lewis College is ADA compliant.

## FIELD TRIPS

For further details on field trips, please contact either the trip leader or the field trip chair, Gary Gianniny, (970) 247-7254, [gianniny\\_g@fortlewis.edu](mailto:gianniny_g@fortlewis.edu), or visit [www.geosociety.org/sectdiv/rockymtn/03rmmtg.htm](http://www.geosociety.org/sectdiv/rockymtn/03rmmtg.htm).

## Premeeting

1. **Geology and Mining History of the San Juan Mountains.** (2 days.) Mon. and Tues., May 5–6. David Gonzales, Fort Lewis College, Dept. of Geosciences, (970) 247-7378, [gonzales\\_d@fortlewis.edu](mailto:gonzales_d@fortlewis.edu); Duane Smith.
2. **Proterozoic Rocks of the Tusas Mountains and the Quartzite-Rhyolite Problem.** Mon. and Tues., May 5–6. Mike Williams, University of Massachusetts, [mlw@geo.umass.edu](mailto:mlw@geo.umass.edu); Karl Karlstrom, University of New Mexico, Dept. of Earth and Planetary Sciences, (505) 277-4346, [kek1@unm.edu](mailto:kek1@unm.edu); Peter Davis; Joe Kopera.
3. **Advances in Mesozoic Stratigraphy of the Durango Area.** Tues., May 6. Spencer Lucas and David Blodget, (505) 841-2873, [SLucas@nmmnh.state.nm.us](mailto:SLucas@nmmnh.state.nm.us).
4. **Erosion and Sedimentation Following the 2002 Missionary Ridge Fire.** Tues., May 6. Andrew Gleason, [algleason@frontier.net](mailto:algleason@frontier.net).

## Concurrent

5. **Geoarchaeology of the Darkmold Site.** Wed., May 7, 1–5 p.m. Mary L. Gillam, independent geologist, 115 Meadow Road East, Durango, CO 81301, (970) 259-0966, fax 970-259-6064, [gillam@rmi.net](mailto:gillam@rmi.net); Mona C. Charles, Fort Lewis College, Anthropology Dept. Max.: 30.

## Postmeeting

6. **Tectonoelastic Sedimentation on the Flanks of the Ancestral Rockies, Pennsylvanian Hermosa Group.** Sat., May 10. Gary Gianniny, (970) 247-7254, [gianniny\\_g@fortlewis.edu](mailto:gianniny_g@fortlewis.edu).
7. **Investigations of Seeps in the Fruitland Formation, La Plata County, Colorado.** Sat., May 10. W.C. Riese, BP America; [rriese1@bp.com](mailto:rriese1@bp.com); Tom Ann Casey, EnerVest Operating, (970) 247-1500, ext. 204, [tacasey@enervestdgo.com](mailto:tacasey@enervestdgo.com).
8. **Durango to Silverton Historic Train Ride and Tour of Silverton's Old Hundred Mine.** Sat., May 10. This trip is appropriate for guests and non-geologists. Fort Lewis College Geology Club, David Gonzales, (970) 247-7378, [gonzales\\_d@fortlewis.edu](mailto:gonzales_d@fortlewis.edu).
9. **Natural and Prehistoric Human Systems of the Canyons of the Ancients National Monument, Hovenweep, and Vicinity.** Sat., May 10. Kenneth E. Kolm, Washington State University and Argonne National Laboratory, 200 Union Blvd., Suite 530, Lakewood, CO 80228, (303) 986-1140, ext. 251, fax 303-896-1311, [kkolm@mines.edu](mailto:kkolm@mines.edu); Mark D. Varen, Crow Canyon Archaeological Center. Max.: 30, min.: 10.

## SYMPOSIA

Complete descriptions are posted at [www.geosociety.org/sectdiv/rockymtn/03rmmtg.htm](http://www.geosociety.org/sectdiv/rockymtn/03rmmtg.htm).

1. **The San Juan Mountains: A Dynamic Earth System.** Sponsored by the Mountain Studies Institute. (Invited papers.) Rob Blair, Fort Lewis College, Dept. of Geosciences, (970) 247-2703, [blair\\_r@fortlewis.edu](mailto:blair_r@fortlewis.edu); Thomas Casadevall, U.S. Geological Survey, (303) 202-4740, [tcasadev@usgs.gov](mailto:tcasadev@usgs.gov).
2. **Water Resources in the Rocky Mountains: A Holistic View Centered on Coupled Processes.** Jonathan Saul Caine, U.S. Geological Survey, [jscaine@usgs.gov](mailto:jscaine@usgs.gov),

(303) 236-1822; Shemin Ge, University of Colorado, Boulder, GES@spot.colorado.edu, (303) 492-8323.

3. **Relationships of Physical Systems to Archaeological Records and Prehistoric Cultures in the Four Corners Area.** Kenneth E. Kolm, Washington State University and Argonne National Laboratory, Lakewood, Colorado, (303) 986-1140, ext. 251, fax 303-896-1311, kkolm@mines.edu; Mary L. Gillam, independent geologist, 115 Meadow Road East, Durango, CO 81301, (970) 259-0966, fax 970-259-6064, gillam@rmi.net.
4. **Rise and Fall of the Rocky Mountains: Proterozoic Lithospheric Evolution and Influence of Basement Fabric on Younger Tectonism in the Rocky Mountains.** (Part 1 of 4.) Karl Karlstrom, University of New Mexico, Dept. of Earth and Planetary Sciences, (505) 277-4346, kek1@unm.edu; David Gonzales, Fort Lewis College, Dept. of Geosciences, (970) 247-7378, gonzales\_d@fortlewis.edu.
5. **Rise and Fall of the Rocky Mountains: The Late Paleozoic Ancestral Rocky Mountains—Intraplate Orogeny in Equatorial Pangea.** (Part 2 of 4.) Lynn Soreghan, University of Oklahoma, Geology and Geophysics, 100 East Boyd Street, Norman, OK 73019, (405) 325-4482, lsoreg@ou.edu; Gary Gianniny, Fort Lewis College, Dept. of Geosciences, 1000 Rim Drive, Durango, CO 81301, (970) 247-7254, gianniny\_g@fortlewis.edu; Dave Barbeau, Dept. of Geosciences, University of Arizona, Tucson, AZ 85721, (520) 621-4910, dbarbeau@geo.arizona.edu.
6. **Rise and Fall of the Rocky Mountains: Tectonics, Eustasy, and Climate Change During the Age of Dinosaurs.** (Part 3 of 4.) Spencer Lucas, New Mexico Museum of Natural History & Science, (505) 841-2873, slucas@nmmnh.state.nm.us; Andrew Heckert, New Mexico Museum of Natural History & Science, (505) 841-2842, aheckert@nmmnh.state.nm.us.
7. **Rise and Fall of the Rocky Mountains: The Ups and Downs of the Cenozoic.** (Part 4 of 4.) Bob Kirkham, Colorado Geological Survey, (719) 587-0139, rmk@amigo.net; Karl S. Kellogg, U.S. Geological Survey, (303) 236-1305, kkellogg@usgs.gov.
8. **Seeps, Science, and Myth: Geology and Hydrology of Shallow Hydrocarbons.** *Sponsored by the Four Corners Geological Society.* Tom Ann Casey, EnerVest Operating, (970) 247-1500, ext. 204, tacasey@enervestdgo.com; Ed Heath, independent geologist, (970) 375-1997, ewheath@frontier.net; Matt Janowiak, Bureau of Land Management, (970) 247-4874, matthew\_janowiak@co.blm.gov.

## THEME SESSIONS

1. **Undergraduate Research Poster Session.** *Sponsored by the Council on Undergraduate Research, Geoscience Division.* Kim Hannula, (970) 247-7463, hannula\_k@fortlewis.edu. (Student must be listed as lead author and be the major preparer of the poster.)
2. **Artful Eye in Geology.** Ray Kenny, (970) 247-7462, kenny\_r@fortlewis.edu.
3. **National Association of Geoscience Teachers Session: Classroom and Laboratory Demonstrations of Geologic Phenomena.** Fred Lohrengel, lohrengel@suu.edu.
4. **Paleontology Society Session: Regional Topics in Paleontology.**
5. **Geologic Processes in the Post-fire Environment.** Chris Wilbur, (970) 247-1488, wilbureng@frontier.net.
6. **The Western San Juan Volcanic Field, Colorado Structural Setting, Evolution, and Geomorphology.** Allen Stork, Western State College, astork@western.edu.
7. **Regional Topics in Archaeogeology.** E. Craig Simmons, Dept. of Chemistry & Geochemistry, Colorado School of Mines, (303) 273-3644, csimmons@mines.edu.
8. **The Western San Juan Volcanic Field, Colorado Structural Setting, Evolution, and Geomorphology.** Allen Stork, Western State College, astork@western.edu; Steve Semken, Dine College, Shiprock, NM, scsemken@shiprock.ncc.cc.nm.us, (505) 368-3630.

## WORKSHOPS

**Roy J. Shlemon Mentor Program in Applied Geology.** *Sponsored by GSA Foundation.* Thurs., May 8, 11:30 a.m.–1 p.m. Karlon Blythe, GSA, (303) 357-1036, kblythe@geosociety.org. Free (includes lunch). This interactive and informal workshop for undergraduate and graduate students is led by practicing geoscientists and covers real-life issues such as the professional opportunities and challenges that await students after graduation. Students will receive in their registration packet a FREE LUNCH ticket to attend the Shlemon Program. However, space is limited. First come, first served.

**Other workshops:** Details are not available as of press time.

## SPECIAL EVENTS

**Ice Breaker.** Tues., May 6, 5 p.m. College amphitheater.

**Paleontological Society Luncheon and Business Meeting.** Wed., May 7, noon. College Union Building.

**Annual Banquet and Business Meeting.** Thurs., May 8, 7 p.m. College Union Building.

**Rocky Mountain Section Board Meeting.** Fri., May 9, 7 a.m., Rochester Hotel.

## SPOUSE AND GUEST ACTIVITIES

The Durango area offers a variety of activities including shopping, hiking, mountain biking, whitewater boating, and archeological tours. For information on these and other activities, contact the Durango Area Chamber Resort Association, 1-800-463-8726, www.dacra.com. In addition, a special historic train ride and mine tour will be held on Saturday, May 10 (see field trips).

## STUDENT TRAVEL

The Rocky Mountain Section and the GSA Foundation have made travel grants available for students who are presenting oral or poster papers. Students must be currently enrolled and must be Rocky Mountain GSA members. Students should contact Kenneth Kolm, Argonne National Laboratories, (303) 986-1140, ext. 251, kkolm@anl.gov.

## STUDENT AWARDS

Awards will be given for best student oral (undergraduate or graduate) and poster (undergraduate only) presentations. To be eligible, students must be lead authors and presenters and should clearly identify their abstracts as student work.

## EXHIBITS

Exhibit space will be available at \$250 per booth for commercial organizations and \$100 per booth for nonprofits. Contact Scott White, (970) 247-7475, white\_s@fortlewis.edu.

## ACCOMMODATIONS

A wide selection of hotels and motels is available. Special GSA rates will appear in the January 2003 *GSA Today*. For students or those on a budget, on-campus apartments will be available for \$16 per night or dormitories for \$13 per night.

## ADDITIONAL INFORMATION

Still have questions? Contact the general chair, James Collier, (970) 247-7129, collier\_j@fortlewis.edu, the technical program chair, David Gonzales, (970) 247-7378, gonzales\_d@fortlewis.edu, or the field trip chair, Gary Gianniny, (970) 247-7254, gianniny\_g@fortlewis.edu.

## Call for Abstracts

### AAPG Hedberg Research Conference on the "Origin of Petroleum—Biogenic and/or Abiogenic and Its Significance in Hydrocarbon Exploration and Production"

**Sponsors:** AAPG and Institute of Petroleum, London

**Conference Site and Dates:** London, June 9-12, 2003

#### Conference Sessions:

- Origin of Petroleum—Organic and/or Abiogenic
- Petroleum System Modeling
- Hydrocarbon Migration
- Exploration Strategies—Organic and/or Abiogenic
- Economic Significance—Organic and/or Abiogenic

**Abstract Submittal Deadline:** December 31, 2002

**Submit Abstract to:** Debbi Boonstra, AAPG;

Phone: (800) 364-2274; Fax: (918) 560-2678;

E-mail: [debbi@aapg.org](mailto:debbi@aapg.org)

## GSA Offers Awards in Geomorphology and Micropaleontology

Two of GSA's most prestigious awards supporting research are made possible by the generosity of the late W. Storrs Cole. Qualified GSA Members and Fellows are urged to apply.

**The Gladys W. Cole Memorial Research Award** provides support for the investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. GSA Members and Fellows between the ages of 30 and 65 who have published one or more significant papers on geomorphology are eligible for the award. While the funds may not be used for work that is already finished, recipients of previous awards may reapply if they need additional support to complete their work. The 2003 award is for \$9,500.

**The W. Storrs Cole Memorial Research Award** supports research in invertebrate micropaleontology. This award carries a stipend of \$8,700 in 2003 and will go to a GSA Member or Fellow between the ages of 30 and 65 who has published one or more significant papers on micropaleontology.

**For application forms or for more information**, contact Leah Carter, Grants, Awards, and Medals, GSA, P.O. Box 9140, Boulder, CO 80301-9140, [lcarter@geosociety.org](mailto:lcarter@geosociety.org). Application forms are also available at [www.geosociety.org](http://www.geosociety.org).

Applications must be mailed and must be postmarked on or before *February 1, 2003*. Applications sent by facsimile or e-mail will not be accepted. The Committee on Research Grants will report its actions to each applicant in April 2003.

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

## Call for Nominations: Planetary Geoscience Student Paper Award

#### The Award

Planetary geologist Stephen E. Dwornik established this award in 1991 to provide encouragement, motivation, and recognition to outstanding future scientists. Two awards are given annually: one for the best oral presentation, the other for the best poster presentation, with each winner receiving a citation and \$500. The program is administered through GSA's Planetary Geology Division. The GSA Foundation manages the award fund. For further details, see [www.lpi.usra.edu/meetings/lpsc2003/](http://www.lpi.usra.edu/meetings/lpsc2003/).

#### Criteria

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

#### To Apply

The application form and instructions are found in the Call for Papers for the 34th Lunar and Planetary Science Conference, to be held March 17-21, 2003, at NASA Johnson Space Center in League City, Texas. For additional information, contact the LPI Publications and Program Services Department; (281) 486-2188, fax 281-486-2125, [publish@lpi.usra.edu](mailto:publish@lpi.usra.edu).

#### Deadline

The deadline for electronic submissions in PDF format is 5 p.m. (CST) Tuesday, January 14, 2003; authors unable to produce PDF files must submit their abstracts electronically by 5 p.m. (CST) Tuesday, January 7, 2003; authors who are unable to submit electronically must send their hard-copy abstracts to the LPI by January 7, 2003. *Non-PDF submissions or hard-copy submissions that arrive after January 7 will not be considered for the conference.*

# JOINT MEETING

**37th Annual Meeting, South-Central Section, GSA, and 52nd Annual Meeting, Southeastern Section, GSA • Memphis, Tennessee • March 12–14, 2003**



THE  
GEOLOGICAL  
SOCIETY  
OF AMERICA

## HEADQUARTERS, ACCOMODATIONS, AND REGISTRATION

Preregistration deadline: February 7, 2003

Cancellation deadline: February 14, 2003

Register online at [www.geosociety.org](http://www.geosociety.org)

Located along the Mississippi River and the boundary between the south-central and south-eastern sections, Memphis, Tennessee, is the perfect site for a joint South-Central and Southeastern Section meeting. Centered in the Mississippi Embayment, the Memphis area has many field locations pertinent to Quaternary geology, neotectonic processes, geologic hazards, and fluvial geomorphology. Field trip destinations in the Ouachita Mountains, Ozark Plateau, St. Francis Mountains, and central Tennessee are all within a few hours by car. The meeting will be held at the University of Memphis Conference Center, located on the northwest side of the campus area. The conference center includes the Fogelman Executive Center and Wilson School of Hospitality and Resort Management.

A block of rooms has been reserved at the University of Memphis Conference Center (Holiday Inn) for meeting attendees, with several room options available ranging in cost from \$85 to \$105 per room per night. Meeting attendees are responsible for making their own housing arrangements. Please call the University of Memphis conference center for reservations at (901) 678-8200 and refer to the Geological Society of America room block.

For more information on registration, lodging, and schedules, please visit [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm). Please preregister online or download the PDF preregistration form at [www.geosociety.org](http://www.geosociety.org). If you are unable to preregister this way, contact GSA Member Services, 1-888-443-4472, [member@geosociety.org](mailto:member@geosociety.org). Preregistration rates will apply until February 7, 2003. After that date, on-site rates will apply.

## Abstracts

Abstract deadline: December 10, 2002

Papers are invited for symposia, theme sessions, and general sessions, in both oral and poster formats. Volunteered abstracts submitted without designating a scheduled symposium or theme session will be placed in theme or general sessions as deemed appropriate by the technical program chairs. All abstracts must be submitted

online at [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm).

Only one volunteered paper may be presented by an individual; however, a person may be a co-author on other papers. Also, those invited for symposia may present other papers.

The proposed symposia and theme sessions follow. For more information, please contact the technical program co-chairs: Gregg Davidson, (662) 915-5824, [davidson@olemiss.edu](mailto:davidson@olemiss.edu), or Roy Dokka, (225) 578-2975, [rkdokka@c4g.lsu.edu](mailto:rkdokka@c4g.lsu.edu). For more details, visit [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm).

## Symposia

1. **History of Geologic Investigation of Crystalline Rocks of Alabama, with Emphasis on the Past 40 Years: How We Saw It Then; How We See It Now.** Robert Deining, University of Memphis, (901) 682-4324, [mdeinin100@aol.com](mailto:mdeinin100@aol.com); Thornton L. Neathery, [tneathery@prodigy.net](mailto:tneathery@prodigy.net).
2. **A 21st Century Look at the Cretaceous Coon Creek Formation.** Stan Dunagan, (731) 587-7430, [dunagans@charter.net](mailto:dunagans@charter.net); Michael Gibson, (731) 587-7435, [mjgibson@utm.edu](mailto:mjgibson@utm.edu).
3. **Cenozoic Paleodrainage in the Southeastern United States.** Robert Self, University of Tennessee at Martin, (731) 587-7444, [rself@utm.edu](mailto:rself@utm.edu).
4. **Environmental Research and Remediation at Department of Energy's Savannah River Site.** Mary Harris, Savannah River Technology Center, (803) 725-4184, [mary.harris@srs.gov](mailto:mary.harris@srs.gov); Chris Romanek, Savannah River Ecology Laboratory, (803) 725-5883, [romanek@srel.edu](mailto:romanek@srel.edu).

## Theme Sessions

1. **Petrotectonic History of the Blue Ridge Belt: Faults, Fault Blocks, Terrains, and Ophiolites.** Loren Raymond, Appalachian State University, (828) 262-2749, [raymondla@appstate.edu](mailto:raymondla@appstate.edu); Calvin Miller, Vanderbilt University, (615) 322-2232, [millercl@ctrvax.vanderbilt.edu](mailto:millercl@ctrvax.vanderbilt.edu).
2. **Post-Mesozoic Tectonics of the Southern Midcontinent.** Paul A. Washington, University of Louisiana at Monroe, (318) 342-1898, [gewashington@ulm.edu](mailto:gewashington@ulm.edu).
3. **Seismicity and Neotectonics in the**

**Southern United States.** Terry Panhorst, University of Mississippi, (662) 915-5825, [panhorst@olemiss.edu](mailto:panhorst@olemiss.edu); James Harris, Millsaps College, (601) 974-1343, [harrjib@okra.millsaps.edu](mailto:harrjib@okra.millsaps.edu).

4. **Connections and Timing in the Appalachian-Ouachita Orogen.** Kent C. Nielsen, University of Texas at Dallas, (972) 883-6837, [knielsen@utdallas.edu](mailto:knielsen@utdallas.edu); William A. Thomas, University of Kentucky, (859) 257-6222, [geowat@pop.uky.edu](mailto:geowat@pop.uky.edu).
5. **Late Paleozoic Intraplate Deformation of Central North America.** Randy Cox, University of Memphis, (901) 678-4361, [randycox@memphis.edu](mailto:randycox@memphis.edu); Mark Hudson, U.S. Geological Survey, (303) 236-7446, [mhudson@usgs.gov](mailto:mhudson@usgs.gov).
6. **Oh Southern Stars! Planetary Geology in the South.** Keith A. Milam, (865) 974-2789, [kmilam@utk.edu](mailto:kmilam@utk.edu), and Karen R. Stockstill, (865) 974-5324, [kstockst@utk.edu](mailto:kstockst@utk.edu), both at University of Tennessee.
7. **Earth Science and Earthquake Education Resources for K–12 Science Teachers in the Central and Eastern United States.** Sponsored by National Association of Geoscience Teachers. Gary Patterson, (901) 678-2007, [patterson@ceri.memphis.edu](mailto:patterson@ceri.memphis.edu), and Michelle Dry, [mdry@memphis.edu](mailto:mdry@memphis.edu), both at University of Memphis.
8. **Innovative Initiatives in Geoscience Education.** Shelley Miller, Saint Mary's School, Raleigh, N.C., (919) 424-4050, [samiller@saint-marys.edu](mailto:samiller@saint-marys.edu).
9. **Geologic Maps and Digital Geologic Maps. (Posters)** Ralph F. Crawford, The Geologic Mapping Institute, (404) 373-6780, [crawford@sprintmail.com](mailto:crawford@sprintmail.com); Michael W. Higgins, Roswell, Ga., (770) 641-1268, [mhiggins@mindspring.com](mailto:mhiggins@mindspring.com).
10. **Coastal Plain Stratigraphy of the Southeastern United States.** Charles Swann, University of Mississippi, (662) 915-7320, [cts@mmri.olemiss.edu](mailto:cts@mmri.olemiss.edu).
11. **Hydrostratigraphy and Hydrology of Cenozoic Aquifer Systems of the Southeastern Coastal Plain, Gulf Coast, and Mississippi Embayment.** Randy Gentry, University of Tennessee at Knoxville, (865) 607-8328, [rgentry@utk.edu](mailto:rgentry@utk.edu); Dan Larsen, University of Memphis, (901) 678-4358, [dlarsen@memphis.edu](mailto:dlarsen@memphis.edu).

12. **The Role of Fieldwork in the Study of Carbonate Rock Aquifer/Landscape Systems.** Chris Groves, Western Kentucky University, (270) 745-4169, chris.groves@wku.edu; Joe Meiman, Mammoth Cave National Park, (270) 758-2137, joe\_meiman@nps.gov.
13. **Recharge Mechanisms and Estimation.** Brian Waldron, University of Memphis, (901) 678-3913, bwaldron@memphis.edu.
14. **Groundwater-Surface Water Interactions.** Gregg Davidson, University of Mississippi, (662) 915-5824, davidson@olemiss.edu.
15. **Water Rock Life: Interactions Between Hydrology and Biology.** Nate Bickford, (870) 972-3087, nbickfor@mail.astate.edu; Robyn Hannigan, (870) 972-3086, hannigan@mail.astate.edu, both at Arkansas State University.
16. **Advances in Environmental Biogeochemistry.** Dibyendu Sarkar, University of Texas at San Antonio, (210) 458-5453, dsarkar@utsa.edu.
17. **Radioisotopes as Tracers of Sedimentary and Pore-Water Processes in the Coastal Zone.** Sam Bentley, (225) 578-2954, sjb@lsu.edu, and Jaye Cable, (225) 578-9402, jcable@lsu.edu, both at Louisiana State University; John Jaeger, University of Florida, (352) 846-1381, jaeger@geology.ufl.edu.
18. **Geomorphology, Sedimentation, and Environmental Geology of the Loess Region of the South-Central United States.** Sean J. Bennett, (662) 232-2926, sjbennett@ars.usda.gov, and Andrew Simon, (662) 232-2918, asimon@ars.usda.gov, both at USDA-ARS National Sedimentation Laboratory.
19. **Geoscience Innovation: Fostering the Achievement of Students with Disabilities.** Wendi J.W. Williams, University of Arkansas at Little Rock, (501) 569-3542, wjwilliams@ualr.edu.
20. **Undergraduate Research Poster Session.** *Sponsored by the Geosciences Division of the Council on Undergraduate Research.* Jeffrey B. Connelly, University of Arkansas at Little Rock, (501) 569-3543, jbconnelly@ualr.edu.

## Workshops

Workshops will be held on the University of Memphis campus. For additional information please check the meeting Web site, [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm), or contact the workshop chair, Roy Van Arsdale, [rvansrdl@memphis.edu](mailto:rvansrdl@memphis.edu), (901) 678-2177, or the workshop conveners.

1. **Introduction to ArcGIS with Geohydrology Applications (ESRI's**

**ArcGIS 8.2).** Sat., March 15, 8 a.m.–noon. Brian Waldron, University of Memphis, (901) 678-3913, bwaldron@memphis.edu. Max.: 24; min.: 8. Cost: \$30.

2. **Three-Dimensional Geological Visualization and Volumetrics: A Hands-On, One-Day Short Course Using RockWorks2002.** Wed., March 12, 9 a.m.–4 p.m. Jim Reed, RockWare Incorporated, (303) 278-3534, jim@rockware.com. Max.: 24; min.: 8. Cost: \$25.
3. **New Satellite Data for the Field Geologist.** Sat., March 15, 1–4 p.m. Tom G. Farr, Jet Propulsion Laboratory, (818) 354-9057, tom.farr@jpl.nasa.gov. Max.: 24; min.: 8. Cost: \$30.

**Roy J. Shlemon Mentor Program in Applied Geoscience.** *Sponsored by GSA Foundation.* Thurs., March 13, 11:30 a.m.–1 p.m., and Fri., March 14, 11:30 a.m.–1 p.m. Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org). These events for undergraduate and graduate students will be led by practicing geologists. These interactive and informal programs will cover real-life issues such as the professional opportunities and challenges that await students after graduation. Students will receive in their registration packet FREE LUNCH tickets to attend the Shlemon Programs. However, space is limited. First come, first served.

## Field Trips

Both premeeting and postmeeting field trips are planned. Registration for some trips is limited. Field trip costs include transportation, field guide, food, and lodging during the excursion, unless otherwise indicated. For additional information please visit [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm), or contact the field trip chair, Randy Cox, (901) 678-4361, [randycox@memphis.edu](mailto:randycox@memphis.edu), or the field trip leader.

1. **Cretaceous to Late Tertiary Gravel Deposits in the Western Tennessee River Valley.** Tues. and Wed., March 11–12. Robert Self, University of Tennessee at Martin, (731) 587-7444, [rself@utm.edu](mailto:rself@utm.edu). Max.: 50; min.: 28. Cost: \$130.
2. **Late Paleozoic Tectonics of the Southern Ozark Dome.** Tues. and Wed., March 11–12. Mark Hudson, U.S. Geological Survey, [mhudson@usgs.gov](mailto:mhudson@usgs.gov); Randy Cox, University of Memphis, [randycox@memphis.edu](mailto:randycox@memphis.edu). Max.: 24; min.: 10. Cost: \$190.
3. **Mississippian-Pennsylvanian Deep Water Depositional Systems and Related Structure of the Ouachita Orogen.** Sun.–Wed., March 9–12. Arnold Bouma and Roy Dokka, Louisiana State University, [rkdokka@c4g.lsu.edu](mailto:rkdokka@c4g.lsu.edu). Max.: 30; min.: 15. Cost: \$290.
4. **Sedimentology, Stratigraphy, Paleontology, and History of Cretaceous Coon Creek Formation of Western**

**Tennessee.** Fri. and Sat., March 14–15. Michael A. Gibson, [mgibson@utm.edu](mailto:mgibson@utm.edu), and Stan Dunagan, [sdunagan@utm.edu](mailto:sdunagan@utm.edu), both at University of Tennessee at Martin. Max.: 40; min.: 26. Cost: \$140.

5. **Hands-on Earth Science at the Coon Creek Science Center.** Fri. and Sat., March 14–15. Pam Riddick, Pink Palace Museum, [pam.riddick@cityofmemphis.org](mailto:pam.riddick@cityofmemphis.org); Michael A. Gibson, University of Tennessee at Martin, [mgibson@utm.edu](mailto:mgibson@utm.edu). Max.: 40; min.: 26. Cost: \$140.
6. **Waulsortian-like Bioherms of the Maury and Fort Payne Formations, Tennessee.** Fri.–Sun., March 14–16. Frank Stapor, [fstapor@tntech.edu](mailto:fstapor@tntech.edu), and Larry W. Knox, both at Tennessee Technological University. Max.: 12; min.: 8. Cost: \$120 (meals not included).
7. **Basement-Cover Tectonic Relationships in Southeastern Missouri.** Fri.–Sun., March 14–16. Gary Lowell, University of Southeastern Missouri, [glowell@semovm.semo.edu](mailto:glowell@semovm.semo.edu); Richard Harrison, U.S. Geological Survey, [rharrison@usgs.gov](mailto:rharrison@usgs.gov); William Clendenin, South Carolina Geological Survey. Max.: 30; min.: 10. Cost: \$175.
8. **Loess in the Northern Mississippi Embayment.** Sat., March 15. David Lumsden, University of Memphis, [diumsden@memphis.edu](mailto:diumsden@memphis.edu). Max.: 15; min.: 10. Cost: \$85.
9. **The New Madrid Seismic Zone.** Sun., March 16. Roy B. Van Arsdale, University of Memphis, [rvansrdl@memphis.edu](mailto:rvansrdl@memphis.edu). Max.: 24; min.: 10. Cost: \$75.
10. **Paleoenvironment, Depositional Setting, and Plant Fossil Diversity Found in the Claiborne Formation (Middle Eocene) Clay Deposits of Western Tennessee.** Sun., March 16. B. Roger Moore, University of Tennessee at Martin, [brmoore@click1.net](mailto:brmoore@click1.net); David L. Dilcher, Florida Museum of Natural History; Michael A. Gibson, University of Tennessee at Martin, [mgibson@utm.edu](mailto:mgibson@utm.edu). Max.: 20; min.: 14. Cost: \$85.

## 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 received no later than February 15, 2003. Additional information may be obtained from Donald Neal, (252) 328-4392, [neald@mail.ecu.edu](mailto:neald@mail.ecu.edu).

Travel grants are also available from the South-Central Section, 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 visit the GSA Web site, [www.geosociety.org](http://www.geosociety.org), for details regarding application instructions for these grants. Applications must be received no later than February 15, 2003. For more information, please contact Elizabeth Y. Anthony, [eanthony@geo.utep.edu](mailto:eanthony@geo.utep.edu).

## Guest Activities

All guest activities will depart from the Holiday Inn. Please check the GSA Web page, [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm), or contact Jim Dorman, (901) 678-2007, [dorman@ceri.memphis.edu](mailto:dorman@ceri.memphis.edu), for more information.

**Campus Tour I.** Thurs., March 13. Tour leaves at 9 a.m. and returns before noon. An escorted campus walking tour will visit the Groundwater Institute and the Center for Earthquake Research & Information on the University of Memphis campus. Cost: Free.

**Campus Tour II.** Thurs., March 13. Tour leaves at 1:30 p.m. and returns by 4 p.m. An escorted campus walking tour will visit the Egyptian Museum on the University of Memphis campus. Cost: Free.

## Off-Campus Tours

Below are listed unescorted off-campus trips for which van transportation is being provided. A \$6 van ticket entitles the holder to board the van on any scheduled March 13 or March 14 trip. Van tickets purchased during preregistration will help to guarantee that this van service is provided.

**Memphis Brooks Museum of Art and the Memphis Zoo.** Thurs., March 13, 9:45 a.m. Van returns at 1 p.m. for trip back to the Holiday Inn. Museum and zoo admissions are sold separately at the respective locations and are not included with the van ticket.

**Dixon Gallery & Gardens.** Thurs., March 13, 1:30 p.m. Van returns at 4:30 p.m. for trip back to the Holiday Inn. Dixon Gallery and Garden admission is sold separately and is not included with the van ticket.

**Memphis Downtown.** Fri., March 14, various times. Van shuttle will take guests from the Holiday Inn to the drop-off/pick-up point at Peabody Place with intermediate stops at the **Memphis Pink Palace Museum** and **Palladio International Antique Market**. Downtown attractions include: **Peabody Place Retail and Entertainment Center**, **The Chinese Museum at Peabody Place**, **National Civil Rights Museum**, historic **Beale Street**, and **The Memphis Queen Line**.

## Special Events and Business Meetings

Societies and groups that wish to schedule meeting space during the meeting should contact Lensyl Urbano, (901) 678-4543, [lurbano@memphis.edu](mailto:lurbano@memphis.edu). Limited space is available at the Holiday Inn for group meetings; catering and audio-visual services are available at additional cost.

**Welcoming Party.** Wed., March 12, 6–8 p.m., Holiday Inn Ballroom 2. You must be registered for the meeting to attend the Welcoming Party.

**Southeastern Section GSA Management Board Meeting.** Wed., March 12, 4 p.m., Holiday Inn.

**Southeastern Section GSA Geology and Public Policy Breakfast.** Thurs., March 13, 7 a.m., Holiday Inn.

**Roy J. Shlemon Mentor Program in Applied Geoscience.** Thurs., March 13, 11:30 a.m.–1:30 p.m., location to be announced.

**South-Central and Southeastern Sections of the Paleontological Society Joint Luncheon.** Thurs., March 13, noon, Holiday Inn.

**Southeastern Section NAGT Business Meeting.** Thurs., March 13, 5 p.m., location to be announced.

**South-Central Section GSA Business Meeting and Party.** Thurs., March 13, 5–8 p.m., Ballroom 1, Holiday Inn.

**Southeastern Section GSA Campus Representatives Breakfast.** Fri., March 14, 7 a.m., Holiday Inn.

**Southeastern Section GSA Ph.D.-Granting Earth Sciences Chairs Breakfast.** Fri., March 14, 7 a.m., Holiday Inn.

**Roy J. Shlemon Mentor Program Student Workshop and Luncheon.** Fri., March 14, 11:30 a.m.–1:30 p.m., location to be announced.

## Exhibits

Exhibit space will be available in an exhibit hall together with the poster sessions. Exhibits hours: 6–8 p.m., Wed., March 12; 9 a.m.–5 p.m., Thursday, March 13; and 9 a.m.–noon, Friday, March 14. For more information on exhibit space, visit [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm), or contact Robyn Hannigan, (870) 972-3086, [hannigan@mail.astate.edu](mailto:hannigan@mail.astate.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, as well as the local Web site. If desired, sponsors may designate their gift for a special event or technical session during the meeting, with recognition for that event. For more information on sponsorship of the meeting, please contact Robyn Hannigan, (870) 972-3086, [hannigan@mail.astate.edu](mailto:hannigan@mail.astate.edu).

## Detailed Information

For more information, please contact the meeting chairman: Dan Larsen, (901) 678-4358, [dlarsen@memphis.edu](mailto:dlarsen@memphis.edu), or visit [www.geosociety.org/sectdiv/southc/03sc-semtg.htm](http://www.geosociety.org/sectdiv/southc/03sc-semtg.htm).

GSA is committed to making all events at the 2003 meeting accessible to all people interested in attending. You can indicate special requirements (wheelchair accessibility, dietary concerns, etc.) on the registration forms.

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## Sixty-nine Years of Research Grants

The GSA Committee on Research Grants recently announced 2002 awards of \$450,000 to 243 graduate students. An overview of the awards and funding, as well as a summary of 28 proposals recognized for their exceptionally high merit, was included in the September 2002 *GSA Today*. Recipients of student research grants awarded by GSA Divisions and Sections are listed on pages 26 and 27 of this issue.

The 243 awards represent only 44% of grant proposals received in 2002. The average award was \$1,852, slightly lower than last year and only 73% of the average amount requested.

The Research Grant Program has been enormously popular and successful for 69 years. Since its inception in 1933, over \$7.6 million has been awarded through 7,047 grants. The impact on both the individuals who received them and our geological science in general has been incalculable. The program supports students in a wide variety of fields including structure and tectonics, Quaternary geology and geomorphology, geochemistry, igneous and metamorphic petrology, sedimentology and stratigraphy, paleontology, hydrocarbon and economic geology, hydrogeology, geophysics, environmental geology, and engineering geology.

The review and selection of proposals, a process that requires a tremendous amount of dedication and time, is conducted primarily by volunteers. The Research Grant Committee consists of 16 GSA members as well as GSA staff.

Funding for Research Grants comes chiefly from private contributions. The \$450,000 budget in 2002 is among the largest ever granted. The National Science Foundation continued its support of the program, contributing \$150,000; the remainder came primarily from GSA investments and from the GSA Foundation and GSA Divisions. These sources cannot meet the existing, much less growing, demand.

The GSA Foundation was established in 1980 to seek financial support for Society initiatives. The Research Grant Program is considered a GSA cornerstone initiative, but funding, particularly these days, is becoming more difficult to obtain. The Society wishes to increase the number as well as the size of grants over the next decade in order to help keep pace with the rising costs of conducting research and to fund all projects deemed meritorious by the Research Grant Committee.

### We Need Your Help

We have formed a subcommittee of GSA Foundation Trustees whose charge is to help secure contributions that will enable the Research Grant Program to continue its support of students. We are appealing to you for your help. We trust you share the Society's desire to foster student research and hope you will make a donation to the GSA Foundation for this cause. Our preference is for you to contribute to the **GEOSTAR Fund**, which has been created as an endowment to support the advancement of research. It is set up as a long-term fund that distributes only a portion of its assets each year. The **Research Fund** is also available should you want your contribution distributed in one year. Your donation to the **GEOSTAR Fund** or the **Research Fund** may be structured as a pledge over three to five years if a one-time contribution is not convenient. Your donation may include gifts other than cash.

**Your donation can go even further.** If you or your spouse have a matching donation program at work, make the donation in both your names and send us the name and address of your (and your spouse's) employer with your gift. We will take care of the rest.

Your contributions may be made on the coupon below. Should you have questions, or if you are considering a multiple-year pledge or gifts other than cash, please contact the Foundation at (303) 357-1054 or 1-800-472-1988, ext. 1054.

Thanks for doing your part to perpetuate and expand this worthwhile program.

### GSA Foundation Research Grant Subcommittee

David Dunn  
Bill Muehlberger  
Catherine Skinner

Farouk El-Baz  
George Sharp

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## Final Announcement

# NORTH-CENTRAL SECTION, GSA

37th Annual Meeting, North-Central Section, GSA • Kansas City, Missouri

Hosted by the University of Missouri—Kansas City • March 24–25, 2003



THE  
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## KANSAS CITY

Pennsylvanian shales and limestones underlie Kansas City, which is noted for secondary use of underground space in room and pillar limestone mines. Kansas City straddles the confluence of the Missouri and Kansas Rivers and the terminus of Pleistocene glaciation, both of which have heavily influenced land usage. Floods occur in upland valleys such as Brush Creek as well as major rivers. Field trips feature Pennsylvanian stratigraphy, urban environmental geology and paleontology, secondary commercial usage of underground space, and Quaternary landscape evolution.

Theme sessions and symposia will focus on health and the environment, urban geology, paleobiology and stratigraphy, and K-16 geoscience education. We encourage those interested in presenting papers at a symposium to contact the symposium organizers in advance of submitting abstracts.

## REGISTRATION

Preregistration and hotel accommodations deadline: February 14, 2003

Cancellation deadline: February 21, 2003

Register online at [www.geosociety.org](http://www.geosociety.org).

Field trip participants must preregister for the meeting. Please preregister online or download the PDF preregistration form at [www.geosociety.org](http://www.geosociety.org). If you are unable to preregister this way, contact GSA Member Services, 1-888-443-4472, [member@geosociety.org](mailto:member@geosociety.org).

## ACCOMMODATIONS

The meeting organizers strongly encourage you to lodge at the Airport Hilton, the site of the meeting. Selected for its reasonable room rates, the Hilton Inn is a full service hotel with free in-room Web access, and exercise facilities ranging from swimming pools to basketball and tennis courts to a selection of cardiovascular fitness machines.

The Kansas City Airport Hilton (8801 NW 112th Street, Kansas City, MO 64153) is near exit 12, just east of I-29. Free parking and airport shuttle are available. The conference room rate is \$82 (single or sharing, with up to four to a room permissible.) Go to [www.kansascityairport.hilton.com](http://www.kansascityairport.hilton.com), and click on "Book a Room." When you reach the question "What rate type do you want to see?" click "Packages/Promotions/Special Offers." Type "GSA" for the group code, and click on "Rate & Availability." Or, call 1-800-HILTONS for reservations. All meeting rooms are ADA accessible. In addition, the Hilton features 10 ADA compliant rooms.

## ABSTRACTS

Abstract deadline: December 10, 2002

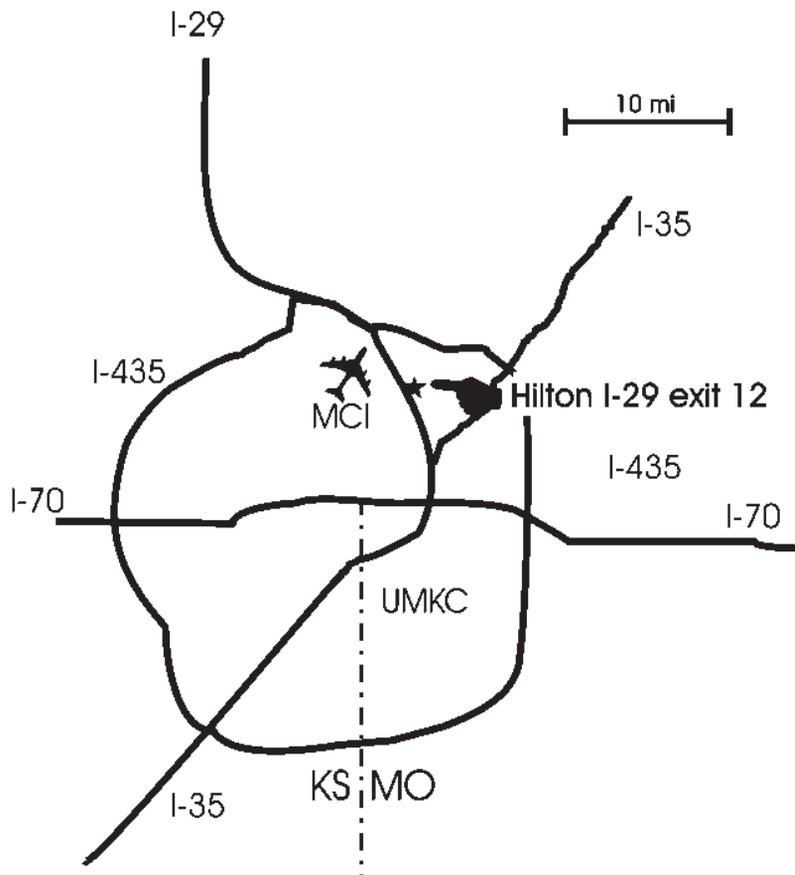
Use the online electronic abstract form from the GSA Web site. An abstract submission fee of \$10 will be charged. If you cannot submit your abstract electronically, contact Nancy Carlson at [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org), (303) 357-1061. For information on technical sessions and symposia, please contact the symposium organizers listed below or the technical program chair, Syed E. Hasan, at [hasans@umkc.edu](mailto:hasans@umkc.edu), (816) 235-2976.

## FIELD TRIPS

For inquiries concerning field trips please contact individual field trip leaders or field trip coordinator, Tina M. Niemi, at [niemit@umkc.edu](mailto:niemit@umkc.edu), (816) 235-5342. A preliminary list of trips follows.

1. **The Geology of Kansas City.** Sun., March 23, 8 a.m.–5 p.m. Richard J. Gentile, University of Missouri—Kansas City, [gentiler@umkc.edu](mailto:gentiler@umkc.edu), (816) 235-2974. Cost: \$45. Students: \$30.

This trip will give participants an overview of the exposed rock section that underlies Kansas City and its environs. Excellent exposures of Pennsylvanian strata (Kansas City Group) will be seen in excavations for roads and highways. The section of Pennsylvanian rocks consists predominately of limestone and shale with minor amounts of sandstone, coal, and conglomerate. These lithologic types occur as "bundles" of strata that alternate in cyclical fashion throughout the section and are commonly called cyclothems. The Pennsylvanian bedrock is overlain by surficial deposits of Pleistocene and Holocene age, which include glacial drift, windblown silt (loess), valley-fill



alluvium, and soil. A cover of loess overlies the glacial drift except in areas where the drift is absent. At these places the loess rests directly on Pennsylvanian bedrock. Discussion at exposures of fossiliferous carbonate buildups, sediment-filled tidal channels, and a text book example of normal faulting in the "stable" interior of the Midcontinent.

2. **Latest Pennsylvanian and Earliest Permian Cyclic Sedimentation and Paleocology in Southeastern Nebraska.**

Wed., March 26, 7:30 a.m.–6:30 p.m. Roger Pabian, rpabian@unlnotes.unl.edu, (402) 472-7564, and Robert F. Diffendal Jr., rfd@unl.edu, (402) 472-7546, both at Conservation and Survey Division, University of Nebraska—Lincoln. Cost: \$55. Students: \$20.

Exposures in Richardson and Pawnee counties, Nebraska, provide a graphic account of the impact of Gondwana glaciation upon the sedimentology and paleocology of the Midcontinent. We will examine continental and marine facies in the Wabaunsee (Virgilian), Admire, and Council Grove Groups that show eolian deposits, paleosols, channel sand, lagoon or estuarine deposits in the former, and near- and offshore deposits in the latter. There will be ample opportunities to collect lithologic and paleontological samples.

3. **Conodont-rich Pennsylvanian Dark Shales of the Kansas City Region.**

*Cosponsored by the Pander Society.* Sun., March 23, 7 a.m.–6 p.m. Philip Heckel, University of Iowa, philip-heckel@uiowa.edu, (319) 335-1804; Jim Barrick, Texas Tech University, Jim.Barrick@TTU.edu, (806) 742-3107. Cost: \$50. Students: \$30.

This one-day trip will visit several localities of conodont-rich dark phosphatic shales in the Kansas City area, from which the first Pennsylvanian conodonts were described and many of the early species of *Idiognathodus* and *Streptognathodus* were named. It includes Gunnell's original 1931 locality from which the genus *Idiognathodus* was named near Lexington, Missouri, and which exposes four separate levels of abundant late Desmoinesian conodonts, now correctly correlated with the Midcontinent cyclothem succession. It also includes at least three other localities in Missouri and Kansas that expose nearly 10 separate levels of early, middle, and late Missourian conodonts, close to many of Gunnell's 1933 localities and Ellison's 1941 localities, from which the majority of Missourian conodont species were named. Sedimentary aspects of the conodont-rich shales will also be discussed.

4. **Tri-State Zinc-Lead District: From Bonanza to Superfund.** Sun., March 23, 7 a.m.–8 p.m. Virginia Ragan, Maple Woods Community College, raganv@maplewoods.

cc.mo.us, (816) 437-3355; David Drake, Environmental Protection Agency, Region 7, David.Drake@epamail.epa.gov, (913) 551-7626. Cost: \$60. Students: \$20.

This one-day trip to the Tri-State mining district of Kansas, Missouri, and Oklahoma provides a working example of the problems associated with remediation of a former world-class zinc-lead mining district. Representative field localities will show untreated areas including mining waste piles and chat piles, Environmental Protection Agency active remediation and fully remediated sites in Kansas, a tour of the Everett Ritchie Tri-State Mineral Museum containing exceptional Tri-State specimens and mining memorabilia, and a side trip to Big Brutus, the second largest electric shovel in the world. Participants will have opportunities to collect minerals and specimens. A luncheon slide presentation will feature planning remediation of a large-scale environmental project.

5. **Quaternary Landscape Evolution and Stratigraphy in Northeastern Kansas.**

Sun., March 23, 8 a.m.–5 p.m. Rolfe Mandel, Kansas Geological Survey, mandel@kgs.ku.edu, (785) 864-2171; E. Arthur Bettis III, University of Iowa, art-bettis@uiowa.edu. Cost: \$45. Students: \$20.

This one-day trip will focus on Quaternary landforms and stratigraphy in river valleys of northeastern Kansas. The type locality of the newly established Severance Formation, a lithostratigraphic unit consisting of late Wisconsinan alluvium and colluvium, will be visited in the Wolf River valley. Stops will also include sections of Holocene alluvium, late Pleistocene loess, and pre-Illinoian till. The trip will provide opportunities for participants to see the effects of more than 600,000 years of landscape evolution.

6. **Metallogeny of Pennsylvanian Black Shales.** Sat., March 22, 8 a.m.–4 p.m.

Raymond Coveney, University of Missouri—Kansas City, coveneyr@umkc.edu, (816) 235-2980. Cost: \$45. Students: \$20.

This one-day trip will visit five exposures of phosphatic black shales in the greater Kansas City area, featuring the Hushpuckney and Stark Shale Members of the Kansas City Group, which are well exposed in road cuts and underground space sites and are consistently enriched in metals, containing an average of 2000 ppm Zn in the form of sphalerite. Metal origins have been variously attributed to seawater, hydrothermal fluids, and diagenetic events. The presence of minor occurrences of Mississippi Valley type mineralization in adjacent limestones and recent radiometric dating of zinc mineralization in the Tri-State Mining District at 251 Ma suggests the likelihood of a post-sedimentary hydrothermal overprint, but

the matter is far from settled.

7. **Kansas City: World Leader in Underground Space Utilization.** Sat.,

March 22, 1–5 p.m. Charles Spencer, University of Missouri—Kansas City, spencerc@umkc.edu, (816) 235-2983. Cost: \$22. Students: \$15.

Extensive use of underground space in the area around Kansas City has been possible due to a combination of favorable stratigraphy, structure, and topography. The uniformity of thickness and lithology of the local Pennsylvanian-age limestones, the more-or-less consistent and gentle dip of beds, and the exposures of mineable units along hillsides have combined to provide favorable conditions for underground space developments. The trip itinerary includes visits to several of the underground space developments in the Kansas City area, containing a wide variety of secondary adaptations of mined-out space (including warehousing, offices, library, and refrigeration-freezer storage). At each stop, representatives of the developments will discuss the types of secondary uses and geotechnical issues related to the development of space at their facility.

8. **Kansas City on the Rocks: Field Trip for K–16 Teachers.** *Sponsored by the Central Section of the National Association of Geoscience Teachers.* Sat., March 22,

8:30 a.m.–3 p.m. Carl Priesendorf, Longview Community College, PriesenC@longview.cc.mo.us, (816) 672-2549; Janis Treworgy, Principia College, jdt@prin.edu, (618) 374-5294. Cost: \$40. Students: \$30.

Visit roadcuts and outcrops in the Kansas City area. Determine from rock types and fossils how these rocks were deposited some 300 million years ago. Analyze some potential environmental hazards. Good fossil and rock collecting opportunities. Useful teaching materials and activities for geology classes will be included in your packet.

## **SYMPOSIA AND THEME SESSIONS**

For general questions concerning symposia please contact technical program chair, Syed E. Hasan, hasans@umkc.edu, (816) 235-2976.

### **Symposia**

1. **Stratigraphic Correlation and Nomenclature of the Upper Midwest Paleozoic.** *Cosponsored by North-Central Section, SEPM—Society of Sedimentary Geology.* Richard J. Gentile, University of Missouri—Kansas City, gentiler@umkc.edu, (816) 235-2974.
2. **Diversity in the Geosciences.** Virginia M. Ragan, raganv@maplewoods.cc.mo.us,

- (816) 437-3355, and Arthur R. Renfro, both at Maple Woods Community College.
- Tri-State Mining District: From Bonanza to Superfund.** David Drake, U.S. Environmental Protection Agency, Region 7, drake.dave@epa.gov, (913) 551-7626.
  - Pander Society Symposium.** James E. Barrick, Texas Tech University, jim.barrick@ttu.edu, (806) 742-3107.
  - Midwest Intraplate Seismicity.** Tina M. Niemi, University of Missouri—Kansas City, niemit@umkc.edu, (816) 235-5342.
  - Origins and Environmental Significance of Midwestern Black Shales.** Charles G. Spencer, spencerc@umkc.edu, (816) 235-2983, and Raymond M. Coveney Jr., both at University of Missouri—Kansas City.
  - Geological, Engineering, and Environmental Problems in the Missouri River Basin.** John Moylan, URS Corporation, johnmoylan@att.net, (913) 262-1557.
  - Climate Variability and Change: Past, Present, and Future.** Jimmy O. Adegoke, adegokej@umkc.edu, (816) 235-2978; and Caroline P. Davies, both at University of Missouri—Kansas City.
  - Recent Progress in Medical Geology.** Syed E. Hasan, University of Missouri—Kansas City, hasans@umkc.edu, (816) 235-2976.
  - Evidence and Evolutionary Consequences of Predation in the Fossil Record.** Danita S. Brandt, Michigan State University, brandt@msu.edu, (517) 355-6595.
  - Fossils as Paleobathymetric and Paleocurrent Indicators.** *Cosponsored by North-Central Section, Great Lakes Section of SEPM—Society of Sedimentary Geology.* Joe T. Hannibal, jhannib@cmnh.org, (216) 231-4600, ext. 233, and David B. Saja, both at Cleveland Museum of Natural History.
  - The Toxic Legacy of Forgotten Gas Plants.** Allen Hatheway, allen@hatheway.net, (406) 849-5228.

## Theme Sessions

- Urban Flood Hazards.** Joseph Topi, U.S. Army Corps of Engineers, joseph.e.topi@nwk02.usace.army.mil, (816) 983-3675.
- Hydrogeologic Problems in the Midwestern U.S.** Dale Blevins, U.S. Geological Survey, dblevins@usgs.gov, (816) 254-8172.
- Innovative Teaching Strategies for Engaging K-16 Geoscience Students.** *Sponsored by North-Central Section, NAGT Central Section.* Janis D. Treworgy, Principia College, jdt@prin.edu, (618) 374-5294.
- Showcase for Undergraduate Student Geosciences Research.** *Sponsored by*

*Council on Undergraduate Research.* James B. Murowchick, University of Missouri—Kansas City, murowchickj@umkc.edu, (816) 235-2979.

- Quaternary Geology of the U.S. Midwest.** Rolfe D. Mandel, University of Kansas, mandel@falcon.cc.ukans.edu, (785) 864-2171.

## EQUIPMENT FOR ORAL PRESENTATIONS

Each meeting room will have one projection screen. Windows-compatible PowerPoint will be the standard format for oral presentations. Speakers are advised to provide Windows-compatible CDs with their presentation *saved as a show*. As an alternative, for those who wish, one standard 35 mm carousel projector will be available in each meeting room as well. The speaker ready room will be equipped with slide and PowerPoint projectors. CDs or slide carousels, clearly labeled with the speaker's name, session number, and speaker number, must be provided to the projectionists no later than 15 minutes prior to the start of the session. Borrowed carousels should be returned to the projectionist.

## POLICY ON CAMERAS, SOUND EQUIPMENT, AND SMOKING

North-Central Section GSA regulations prohibit the use of cameras or sound equipment at technical sessions. A no-smoking policy applies to all North-Central Section GSA annual meeting events and will be followed in technical sessions, workshops, and social events.

## POSTER SESSIONS

Each poster booth contains a 4 by 8 foot landscape-format panel. The panels consist of felt covered cardboard. Materials may be mounted with Velcro, tacks, or pushpins. Posters are available for four hours during each session.

## EXHIBITS

Exhibitors: please contact James B. Murowchick, murowchickj@umkc.edu, (816) 235-2979.

## SPECIAL EVENTS

- Association for Women Geoscientists Breakfast and Business Meeting.** Mon., March 24. Cost: \$22. Students: \$15.
- Central Section National Association of Geoscience Teachers Luncheon and Business Meeting.** Tues., March 25. Cost: \$22. Students: \$15.
- Paleontology Society Luncheon.** Tues., March 25. Cost: \$22. Student: \$15.
- Pander Society Luncheon.** Mon., March 24. Cost: \$22. Students: \$15.

**North-Central Section Department Chairs Breakfast Meeting.** Tues., March 25. Cost: \$22.

## WORKSHOP

**Roy J. Shlemon Mentor Program In Applied Geoscience.** *Sponsored by GSA Foundation.* Mon., March 24, 11:30 a.m.–1 p.m., location to be announced. Karlon Blythe, kblythe@geosociety.org. This interactive and informal program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues such as the professional opportunities and challenges that await students after graduation. Students will receive in their registration packet a FREE LUNCH ticket to attend the Shlemon Program. However, space is limited. First come, first served.

## GUEST ACTIVITIES

A hospitality room with continental breakfast and refreshments will be provided throughout the day at the Airport Hilton. Shuttle service to local attractions will also be available as needed.

Nongeologic attractions of Kansas City include the Country Club Plaza and Westport shopping and dining district, 18th and Vine Jazz district, Nelson-Atkins Art Gallery, UMKC Belger Center for the Arts and Creativity, Kemper Museum of Modern Art, Crown Center and Hallmark Cards Visitor Center including the Crayola Cafe, Union Station Science City, the Library Memorial, Linda Hall Library of Science, Technology and Engineering, the Toy and Miniature Museum, University of Missouri—Kansas City, and the Harry S. Truman Presidential Library.

## TRAVEL GRANTS AVAILABLE FROM THE NORTH-CENTRAL SECTION AND THE GSA FOUNDATION

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, and requests for funding should be made through North-Central Section Chair, Raymond M. Coveney Jr., geosciences@umkc.edu, (816) 235-1334.

## STUDENT AWARDS

Cash awards for the best paper will be given to students by the Great Lakes Section SEPM—Society of Sedimentary Geology and the North-Central Section of GSA.

## OTHER

For other matters, please contact North-Central Section Chair, Raymond M. Coveney Jr., geosciences@umkc.edu, (816) 235-1334, or Co-Chair, Syed E. Hasan, hasans@umkc.edu, (816) 235-2976.

# COMMENTARY

## Biological Clocks and Tenure Timetables: Restructuring the Academic Timeline

**Carol B. de Wet**, *Department of Geosciences,  
Franklin & Marshall College, Lancaster, Pennsylvania 17604,  
c\_dewet@email.fandm.edu*

**Gail M. Ashley**, *Department of Geological Sciences, Rutgers,  
The State University of New Jersey, Piscataway, New Jersey  
08854-8066, gmashley@rci.rutgers.edu*

**Daniel P. Kegel**, *OB-GYN Associates, Columbia Avenue,  
Lancaster, Pennsylvania 17603*

The objectives of this paper are to (1) reaffirm the need for gender equity; (2) examine contributing factors to the attrition of women faculty; and (3) suggest alternative strategies to promote the full participation of women in geoscience higher education. Sections of the complete Commentary are abstracted below; the full text is posted at [www.geosociety.org/pubs/gsatoday/](http://www.geosociety.org/pubs/gsatoday/).

### Abstract

Despite decades of progressive social change by an active women's movement, federal and state legislation, and adoption of academic affirmative action policies, women geoscientists have not reached a critical mass in higher education. Women comprise only 12.5% of geoscience faculty in U.S. colleges and universities and only 10% at Ph.D. granting institutions. Senior women faculty tend to be marginalized from the academic power structure. A combination of biological factors, lifestyle choices, dual career pressures, double standards for social and professional interactions, and gender-based discrimination creates an effective filter, reducing women in geoscience departments to a surprisingly low level. There are two rungs on the ladder where women proportionally leave the discipline at a higher rate than men. One is continuing on to obtain a Ph.D.; the other is prior to, or at tenure. The present time frame for achieving tenure and promotion was established by men, for men, decades ago. Such a time frame is incompatible with women's biologic reproductive constraints, and as such, puts an unequal level of pressure and stress on women relative to their male professional counterparts. Only a significant change in the culture of science, and its traditional pathways, will create a geoscience community that has a sound base of gender equity. Strong leadership from innovative and far-sighted administrators and colleagues is required to introduce and foster institutional change that will reduce the conditions that leave women disadvantaged.

### Biological Factors—Childbearing Years and Tenure Trajectory

Due to the inevitable tick of the biological clock, there is an unavoidable collision between a woman's optimum childbearing years and her career trajectory. Although career and family issues affect both men and women, there are issues unique to women who are starting a family.

The most fundamental gender specific issue is childbearing. Women face a difficult choice: wait to have children until their professional life is secure, but risk serious health consequences for their children (or selves), or bear their children earlier, and risk their professional success. Maternal mortality rates are four times higher among women 35 to 39 years old than those of ages 20 to 24, and babies of older women have higher mortality rates as well. In women age 35 or older, there is a four-fold increase in serious fetal complications, including stillbirth. This kind of emotional dilemma is what may lead some women leave the discipline. Those who stay in the profession experience tension that may seriously impact their quality of life, their career (research productivity, field and lab work), and their ability to successfully compete for jobs and grants. The overlap in biological and professional imperatives lasts for only a minor portion of a women's life, perhaps only 6 years out of a 35-year career.

The risk of giving birth to a child with Down syndrome at age 35 is ~ 1:270. By age 40 this risk is 1:106. Lethal chromosomal abnormalities are also more common with advanced maternal age, and risk of miscarriage is a significant concern. Only ~10% of woman under the age of 20 experience spontaneous miscarriage. By age 40 this risk has more than doubled, to almost 34%. Aging eggs, not simply overall good health, also affect a woman's fertility, and the natural incidence of chronic illnesses that complicate pregnancy increases with maternal age.

### Conclusions

Attrition from the geosciences is higher for women than men at two critical points: after the M.Sc. degree, and between assistant and associate professor. Due to the inevitable tick of the biological clock, there is an unavoidable collision between a woman's optimum childbearing years and her career trajectory. Assuming that gender equity in science makes sense in terms of resources, diversified types of study, and balance, then causes for the rate of women's attrition must be sought.

Biological realities should be acknowledged if we are to attain a critical mass of women in the geosciences. Stopping the tenure clock, allowing part time work for given time periods, and encouraging split positions are policies that already exist in some institutions. More responsive, flexible schemes for integrating work and family are essential to ensure women's full participation in higher education. At one time, it was considered impossible for female students to go on field excursions because of a lack of facilities. This "impossible situation" has been overcome, and there is no reason to doubt that the issues we have described can also be overcome.

Only by the retention and advancement of women can critical mass be achieved, after which women can begin to fill positions of power and influence. Women then can serve as role models for the next generation of scientists, encouraging more of them to enter and stay in science. This pool will then form the teaching basis for both academia and industry, and will potentially lead to a generation of managers and department heads who will be part of the ongoing transformation of the sciences. Only strong leadership today, by both administrators and faculty, can change the academic culture of priorities, workloads, reward structure and values to more closely reflect all of its constituencies and begin such a transformation.

*Read the full text at [www.geosociety.org/pubs/gsatoday/](http://www.geosociety.org/pubs/gsatoday/).*

# The Biggs Award

Congratulations to Karen Harpp, professor in the Geology Department of Colgate University, who has been named the 2002 Biggs Award recipient.

The Biggs Award encourages and rewards excellence in teaching among college-level professors of earth science who are in the early stages of their careers. The award is made possible through support from the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA's Science, Education, and Outreach Programs.

Earth science instructors and faculty members from any academic institution engaged in undergraduate education who have been teaching full time for 10 years or fewer are eligible. (Part-time teaching is not counted in the 10-years-or-fewer requirement.)

For more information, contact Leah Carter at [lcarter@geosociety.org](mailto:lcarter@geosociety.org), (303) 357-1037.

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# LETTER

## A Dissident's View of the Society's New Logo

A few months ago, and with considerable fanfare, the Society announced the adoption of a fresh logo: "A New Symbol for a Great Vision" (*GSA Today*, March 2002, p. 26-27). Here I present a dissident's view, and propose that the new logo is counter productive and will prove harmful to the Society's constructive and firmly established global image.

On page 26 of the issue of *GSA Today* cited above, we read "GSA's seal is widely recognized and respected in the field of geosciences." Indeed it is! The seal first appeared in vol. 2 of the *Bulletin* (1891), having been chosen by a committee made up of G.K. Gilbert, H.S. Williams, and C.H. Hitchcock. Now, well over a century later, even where viewed at a distance too great to read the encircling text, the seal is recognized instantly by geoscientists worldwide as that of the Geological Society of America. One does not need a page of instructions to interpret it. Alone it is clear, vivid, and respected. Period. We are now offered a new logo that resembles greatly the symbol of a multi-national shoe manufacturer, and like that logo, to the uninitiated it signifies absolutely nothing.

The present situation recalls an unfortunate incident that took place in 1968 when I was working for the USGS. The Department of the Interior abandoned its long-standing and broadly recognized logo—the bison with the sun over its shoulder—for some sort of warm and fuzzy stylized pair of hands, pointed skyward, and holding an unidentifiable object. That "new and improved" logo was mercifully shelved after less than a year and the bison was brought back. It is my sincere hope that the Society's "New Symbol for a Great Vision" will suffer the same fate as did the Interior's fuzzy hands, and that it will be seen for what it is: a bad decision.

Beyond the speedy abandonment of the new logo, what should we do? Here I maintain that we do nothing. Aren't we fortunate to operate under a seal so honored and so widely recognized? Aren't we lucky to possess one of the rare benchmark symbols in the sciences anywhere? No, fellow members of GSA, we really have no need of a new "elegant, classy, modern" logo. We already have one!

Tomas Feininger  
Université Laval, Québec City  
GeoNord  
[feininger@ggl.ulaval.ca](mailto:feininger@ggl.ulaval.ca)

*Ed. note:* Mr. Feininger's letter is a representative sample of the dissenting viewpoints expressed by a minority of members voicing opinions on the logo that was adopted by Council in November 2001. GSA remains firm in its belief that the new logo will represent the vision and the mission of the Society well in building a strong future for the geosciences.

# GSA Division and Section Grants for 2002

## Division Research Grants

Nine of the fourteen GSA divisions offer grants for outstanding student research within the fields of the respective divisions. Recipients of these grants for 2002 are listed below. The five divisions that do not currently offer any awards to students are Geoscience Education, Geobiology and Geomicrobiology, History of Geology, Limnogeology, and International.

### **The Archaeological Geology**

**Division** awarded two grants this year for the Claude C. Albritton, Jr., Memorial Student Research Award. The recipients are Jenny Bennett, University of Exeter, UK, for "Mesolithic Environments and Environmental Change in the Exe Basin, SW England"; and Sidney Carter, Stanford University, for "Exploring the Strontium Isotopic Compositions of Geological Sources of Ceramic Raw Materials in Northern Arizona as a Basis for Provenance Analysis of Cohonina and Anasazi Ceramics." The Claude C. Albritton, Jr. Memorial Fund was established at the GSA Foundation in 1991 with contributions from the family and friends of Claude Albritton. The division continues to seek contributions to the fund in memory of Dr. Albritton to provide scholarships for graduate students in the earth sciences and archaeology. The GSA Foundation manages this fund.

**The Coal Geology Division** presented the annual Antoinette Lierman Medlin Research Awards for 2002. The Field Award went to David S. Jacks, University of California, Davis, for "Productivity Growth in English Coal Mining, 1740–1870." The Research Award went to Eric G. Ober, University of Tennessee, for "A Study of Paleohydrological History of Coal Underclays Based on Pennsylvanian Paleosols in Eastern Tennessee." The GSA Foundation manages this fund.

**The Engineering Geology Division** presented the Roy J. Shlemon Scholarship Awards for 2002 as follows: Kyu Ho Cho, First Place Doctorate Level; Sergio A. Sepulveda, Second

Place Doctorate Level; Jamie Marie Monte, First Place Master's Level; Eric Fossett, Second Place Master's Level. The GSA Foundation manages this fund.

**The Geophysics Division** presented the Allan V. Cox Student Research Award this year for an outstanding student research proposal submitted to the GSA Research Grants Program. The 2002 Cox award goes to Edwin V. Apel III, University of Idaho, for "GPS Geodesy and 3D Boundary Element Modeling: Assessing the Seismic Hazard along the Devil's Mountain Fault Zone, Northwest Washington." The 2002 Geophysics Division award was presented to France Lagroix, University of Minnesota, for "A Magnetic Investigation of Alaska's Climate and Surface Air Circulation Since the Late Pleistocene."

**The Hydrogeology Division** presented awards for outstanding student research this year to five students: A. Brooke Asbury, Central Washington University, for "Hydrological Modeling of Hyporheic Response to Irrigation in Fall Chinook Salmon Spawning Areas," Noel Bush, California State University, Sacramento, for "Streambed Permeability and Water Chemistry within the Hyporheic Zone of Streambed Gravels," Jay W. Chennault, Western Washington University, for "Influence of Glacial Meltwater on Discharge at Thunder Creek, North Cascades National Park, Washington," Sarah Rebecca Hill, University of Alberta, for "The Physical and Geochemical Characterization of Oxygen Depleted breathing Wells (ODBW) in Central Alberta," and Tara L. Root, University of Wisconsin-Madison, for "Arsenic Contamination in Groundwater in Southeast Wisconsin: Identifying sources of Arsenic and Mechanisms Controlling Arsenic Release." The GSA Foundation manages this fund.

**The Planetary Geology Division** presents the Stephen E. Dwornik Best

Student Paper Awards annually to students who are U.S. citizens pursuing advanced degrees in Planetary Sciences. The awards are presented each year for papers given in March at the Lunar and Planetary Science Conference. The recipient of the 2002 Oral Presentation Award is Kelly Wilbur, Brown University, for, "The Effect of Coriolis Effect on Distal Ejecta Deposits on Mars," and the Oral Honorable Mention Awardees are Molly McCanta, Brown University, for "An Experimental Study of Eu/Gd Partitioning Between a Shergottite Melt and Pigeonite: Implications for the Oxygen Fugacity of the Martian Interior," and Chris Okubo, University of Nevada, Reno, for "Fault Geometry below Wrinkle Ridges Based on Slope Asymmetry and Implications for Mechanical Stratigraphy." The recipient of the Best Poster Award is Nicholas Warner, State University of New York at Buffalo, for "Lava Flow Field Southwest of Arsia Mons, Mars: Estimates and Comparisons of Rheologic Properties." Recipients of the awards are presented with a citation and a \$500 cash prize, and the honorable mention winners receive a certificate in an awards ceremony held at NASA Headquarters in Washington, D.C., early in the summer. The GSA Foundation manages this fund.

**The Quaternary Geology and Geomorphology Division** awarded the 2002 J. Hoover Mackin Award to Greg Balco, University of Washington, for "Erosion Beneath the Laurentide Ice Sheet, and Its Role in Pleistocene Ice Age Dynamics." The Arthur D. Howard Research Grant was awarded this year to Nicole Davis, Montana State University, for "Investigations of Glacial Lake Musselshell, Central Montana." The GSA Foundation manages this fund.

**The Sedimentary Geology Division** presented the award for outstanding student research in 2002 to Guillaume Dupont-Nivet, University of Arizona, for "Testing Northward Propagation of the Tibetan Uplift by Magnetostratigraphic Dating in Eastern Tibet."

# GSA Division and Section Grants for 2002

## The Structural Geology and

**Tectonics Division** presented its 17th annual awards for outstanding student research this year to Jeffrey M. Rahl, Yale University, for "Does Pressure Solution Control the Location of the Brittle-Ductile Transition? A Case Study on the High-Pressure, Low-Temperature Metamorphic Rocks of Crete, Greece," and Phillip G. Resor, Stanford University, for "Deformation Associated with Continental Normal Faults, Western Grand Canyon, Arizona."

## Section Research Grants

Four of the six GSA regional sections award grants for research to students attending colleges and universities within each section's respective geographical boundaries. The Cordilleran and Rocky Mountain Sections do not currently offer student research grants. Grants awarded in 2002 by the other sections are listed below.

**The North-Central Section** awarded grants for undergraduate research projects to students who attend a college or university within the North-Central Section geographic area. Research proposals are submitted and evaluated competitively. Recipients for fall 2001

are: Joel Fassbinder, University of Iowa, for "Geochemical Analysis of Exotic Chert Found at Archaeological Sites in Northwest Iowa"; Kasey Hutchinson, University of Iowa, for "Petrogenetic History of the Cowhole Mountain Volcanics, SE Mojave, California"; Lisa King, University of Cincinnati, for "Seeking High-Frequency Signals in Glaciolacustrine Sediment During the Last Glacial Maximum"; Erik Kneller, University of Toledo, for "Microscopic Textures of the Red, High Silica Rhyolite Lavas of the Precambrian St. Francois Mountains, S.E. Missouri"; Jennifer Berry, DePauw University, for "Mineralogy of a Calcite Vein-Dyke Complex at Bear Lake Diggings, Monmouth Township, Ontario, Canada"; Michael Iacoboni, Eastern Michigan University, for "Fault and Joint Orientations as Evidence for Subglacial Deformation in Drumlin Formation"; and Rebekah Shepard, Oberlin College, for "Microbial Ecology, Texture, and Morphology in Bahamian Stromatolites."

**The South-Central Section** did not award any grants in 2002.

**The Northeastern Section** awarded grants to six undergraduate students.

The 2002 recipients are: Daniel Peppe, Saint Lawrence University; Bradley Erney, Slippery Rock College; Evan Teeters, Juniata College; Michael DaSilva, Monclair State; Andrew Zaprzal, University of Buffalo; and Jon Bestine, University of Buffalo.

**The Southeastern Section** awarded undergraduate and graduate research grants in 2002. The undergraduate students are Christopher W. Helper, Clemson University; Michael P. Lucas, Florida Gulf Coast University; and Caroline E. Webber, College of William and Mary. The graduate students are John K. Cooper, East Carolina University; Michael Rasbury, University of Alabama; Sandra A. Smith, University of Tennessee at Knoxville; Michael A. Crump, University of North Carolina at Wilmington; John P. Foudy, University of North Carolina at Chapel Hill; Abhijit Mukherjee, University of Kentucky; Leslie A. Shaver, University of Tennessee at Knoxville; Alfred M. Elser, Georgia State University; and Carlos A. Zuluaga, University of Alabama.

## E&EG Call for Papers

*Environmental & Engineering Geoscience (E&EG)*, a quarterly journal copublished by GSA and the Association of Engineering Geologists, is seeking new manuscripts. *E&EG* publishes peer-reviewed contributions, based on original work, in the broadly defined areas of environmental and engineering geosciences (including geomorphology, hydrogeology, low-temperature geochemistry, neotectonics, and other earth surface processes). Both theoretical and empirical contributions related to these areas are welcome, although preference will be given to papers of an applied nature. Specifically, *E&EG* encourages the submission of the following kinds of papers.

- Results of original research in the environmental and engineering geosciences.
- Case histories describing the solution of new or unusually difficult problems in the applied geosciences.
- Review papers that summarize the state of the science or professional practice in a branch of the applied geosciences, including contributions describing relevant aspects of local or regional geology or the history of environmental and engineering geosciences.
- Short technical notes (six published pages or less) describing new techniques, novel case histories or other topics in the environmental and engineering geosciences.
- Brief critical discussions of papers and technical notes published in *E&EG*.

**Authors should submit six copies of manuscripts for review to:**

**Abdul Shakoor**, Co-Editor  
*Environmental & Engineering Geoscience*  
Department of Geology  
Kent State University, Kent, OH 44242

All text, captions, tables, and references should be double spaced and printed on one side of the paper only. Good quality copies of illustrations should be sent until the originals are requested. Charges for color figures are \$450 per page. Each author receives 25 free offprints of the published paper.

For more information, contact Shako or (330) 672-2968, ashakoor@kent.edu, or Co-Editor Alan Fryar, (859) 257-4392, afryar1@uky.edu.

# ANNOUNCEMENTS

## MEETINGS CALENDAR

### 2003

February 13–18	American Association for the Advancement of Science, Denver, Colorado. Information: AAAS Meetings Department, 1200 New York Avenue, NW, Washington, D.C. 20005, (202) 326-6450, 202-289-4021, aaasmeeting@aaas.org, www.aaas.org/meetings/.
March 29–April 2	3rd International Limnogeology Congress (ILIC3), Tucson, Arizona, USA. Information: ILIC3@geo.arizona.edu, <a href="http://w3.arizona.edu/~uaextend/ilic3/">http://w3.arizona.edu/~uaextend/ilic3/</a> . (Early registration deadline: January 15, 2003. Abstract deadline: January 2, 2003.)
May 18–24	39th Forum on the Geology of Industrial Minerals, Sparks, Nevada. Information: Terri Garside, Nevada Bureau of Mines and Geology, Mail Stop 178, University of Nevada, Reno, NV 89557, (775) 784-6691, ext. 126, fax 775-784-1709, tgarside@unr.edu, www.nbmng.unr.edu/imf.
June 8–11	3rd Latin American Congress of Sedimentology, Belém-PA, Brazil. Information: Contact: Dilce de F. Rossetti (Convenor), www.ufpa.br/latinamerican/, latinoamericano@museu-goeldi.br.
June 15–18	International Conference on Military Geology and Geography, West Point, New York. Information: Peter Anderson, Department of Geography and Environmental Engineering, The United States Military Academy, West Point, New York 10996, USA, (845) 938-3509, bp5223@exmail.usma.army.mil. (Abstracts deadline: January 4, 2003.)

## About People

GSA Fellow and Past President **Gail M. Ashley** received the 2002 Association for Women Geoscientists Foundation Outstanding Educator Award on October 28 at the GSA Annual Meeting in Denver.

GSA Members **Nancy E. Bowers** and **Penny M. Taylor** were awarded the 2002 Chrysalis Scholarships by the Association for Women Geoscientists. This financial aid is given to exemplary women graduate students in the geosciences who have experienced an interruption in their formal education and are in the final stages of writing their theses. More information is posted at [www.awg.org](http://www.awg.org).

## SEG Foundation Student Research Grants

Students of mineral resources throughout the world may apply for thesis research grants available in 2003 from the Society of Economic Geologists Foundation. The grants provide partial support of master's and doctoral thesis research for graduate students. Grants also are available to undergraduate students to support exceptional honors degree research projects.

Individual grants usually range from US\$500 to US\$3000, but larger awards may be made to particularly meritorious candidates. Awards are competitive and are intended to fund specific thesis research expenses. Applicants must describe what the project is, why the research is important, and how it is to be done, and provide a budget summary.

For application forms and details on the grants, contact Chair, SEG Foundation Student Research Grants, 7811 Shaffer Parkway, Littleton, CO 80127, USA, (720) 981-7882, ext. 204, fax: 720-981-7874, [seg@segweb.org](mailto:seg@segweb.org), or visit [www.segweb.org](http://www.segweb.org). Applications must be postmarked by February 1, 2003; awards will be announced by April 15, 2003.

## National Security Education Program's 2003 Fellowships

The Academy for Educational Development (AED) invites applications for the 2003 National Security Education Program's David L. Boren Graduate Fellowships competition. Fellowships are awarded in a broad range of academic and professional disciplines including business, economics, history, international affairs, law, applied sciences and engineering, health and biomedical sciences, political science, and other social sciences. Award recipients incur a requirement to work for an agency or office of the federal government involved in national security affairs or in the field of U.S. higher education in an area of study for which the fellowship was awarded. For details and eligibility and application information, see [www.aed.org/nsep](http://www.aed.org/nsep), or contact AED at 1-800-498-9360, (202) 884-8285, or [nsep@aed.org](mailto:nsep@aed.org). Applications must be postmarked by January 31, 2003.

## In Memoriam

**Roger G. Alexander Jr.**  
Walnut Creek, California  
June 8, 2002

**Gladys P. Louke**  
Martinez, California  
August 4, 2002

**Charles S. Content**  
Danville, California  
February 21, 2002

**Alden Loomis**  
Altadena, California  
August 17, 2002

Ads (or cancellations) must reach the GSA Advertising office one month prior. Contact Advertising Department, (303) 357-1053, 1-800-472-1988, ext. 1053, fax 303-357-1073, acrawford@geosociety.org. Please include address, phone number, and e-mail address with all correspondence.

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## Positions Open

**HYDROGEOLOGY, UNIVERSITY OF SOUTH FLORIDA**  
The University of South Florida (USF) Department of Geology ([www.cas.usf.edu/geology](http://www.cas.usf.edu/geology)) is accepting applications for a tenure-earning Assistant Professor position to begin in August of 2003, pending available funding. We are looking for a dynamic scientist with a commitment to educational and research excellence, who will develop an active research program and mentor graduate students in hydrogeology. Collaborative opportunities are available with well-established faculty research programs including hydrogeology, coastal processes, aqueous geochemistry and environmental geophysics. The expected teaching load is three courses/yr, including undergraduate and graduate-level courses. The USF Geology Department offers an innovative undergraduate curriculum, and grants B.S., M.S. and Ph.D. degrees in Geology. A Ph.D. is required at the time of employment. Salary is negotiable.

USF has a long-standing tradition of promoting a holistic and global view of water research and education. Recent hires in Geography, Environmental Science & Policy and several Engineering departments were water-related. The USF Water Institute ([water.grad.usf.edu/water.html](http://water.grad.usf.edu/water.html)) serves as an umbrella for the multidisciplinary approach to a wide-range of water-related issues.

To apply, send a letter of interest, current curriculum vitae, a statement of research goals, statement of teaching goals and arrange for at least three letters of reference to be sent to: Dr. Thomas Pichler, Chair, Hydrogeology Search Committee, Department of Geology, University of South Florida, 4202 E. Fowler Ave., SCA 528, Tampa, FL 33620-5201.

Applications will be accepted through January 15, 2003. For additional information contact Thomas Pichler (813-974-0321, [pichler@chuma.cas.usf.edu](mailto:pichler@chuma.cas.usf.edu)).

USF is an equal opportunity/affirmative action/equal access employer. Women and minorities are strongly encouraged to apply. Those persons requiring reasonable accommodation under the Americans with Disabilities Act should contact Thomas Pichler at the mail or email addresses above. According to Florida law, applications and meetings regarding them are open to the public.

### FLORIDA ATLANTIC UNIVERSITY (BOCA RATON, FLORIDA)

#### CHARLES E. SCHMIDT COLLEGE OF SCIENCE CLIMATOLOGY/BIOGEOGRAPHY AND GEOGRAPHIC INFORMATION SCIENCE

The Department of Geography and Geology invites applications for two academic year positions beginning in August 2003. Both positions are tenure-track and require a Ph.D. in geography, geology, or related discipline for appointment at the Assistant Professor level.

**Position 1**—tenure-track Assistant Professor within the fields of **climatology/biogeography**. Preference will

be given to candidates with additional expertise in digital image analysis, physical climatology, natural hazards, or hydrology. The successful candidate will share responsibility for a large enrollment lower division weather and climate general education course, along with courses at the upper division and graduate level. The successful candidate will have the opportunity to participate in a growing interdisciplinary research environment at FAU, and with the Center for Geo-Information Science and the Center for Hydrological Research and Modeling each housed in the Department of Geography and Geology. Documented interest in quality teaching, published research, and external funding will be expected.

**Position 2**—tenure-track Assistant Professor in **Geographic Information Science**. Responsibility for teaching in the undergraduate and graduate curriculum in GIS and within one or more sub-fields within Geography and the Earth Sciences. Preference will be given to candidates with demonstrated programming skills and expertise in data base management. This position will be expected to develop and offer an upper-division course in 'Programming in GIS'. The successful candidate will have the opportunity to participate in a growing interdisciplinary research environment at FAU, and with the Center for Geo-Information Science and the Center for Hydrological Research and Modeling each housed in the Department of Geography and Geology. Documented interest in quality teaching, published research, and external funding will be expected.

The Department consists of 13 full-time faculty, 2 computer and research support professional staff, along with secretarial and budget personnel, a variable number of adjunct instructors, and over a dozen graduate teaching assistantships. The Department offers BA and BS degrees in geography and in geology as well as MA and MS degrees. Department faculty support an Environmental Science master's degree and the undergraduate Environmental Studies Certificate administratively housed in the Biological Sciences Department. Authorized salary for each 9-month position is \$45,000–\$48,000. Review of applications will begin January 15, 2003, and continue until the position is filled.

Applications should include a letter of qualifications and interests, academic transcript, curriculum vitae, and the names of three references with email addresses. Please visit our web site at: [www.geogool.fau.edu](http://www.geogool.fau.edu) for further information on our programs and faculty interests. Apply: Chair Search Committee Position 1 or Position 2, Department of Geography and Geology, Florida Atlantic University, Boca Raton, FL 33431. Phone 561-297-3250, Fax -2745, email [SchultzR@fau.edu](mailto:SchultzR@fau.edu). FAU is an Equal Opportunity/Equal Access/Affirmative Action Institution.

#### STRUCTURAL GEOLOGY FACULTY POSITION UNIVERSITY OF ALABAMA

The Department of Geological Sciences invites applications for a tenure track position in Structural Geology beginning in August 2003. 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 and to teach introductory geology, structural geology, and graduate-level courses in specialized topics. Preference will be given to individuals with research specialties in one or more of the following areas: structural analysis of compressional structures in mountain belts, modeling fault and/or fold development in sedimentary basins, and modeling the development of extensional structures. The position will build on the Tectonics Program's existing strengths in extensional structures, Cordilleran tectonics, metamorphic P-T-t paths, geochronology, and volcanology. Applicants must hold a Ph.D. degree in structural geology or a related field at the time of appointment. Please send a curriculum vitae, statements of research and teaching interests, and contact information for 4 referees to Dr. Ernest Mancini, Structural Geology 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 department website at <http://www.geo.ua.edu>. Review of applications will begin on December 1, 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.

#### OREGON STATE UNIVERSITY OCEANIC AND ATMOSPHERIC SCIENCES (COAS)

The College of Oceanic and Atmospheric Sciences (COAS) at Oregon State University announces the avail-

**Lafayette College**  
**Mineralogy/Petrology/  
Geochemistry**



The Department of Geology and Environmental Geosciences at Lafayette College invites applications for an anticipated full-time one-year appointment in mineralogy, petrology or geochemistry, beginning fall 2003. We seek an individual to teach upper-level courses in mineralogy, igneous and metamorphic petrology, and geochemistry and an intro-level course in geology. In support of our teaching efforts, we have well equipped petrographic, computational and x-ray facilities as well as an extensive mineral and rock collection. Preference will be given to candidates with the Ph.D. and teaching experience; however we will consider well-qualified ABD applicants. The review process will begin February 15, 2003. Candidates should submit a letter of application, statement of teaching interests, vita, college and graduate school transcripts and three letters of reference to **Lawrence Malinconico, Department of Geology and Environmental Geosciences, Lafayette College, Easton, PA 18042**. The College is an equal opportunity employer and encourages applications from women and minorities.

  
**LAFAYETTE COLLEGE**

ability of a tenure track faculty position in Radioisotope Geochemistry. COAS is one of the leading oceanographic and atmospheric graduate research institutions in the country with more than 200 faculty and staff members, and a wide variety of assets. These include two research vessels and state-of-the-art analytical laboratories, notably a laboratory for plasma spectrometry featuring a Nu Plasma multicollector ICP-MS (<http://wmkeck-icpms.coas.oregonstate.edu/>). We seek a colleague whose research will focus on the analysis and application of radioisotopes to marine geochemistry. These applications would emphasize studies of processes and/or tracing material sources and pathways through chemical, biological, geological, and/or physical oceanographic systems. The appointee will be expected to develop and maintain a vigorous, externally funded research program, to interact with faculty colleagues, to advise and mentor graduate students, and to participate in the COAS teaching program. This faculty member would contribute to the Chemical Oceanography instructional curriculum by developing an interdisciplinary course in oceanographic applications for radioisotopes. Essential qualifications include a Ph.D. in oceanography, geochemistry, or a closely related field. The successful candidate must possess a record of significant and innovative research applying radioisotopic tools to marine geochemistry or oceanography, and the clear potential to attract external funding. Research themes could include, but are not limited to: studies of particle dynamics in seawater and/or sediments; tracing the sources and fates of nutrients or pollutants; development of chronologies as part of the study of geochemical, biological, or anthropogenic processes; tracing water masses or characterizing physical processes such as groundwater infusion into estuaries and coastal environments, ocean boundary mixing, or thermohaline circulation. Interest or experience in mentoring or teaching of graduate students is also desirable. Preference will be given to candidates at the Assistant Professor level, however, applicants with an exceptional record of research achievements and other relevant experience may be considered at the Associate Professor level. This position is funded by grant, education and general funds.

Applications should consist of a letter of interest referencing position 005-523, a detailed curriculum vitae that includes a description of current and future research

**Lafayette College  
Environmental Geology  
and Geomorphology**



The Department of Geology and Environmental Geosciences at Lafayette College invites applications for a full-time sabbatical leave replacement for the spring semester 2003 in geomorphology and environmental geology. We seek an individual with an expertise in fluvial geomorphology to teach an upper-level course in Earth Surface Processes and an intro-level course in environmental geology. In support of our teaching efforts, we have well-equipped geomorphology facilities including a 9 meter recirculating flume for simulating river processes. Preference will be given to candidates with the Ph.D. and teaching experience; however we will consider well-qualified ABD applicants. The review process will begin immediately and continue until an individual is selected. Candidates should submit a letter of application, statement of teaching interests, vita, college and graduate school transcripts and three letters of reference to Lawrence Malinicono, Department of Geology and Environmental Geosciences, Lafayette College, Easton, PA 18042. The College is an equal opportunity employer and encourages applications from women and minorities.



**LAFAYETTE COLLEGE**

interests, a list of publications, and the names and addresses of at least four references to: Mark R. Abbott, Dean; College of Oceanic & Atmospheric Sciences; Oregon State University; 104 Ocean Admin Bldg; Corvallis, OR 97331-5503. For full consideration complete applications must arrive by 16 December 2002. Inquiries about the position may be directed to Dr. Robert Collier by phone (541-737-4367), e-mail (rcollier@coas.oregonstate.edu), or by FAX (541-737-2064), or go to COAS web site at: <http://www.coas.oregonstate.edu/employment/>. Oregon State University is an AA EOE.

**RESEARCH SCIENTIST, STOCKHOLM UNIVERSITY**  
Stockholm University invites applications for a four-year position as Research Scientist in Quaternary Geology with Emphasis on Stratigraphy/Glacial Sedimentology at the Department of Physical Geography and Quaternary Geology (Ref. no. SU 614-2255-02)

The Department has a long research tradition in the fields of geomorphology, glaciology, Quaternary stratigraphy, paleoclimate and paleoenvironment and seeks to complement its research staff with a dynamic person, who is willing to establish her/his own research platform within Quaternary stratigraphy/glacial sedimentology. The position provides four years of salary; applicants are expected to apply for external research funding and participate in undergraduate and graduate education (at most 20% teaching). Knowledge of the Swedish language is not required.

Applicants should be researchers who received their Ph.D. within the last five years and who possess documented and verified research experience in Quaternary stratigraphy/glacial sedimentology.

Special weight shall be given to academic expertise in the hiring of research scientists.

Planned starting date is April 2003.

For more information about the position, please contact Professor Barbara Wohlfarth, +46-(0)8-164883, [barbara@geo.su.se](mailto:barbara@geo.su.se) or Professor Johan Kleman, Head of Department, +46-(0)8-164813, [kleman@natgeo.su.se](mailto:kleman@natgeo.su.se). Department website: <http://www.geo.su.se>

The application should contain: curriculum vitae; verified transcript of courses and verified copies of all diplomas; a complete list of publications (numbered); a 2-3 page summary of previous research and teaching experience and names of three references willing to provide let-

ters of reference upon request: a research plan (1-2 pages) and two copies of each publication that the applicant wishes to refer to. Stockholm University has issued guidelines for qualifying for employment at <http://www.pb.su.se/english-documents.html>, which should be consulted by the applicants.

The application, marked with reference number SU 614-2255-02, must arrive no later than November 20, 2002, at: Stockholm University, Registrar/PA, SE-106 91 Stockholm, Sweden, Fax +46-(0)8-163866. Whenever an application is sent by fax or e-mail, it should immediately be followed by a signed hard-copy version.

**UNIVERSITY OF MINNESOTA  
DIRECTOR, MINNESOTA GEOLOGICAL SURVEY**  
The University of Minnesota seeks to fill the position of Director of the Minnesota Geological Survey (MGS). The Director is the scientific and administrative leader of an earth science research and service organization and as such leads the MGS with considerable autonomy. The MGS is staffed by 30 professional geologists, hydrogeologists, geophysicists, and support personnel, and operates on an annual budget of approximately \$2 million. Administratively, the MGS is a unit of the School of Earth Sciences in the Institute of Technology. The MGS Director is a tenured faculty member in the Department of Geology and Geophysics and reports to the Head of the School.

The Minnesota Geological Survey carries out an active program of basic and applied geological research and provides service and education in geological matters to the people of Minnesota. Principal activities include geologic mapping in (1) structurally complex Precambrian terranes, (2) essentially undeformed sedimentary strata of Paleozoic and Mesozoic age, and (3) varied glacial deposits of Quaternary age. Geologic mapping is integrated with vigorous programs in applied geophysics, applied stratigraphy and hydrogeology, and glacial geology. MGS staff, publications and databases serve the needs of scientists, decision-makers, and resource managers at all public and private levels concerned with ground water, environmental issues, land-use planning, waste disposal, mineral discovery, and mineral-resource development.

The MGS is funded by a special appropriation from the State Legislature and in addition receives significant contract funding for special projects and research from various governmental agencies. The Director is responsible for maintaining and augmenting the present programs of research and service to the State, maintaining records of the State's mineral and water resources data, and for providing geological information and evaluation to various governmental agencies and the public. The Director is expected to work closely with University administration in presenting program proposals to the State Legislature. The Director is responsible for establishing and maintaining close working relationships with local, State and Federal agencies as well as other University departments involved in geological research and the use of geological information in public policy and resource development.

Candidates for the position must hold a Ph.D. in geology or related fields, have several years of professional experience, demonstrated management and personnel skills, and credentials qualifying them for a senior level academic appointment in the Department of Geology and Geophysics. The appointment as Director is full time for an initial period of 3 years and is renewable.

Interested persons should send a resume and the names, addresses, and telephone numbers of three references to Professor James Stout, Chair, MGS Director Search Committee, Department of Geology and Geophysics, 108 Pillsbury Hall, University of Minnesota, Minneapolis, MN 55455. Inquiries may also be made to Dr. Stout at 612 624-4344 or [jstout@umn.edu](mailto:jstout@umn.edu). The position is available July 1, 2003, and the closing date for applications is **December 2, 2002**.

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

**GEOLOGICAL SCIENCES AND SCIENCE EDUCATION  
CALIFORNIA STATE UNIVERSITY, LONG BEACH**

The Departments of Geological Sciences and Science Education at California State University, Long Beach invite applications for a joint appointment tenure-track position at the assistant or associate professor level beginning August 2003. The successful candidate will have a Ph.D. in geology or earth sciences with research and training in any area of geological sciences as well as substantial experience in K-12 education, science education, and/or teacher preparation at the time of appointment. All areas of geological sciences will be considered for the candidate's field of specialization. The incumbent will develop externally funded research programs involving undergraduate and MS students leading to scientific publication and presentation, and teach effectively within an ethnically and culturally diverse campus community. For complete

position description, see <http://seis.natsci.csulb.edu/HOMEPAGE/default.htm>, or contact Dr. Stanley Finney, Chair, Geological Sciences Department (Telephone: 562.985.4809, [scfinney@csulb.edu](mailto:scfinney@csulb.edu)). CSULB is an EEO/AA Employer.

**ENVIRONMENTAL SCIENCE AND POLICY  
UNIVERSITY OF SOUTH FLORIDA**

The Department of Environmental Science and Policy (ESP), University of South Florida, invites applications for a full-time tenure-track position at the Assistant Professor level in the area of environmental karst studies beginning August 2003, subject to funding. Responsibilities include teaching at all levels of the undergraduate and graduate program, leadership in the Department's Undergraduate Program, and developing an active, externally funded research program. Minimum Qualifications: a Ph.D. in Geology, Geography, Environmental Science, or other cognate field in hand by August 7, 2003 in order to be appointed as Assistant Professor; expertise in karst science, preferably with environmental applications, plus potential for publication and external funding. Preferred Qualifications: College level teaching experience. Applicants should submit a letter describing research and teaching interests and possible contributions to our program, a complete curriculum vitae, and the names, addresses, E-mail, and telephone numbers of three referees by January 6, 2003.

The ESP Department draws from the expertise of more than 70 interdisciplinary faculty, has over 200 undergraduate majors and 30+ Masters students, and is planning a Ph.D. program which is expected to be available in 2003. ESP will be moving into the new Natural and Environmental Sciences Building, a state-of-the-art research and teaching facility, in 2004. A Carnegie Doctoral/Research Extensive University, USF offers degree programs in 79 undergraduate disciplines, 89 master's and specialist's programs and 26 doctoral programs, including the M.D.; the faculty numbers more than 2,000 members, with 36,000 students in ten colleges on four campuses. The University of South Florida is an equal opportunity, affirmative action, equal access institution. For disability accommodations, please contact Sue Viens, by phone (813) 974-2735 or e-mail [sviens@chum1.cas.usf.edu](mailto:sviens@chum1.cas.usf.edu), at least five working days in advance. According to Florida law, applications and meetings regarding them are open to the public.

Apply to: Dr. Rick Oches, Search Committee Chair, Department of Environmental Science and Policy, SCA238, 4202 East Fowler Ave., Tampa, FL 33620; e-mail: [oches@chum1.cas.usf.edu](mailto:oches@chum1.cas.usf.edu). For information about the program, visit the Department's website at: <http://www.cas.usf.edu/esp/>.

**SONOMA STATE UNIVERSITY, CALIFORNIA  
ASSISTANT OR ASSOCIATE PROFESSOR  
OF GEOLOGY AND DEPARTMENT CHAIR**

The Department of Geology at Sonoma State University invites applications for a tenure-track chair position starting August 2003. We seek a dynamic teacher-scholar-administrator with a strong commitment to undergraduate education who will serve as Chair of the Department for a minimum of three years, in addition to teaching courses in his/her specialty and general education courses. The successful candidate will oversee the hiring of several new tenure-track faculty members to replace retiring faculty, and bring new ideas for departmental growth and curricular development for the next phase of the department's life. Areas of specialty that will be considered include all traditional disciplines in geology, except paleontology. The allocation of time in the position is 1/3 as Chair and 2/3 in teaching. Rank and salary are to be negotiated. Courses to be taught include lecture, laboratory and field courses in the major, and general education courses. The successful candidate will be expected to coordinate fundraising in support of departmental activities, and to develop an active research program involving SSU undergraduates.

The Department of Geology was formed in 1969, has 365 graduates and offers both BA and BS degrees. The Department has five tenured faculty and averages 50 majors, almost all of whom take the BS path. The BA and BS are traditional, emphasizing mineralogy, petrology, and field studies. Both degrees require 14 units of field classes, which is, as far as we know, more than required at any other school in the United States.

Required: A Ph.D. in geology, with demonstrated administrative experience at the department chair or equivalent or higher level. The successful candidate will also have a demonstrable record of teaching excellence at the undergraduate level, supported by teaching evaluations and/or peer reviews, and demonstrated research experience in their specialty.

Applications must be postmarked by December 1, 2002, in order to be considered. For the full position

announcement and application information see [www.sonoma.edu/facaffairs/](http://www.sonoma.edu/facaffairs/).

Questions concerning this position may be directed to: Dr. Rolfe Erickson, Search Committee Chair, E-mail: [rolfe.erickson@sonoma.edu](mailto:rolfe.erickson@sonoma.edu), Geology Department phone: 707-664-2334.

**HYDROGEOLOGY-STRUCTURAL GEOLOGY  
ASSISTANT PROFESSOR  
TUFTS UNIVERSITY**

Tufts University has a full-time, tenure-track position as an Assistant Professor of Geology in the area of Hydrogeology and Structural Geology, beginning September 1, 2003. Qualifications of applicants should include the Ph.D. or equivalent degree, although candidates about to complete the Ph.D. will be considered. We will also consider candidates at the Associate Professor level, based on experience and qualifications. Preference will be given to those with teaching experience at the college level and demonstrated research potential, especially in areas that blend hydrogeology and structural geology. The applicant should be able to fit into a small, well-equipped, undergraduate teaching department where research is expected and encouraged. The person hired will be expected to teach Hydrogeology, Structural Geology, and one or more related courses, and to assist in teaching the elementary courses. He or she will develop his/her own research program and seek outside funding for that research. We also encourage collaborative work with faculty in the Engineering and Environmental programs at Tufts. Applications, including references from three qualified persons, transcripts, and resume, should be sent to Anne F. Gardulski, Chair, Department of Geology, Tufts University, Medford, MA 02155. Review of applications will begin December 15, 2002 and will continue until the position is filled. Tufts University is an Affirmative Action/Equal Opportunity employer. We are committed to increasing the diversity of our faculty. Members of under-represented groups are strongly encouraged to apply.

**TENURE-TRACK FACULTY POSITION  
STRUCTURE/HYDROLOGY  
GUILFORD COLLEGE**

Guilford College Geology Department seeks applicants for a tenure-track assistant professor position, beginning August 2003. Background in hydrology, structural geology, and geophysics; strengths in environmental studies; broad interests and versatility in the earth sciences; strong commitment to undergraduate teaching in a liberal arts institution required. Courses taught include Structural Geology, Hydrology, Exploration Geophysics, and introductory courses for non-majors and majors. Areas of expertise may also include soil science, water resources, shallow-level geophysics, GIS, and other applications of information technology. Position also includes teaching courses in the interdisciplinary Environmental Studies major, advising of majors and first-year students, teaching First-Year Seminars and senior interdisciplinary courses, and mentoring undergraduate research. Candidates should send a cover letter, statement of teaching and research interests, curriculum vitae, and names and contact information of three references to Dr. Marlene McCauley, Geology Department Chair, Guilford College, 5800 W. Friendly Ave, Greensboro NC 27410. Additional information available at: [www.guilford.edu/original/academic/geology/GeoPosF02.htm](http://www.guilford.edu/original/academic/geology/GeoPosF02.htm). We begin reviewing applications Dec. 15. Guilford College seeks applications representative of diversity based on age, race, gender, sexual orientation, disabilities, ethnicity, religion, national origin, life experiences, socio-economic background, geographic roots, as well as members of the Society of Friends. EOE/AA <http://www.guilford.edu>.

**COLLEGE OF NATURAL SCIENCES AND  
MATHEMATICS  
DEPARTMENT OF GEOLOGICAL SCIENCES  
EARTH SCIENCE EDUCATION  
CALIFORNIA STATE UNIVERSITY, FULLERTON**

The Department of Geological Sciences, in conjunction with the Science Education Program, seeks applicants for a full-time tenure-track position in Earth Science Education at the Assistant or Associate Professor level beginning fall 2003. Teaching responsibilities include introductory and/or specialized courses in the Geological Sciences Department and courses for K-12 pre-service teachers and graduate courses for in-service teachers in the Science Education Program. Supervision of MAT-S (Master of Arts in Teaching-Science) students is also required. More information regarding qualifications and application procedures is available from <http://geology.fullerton.edu> (go to Job Opportunities). The successful candidate is expected to pursue extramural funding to support research interests in Earth Science Education. Applicants should send: (1) a detailed curriculum vita, (2) a letter that explains how you meet the qualifications, (3) a statement that explains courses you would

feel competent to teach, (4) a statement of your teaching philosophy, (5) a statement that identifies your research specialty within Earth Science Education, your accomplishments and future research plans and (6) at least three signed letters (emails are acceptable if followed by signed originals) of recommendation from references familiar with your teaching and research potential to: Galen Carlson-Chair of Search Committee ([GCarlson@Fullerton.edu](mailto:GCarlson@Fullerton.edu)), Department of Geological Sciences, California State University, Fullerton, P.O. Box 6850, Fullerton, CA 92834-6850. Review of applicants will begin December 31, 2002. CSUF is an Affirmative Action/Equal Opportunity/Title IX/Americans With Disabilities.

**ENDOWED CHAIR IN EXPLORATION GEOPHYSICS  
OKLAHOMA STATE UNIVERSITY**

The School of Geology at Oklahoma State University invites applications for an endowed chair faculty position in exploration geophysics. The position will be filled at the associate professor or full professor level, with or without tenure, depending on the qualifications of the successful applicant. The target starting date of appointment is August 2003.

Individuals seeking this position must possess a Ph.D. and have an extensive research record in geophysics. Candidates with industry experience are welcome to apply. The successful candidate should have skills in a wide array of exploration geophysical techniques, including acquisition, processing, and interpretation of 2-D and 3-D seismic data, gravity, and magnetics. Additionally, a thorough working knowledge of current geophysical software is essential. The ideal candidate should be able to solve problems through integration of geological, petrophysical, and reservoir engineering data.

The successful applicant will be expected to work with existing faculty to develop a quality geophysics program. This program should produce highly competitive graduates who are comfortable with geophysics, high technology, and work effectively as part of an interdisciplinary team. Duties will include the development of externally funded research grants and contracts, the publication of articles in refereed journals, a commitment to high quality undergraduate and graduate education, and advisement of graduate students.

Interested candidates should submit an application, curriculum vitae, statement of research interests (including future research pursuits), statement of teaching interests (including new courses), and the names and addresses of three references. The position will be subject to availability of funding. For full consideration, applications must be received by January 15, 2003; however, applications will be accepted until the position is filled.

OSU is a comprehensive land grant university with approximately 22,000 students. The School of Geology has a long and proud tradition of ties with the petroleum industry. The School of Geology consists of 9 full-time faculty as well as approximately 40 undergraduates, and 40 graduate students.

Please send all materials to: Geophysics Chair Search, School of Geology, Oklahoma State University, 105 Noble Research Center, Stillwater, OK 74078-3031.

For more information on the OSU School of Geology, please visit our Web site at [www.okstate.edu/geology](http://www.okstate.edu/geology).

**OSU IS AN AFFIRMATIVE ACTION/EQUAL EMPLOYMENT OPPORTUNITY EMPLOYER, COMMITTED TO MULTICULTURAL DIVERSITY**

**GEOLOGIST/ASSISTANT PROFESSOR  
WISCONSIN GEOLOGICAL AND  
NATURAL HISTORY SURVEY**

Tenure-track position available 4/1/2003. Geologist to conduct field-based investigations, including geologic mapping, focusing on the Paleozoic geology of WI in cooperation with other WGNHS staff and local, state, and federal agencies. Activities include project planning, fieldwork, data collection/compilation, report preparation, and public presentations. PhD required in geology or closely related field or MS with 4 yrs experience. Preference given to candidates with training and experience in physical stratigraphy and sedimentology, including regional stratigraphic analysis. Salary: \$40,000 min, excellent benefits package. Office located in Madison, WI. Apply by 12/1/2002 with cover letter, resume, contact information for 3 professional references, official transcripts of post-secondary academic work and three (3) examples of professional work in geology. Send to Cooperative Extension Personnel, 249 Extension Building, 432 North Lake Street, Madison, WI 53706 or email [ces.jobs@ces.uwex.edu](mailto:ces.jobs@ces.uwex.edu). Applications will be accepted until an adequate pool is achieved. Additional information available at [www1.uwex.edu/ces/personnel/](http://www1.uwex.edu/ces/personnel/) or call 608-263-1945.

**ASSISTANT PROFESSOR OF GEOLOGY  
UNIVERSITY OF SOUTHERN INDIANA**

The Department of Geology and Physics at the University of Southern Indiana invites applications for a new tenure-track

appointment in Geology at the Assistant Professor level to begin August 2003. A Ph.D. is required, but exceptional ABD candidates may be considered. Primary teaching responsibilities include Igneous and Metamorphic Petrology, complementary elective courses in the candidate's area of expertise, and introductory level courses in the geosciences. The ideal candidate will teach in our introductory meteorology/climatology sequence. In Fall 2003, our department will relocate to a new state-of-the-art science building with space dedicated for this new position. In our growing undergraduate department we stress a balance of classroom, field, laboratory, and research experiences for our majors, and we seek a dynamic colleague who will contribute to all these components.

Submit letter of application, vitae, discussion of your approach to teaching and research in an undergraduate program, and contact information for at least three references to Dr. Paul K. Doss, Geology Search Committee Chair, Department of Geology and Physics, University of Southern Indiana, 8600 University Blvd., Evansville, IN 47712. For information about our department and facilities, visit our website at <http://www.usi.edu/science/geology/index.asp>. Application deadline is January 10, 2003, but may be extended until position is filled. The University is committed to excellence in teaching, outreach to the community, scholarship and professional activity. The University of Southern Indiana is an equal employment opportunity/affirmative action employer. Women and minorities are strongly encouraged to apply.

**IGNEOUS/METAMORPHIC PETROLOGY  
AND GEOMORPHOLOGY/QUATERNARY  
GEOLOGY FACULTY OPENINGS  
GRAND VALLEY STATE UNIVERSITY**

The Department of Geology, Grand Valley State University, invites applications for tenure-track positions in igneous/metamorphic petrology and geomorphology/Quaternary geology. Each position requires a Ph.D. in Geoscience with expertise and a strong background in the position's discipline. Candidates must have a strong interest in undergraduate teaching, particularly introductory courses, as well as scholarly activity. Responsibilities include teaching introductory geology courses, other shared major courses (e.g., seminar, information technology, field methods), general-education theme courses in geology, and the position's discipline (i.e., petrology or geomorphology). Faculty are expected to do co-operative research with undergraduates, develop the use of computers in education, and carry out regular faculty duties such as advising, committee work, etc. Additional expertise or experience in areas that increase the breadth of our department are also desirable (e.g., tectonics/neotectonics; GIS/remote sensing/geological mapping; computer applications in geology; fluvial processes). The department has a faculty of nine with over 100 majors in three programs. Send a letter of application, a vita, a succinct statement of teaching philosophy, and the names, addresses, phone numbers, and e-mail addresses of three references to: William J. Neal, Chair, Department of Geology, Grand Valley State University, Allendale, Michigan 49401. (616-895-3381) ([nealw@gvsu.edu](mailto:nealw@gvsu.edu)). (<http://www.gvsu.edu/acad/geology/>). Applications for the petrology position must be postmarked by November 30, 2002. Applications for the geomorphology position will be accepted until the position is filled, however, review of applicants will begin 12/1/02. Grand Valley State University is an affirmative action, equal opportunity institution.

**ENVIRONMENTAL GEOCHEMISTRY/GEOPHYSICS  
MONTCLAIR STATE UNIVERSITY**

The Department of Earth and Environmental Studies at Montclair State University invites applications for two full-time (10-month), tenure-track faculty positions at the assistant (geochemistry) and/or associate (geophysics) rank starting September 1, 2003. The geochemistry position requires expertise in environmental analytical chemistry or geochemistry. A field-oriented research program, especially air, soil, and water field sampling as well as experience with environmental analytical laboratory techniques is preferred. The geophysics position requires expertise in environmental geophysics preferably with applications in coastal and/or aquatic systems. Experience should include environmental applications of one or more of the following geophysical techniques: resistivity profiling, shallow seismic exploration, ground-penetrating radar, gravity and/or magnetics. Additional information about the positions and the department is available at <http://www.csam.montclair.edu/earth/eesweb>. Applicants should send cover letter, curriculum vitae, three letters of recommendation, and a statement of professional goals, research interests and teaching philosophy to: Dr. Matthew Goring, Search Committee Chair (VF39 Geochemistry or VF40 Geophysics), Dept. of Earth and Environmental Studies, Montclair State University, Upper Montclair, NJ 07043.

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

The Department of Geological Sciences invites applications for a tenure track position in Hydrogeology beginning in August 2003. 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, or 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 4 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 department website at <http://www.geo.ua.edu>. Review of applications will begin on December 1, 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.

**GEOPHYSICS FACULTY POSITION  
UNIVERSITY OF ALABAMA**

**DEPARTMENT OF GEOLOGICAL SCIENCES  
Reflection Seismology/Applied Geophysics**—The Department of Geological Sciences invites applications for a tenure-track faculty position in applied geophysics, beginning August 2003. 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 applied geophysics and multichannel seismic methods, to attract and supervise masters and doctoral students, and to obtain external research funding. Experience with the acquisition, processing, and interpretation of multichannel seismic reflection data and geologic and geophysical software used to construct 3-D earth models is desired. This position complements programs in basin analysis, hydrogeology, coastal geology, and petroleum systems. The department has recently been awarded a NSF geophysical field equipment grant to enhance our geophysical research program. Equipment available includes a multichannel seismic data acquisition system, a ground penetrating radar, high-resolution marine seismic systems, 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 four referees to Dr. Richard H. Groshong, 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 December 1, 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.

**STABLE ISOTOPE GEOCHEMISTRY  
UNIVERSITY OF IOWA**

The Department of Geoscience at the University of Iowa invites applications for a full-time tenure-track Assistant or Associate Professorship in stable isotope geochemistry. We seek an outstanding researcher and teacher, who has developed or will develop an internationally recognized research program involving stable isotopes, and who will serve as Director of the Department's Paul H. Nelson Stable Isotope Laboratory (Finnigan MAT 252 IRMS with a Kiel III device, a Gasbench II H Device, and a Costech CHNS Analyzer). Desirable qualifications include expertise in areas offering collaborative opportunities with faculty within the department and university and the ability to attract external funding. The successful applicant typically will be responsible for teaching three courses per academic year including participation in the Environmental Science general education course rotation. Applicants should have their Ph.D. by the time the appointment begins in August 2003. Women and minorities are especially encouraged to apply. Applicants should send a

complete resume (including a bibliography and a statement of teaching and research interests) and have at least three letters of recommendation sent to: Ann F. Budd, Search Committee Chair, Department of Geoscience, University of Iowa, Iowa City, IA 52242-1379 (phone 319-335-1818; Fax 319-335-1821; email: [geology@uiowa.edu](mailto:geology@uiowa.edu)). Screening of applications will begin on January 20, 2003 and continue until the position is filled. The University of Iowa is an affirmative action-equal opportunity employer.

**HIGH-TEMPERATURE GEOCHEMISTRY  
OR GEOCHRONOLOGY  
UNIVERSITY OF IOWA**

The Department of Geoscience at the University of Iowa invites applications for a full-time tenure-track Assistant Professor position under the broad umbrella of high-temperature geochemistry or geochronology. We seek an outstanding researcher and teacher, who will develop an internationally recognized research program involving the elemental or isotopic chemistry of rocks and minerals that precipitate at high temperatures. Desirable qualifications include expertise in areas offering collaborative opportunities with faculty within the department and university, the ability to attract external funding, and complementary teaching expertise. The successful applicant will typically be responsible for teaching three courses per academic year including participation in the core curriculum of the Geoscience B.S./B.A. degree. Applicants must have their Ph.D. by the time the appointment begins in August 2003. Women and minorities are especially encouraged to apply. Applicants should send a complete resume (including a bibliography and a statement of teaching and research interests) and have at least three letters of recommendation sent to: Dr. Mark K. Reagan, Search Committee Chair, Department of Geoscience, University of Iowa, Iowa City, IA 52242-1379 (phone 319-335-1818; Fax 319-335-1821; email: [geology@uiowa.edu](mailto:geology@uiowa.edu)). Screening of applications will begin on January 20, 2003 and continue until the position is filled. The University of Iowa is an affirmative action-equal opportunity employer.

**ANTHROPOLOGY  
WASHINGTON STATE UNIVERSITY**

Washington State University, Department of Anthropology, invites applications for a tenure-track assistant professorship, to begin August 18, 2003. Required: Ph.D. in anthropology or closely related field completed by May 2003 and a paleoecological research focus. Preferred: specialty in paleoecological reconstruction of human ecosystems; demonstrated excellence in research and teaching; ability to teach graduate level course in paleoecology and undergraduate introductory courses in general anthropology. Analytical specialties should include pollen, phytoliths, macrofossils, or stable isotopes as applied to paleobotany or paleoethnobotany. Preference also given to those with paleoecological and archaeological experience in western North America. Experience with GIS desirable. WSU is an EEO/AA educator and employer. Protected group members encouraged to apply. Send letter of interest, names of 3-5 references (with current phone numbers and email addresses), and curriculum vitae by November 15 to: Chair, Paleoecology Search, Department of Anthropology, P.O. Box 644910, WSU, Pullman, WA 99164-4910.

**ASSISTANT PROFESSOR HYDROLOGY  
NEW MEXICO INSTITUTE OF MINING AND  
TECHNOLOGY**

New Mexico Institute of Mining and Technology invites applications for a new tenure-track position in the Hydrology Program. Appointment at a higher level may be considered for exceptional candidates. The position is a joint appointment between the Department of Earth and Environmental Science and the Geophysical Research Center, a state-funded research agency. Applicants should have a Ph.D. in Earth Sciences or a related field at the time of appointment. We seek candidates with expertise in water/land surface interactions (e.g., watershed hydrology, hydrogeomorphology, or hydroclimatology) who have strong quantitative skills and an interest in field problems. Excellence in teaching and research with potential for future growth are the most important qualifications. Responsibilities will include developing an active program of extramurally funded research, supervising and supporting graduate students, and teaching two upper-division or graduate courses per year. The successful candidate will join a program of eight full-time Hydrology faculty, eight adjunct faculty, and 30 graduate students. Hydrology is part of the Department of Earth and Environmental Science, consisting of 20 faculty and 150 undergraduate and graduate students. Additional geoscience professionals on campus include over 30 staff members of the Bureau of Geology and Mineral Resources, New Mexico's geological survey. For further information on the position and on New Mexico Tech see [http://](http://www.ees.nmt.edu/professional_ops.html)

[www.ees.nmt.edu/professional\\_ops.html](http://www.ees.nmt.edu/professional_ops.html). Applicants should submit a letter of interest, resume, college transcripts, and the names of three references to Human Resources, Box 104B, New Mexico Institute of Mining and Technology, Socorro, New Mexico 87801. To receive full consideration all materials must be received by 1 November 2002. Email applications are not accepted. New Mexico Tech is an equal opportunity/affirmative action employer.

**NANOGEOSCIENCE, U.C. DAVIS**

Assistant/Associate Professor in Nanogeoscience. The Department of Geology invites applications from scientists emphasizing geological processes at the nanoscale, with specific research in geomicrobiology, biomineralization, and/or chemical reactions at mineral surfaces. The Department of Geology seeks a scientist who will expand upon, and complement, our existing strengths in biogeology and Earth System Science, low-temperature and stable isotope geochemistry, and environmental geology. This position is part of a campus-wide initiative in Nanophases in the Environment, Agriculture and Technology (NEAT), and the candidate is expected to develop campus-wide, interdisciplinary collaborations. 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 earth sciences or related field 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: Robert Zierenberg, Chair, Geology/NEAT Committee, Department of Geology, One Shields Avenue, University of California, Davis, Davis, CA 95616, Phone: (530) 752-0350, Fax (530) 752-0951, E-mail: [NEAT-search@geology.ucdavis.edu](mailto:NEAT-search@geology.ucdavis.edu).

The position will be effective starting fall 2003. To ensure full consideration, applications should be received by November 15, 2002. The position will remain open until filled.

The University of California is an affirmative action/equal-opportunity employer. The University undertakes affirmative action to assure equal employment opportunity for minorities and women, for persons with disabilities, and for special disabled veterans, Vietnam era veterans, and any other veterans who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized.

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)  
OFFICE OF RESEARCH AND DEVELOPMENT (ORD)**

EPA is seeking three highly qualified scientific leaders who are currently engaged in bench-level work and research and development in the physical, biological, medical, or engineering sciences. Further rounds of hires are possible. The incumbent should be a nationally recognized authority and leader in an area of widespread scientific interest and investigation. He/she will typically have received honors and awards from major national organizations for his/her accomplishments. His/her reputation as a scientific leader is such that he/she serves as a recruiting attraction for recent graduates who seek opportunities to work under his/her inspiration and guidance in one of the fields of study listed below. To meet the requirements of these positions, applicants must have a PhD or equivalent experience.

These are Scientific/Technical (ST) Professional positions located in the Office of Research and Development (ORD). The ST shall be based in one of ORD's many laboratories or centers, dependent on field of study.

The minimum rate of basic pay for an ST position shall equal 120 percent of the GS-15 step 1 rate of basic pay.

The incumbent will be responsible for one of the following fields of study:

- Surface Water Hydrology
- Systems Ecology
- Human Exposure
- GIS / Spatial Analysis
- Atmospheric Sciences
- Environmental-Epidemiology
- Risk Assessment Modeling
- Genomics/Proteomics
- Bioinformatics

Interested applicants may submit a short resume, a vision statement, and 2-3 representative publications to Jayne Ramsey at U.S. EPA/ORD (8101R), 1200 Pennsylvania Avenue, NW, Washington, DC 20460.

For more information, please go to [http://www.epa.gov/ORD/hlm/jobs\\_ord.htm](http://www.epa.gov/ORD/hlm/jobs_ord.htm), or contact Jayne Ramsey at (202) 564-6736 or [ramsey.jayne@epa.gov](mailto:ramsey.jayne@epa.gov).

U.S. Citizenship Required. Applications must be post-marked by January 10, 2003. EPA is an Equal Opportunity Employer.

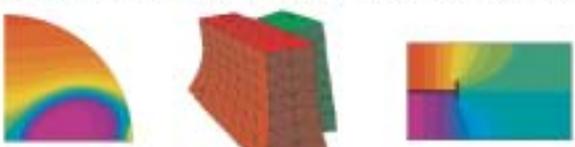


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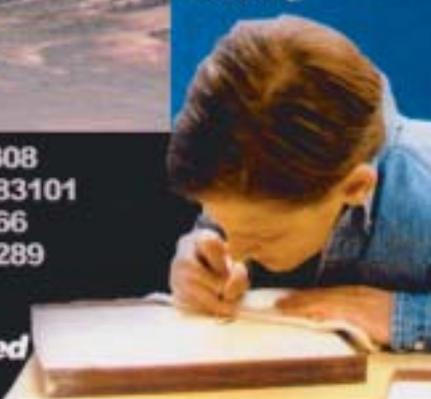
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**For the Earth Science-Minded Student**

## GSA Geology and Public Policy Committee Announces 2002–2003 Speaker's Tour

The Geology and Public Policy Committee is pleased to announce the first annual Speaker's Tour for 2003. Daniel Sarewitz, managing director and senior research scholar at the Center for Science, Policy, and Outcomes at Columbia University in Washington, D.C., has been selected as the 2003 Distinguished Lecturer, sponsored by the committee. At the request of interested institutions, Sarewitz will present one of three lectures for audiences interested in broad geologic aspects of public policy: "Use and Abuse of Scientific Predictions in Environmental Policy," "An Excess of Objectivity: Science and the Myth of Rational Decision Making," and "Science and Democracy: Who's in charge around here?"

Sarewitz's work focuses on understanding the connections between scientific

research and social benefit, and on developing policies to strengthen such connections. He is the co-editor of *Prediction: Science, Decision-Making, and the Future of Nature* (Island Press, 2000) and the author of *Frontiers of Illusion: Science, Technology, and the Politics of Progress* (Temple University Press, 1996). He has also written many other articles, speeches, and reports about the relationship between science and social progress.

Prior to taking his current position, Sarewitz was the director of GSA's Institute for Environmental Education. From 1989 to 1993, he worked on Capitol Hill, first as a congressional science fellow and then as science consultant to the House of Representatives Committee on Science, Space, and Technology. His policy-analysis responsibilities included federal research policy, international scientific cooperation, and

science education. He was also principal speechwriter for Committee Chairman George E. Brown Jr. Sarewitz received his Ph.D. in geological sciences from Cornell University in 1986.

The tour subcommittee will organize the presentation schedule to best suit the speaker and budget constraints. Host institutions are expected to provide local accommodations. To request a visit to your institution, contact Melanie Barnes, head of G&PPC Speaker's Tour Subcommittee, Texas Tech University, Department of Geosciences, P.O. Box 41053, Lubbock, TX 79409-1053, melanie.barnes@ttu.edu.

This first annual speaker's tour is limited to the area located within a one-day roundtrip from Washington, D.C. The committee hopes in subsequent tours to provide speakers to the entire United States.

## The Petroleum Institute in Abu Dhabi



### Program Faculty, Petroleum Geosciences Engineering

The Petroleum Institute in Abu Dhabi is seeking applications for faculty for the Petroleum Geosciences Engineering program. Program faculty report directly to the Program Director who has overall responsibility for leadership of the Petroleum Geosciences Engineering program. Applicants should possess an earned PhD degree in Geology, Geological Engineering, Geophysics, Geophysical Engineering, or a closely related field; relevant industrial experience is also highly desirable. Appointments at all levels (Assistant Professor, Associate Professor, Professor) are available.

Program faculty in Petroleum Geosciences Engineering will teach undergraduate and graduate courses, develop an active research program, and will engage in professional service and institutional and professional committee work. Opportunities to interact with PI industrial stakeholders and local industries will be a key feature in the development of a research program. Petroleum Geosciences Engineering faculty will work closely with the Program Head to develop departmental budgets and appropriate departmental and institutional staffing plans.

The Petroleum Institute opened in September of 2001 in newly-constructed “start-up” facilities, which provides interim space required for instruction while a new grass-roots permanent campus is built. Architectural design for the permanent campus is complete, with a view to occupancy in the fall of 2004. Petroleum Geosciences Engineering program faculty will have the opportunity to interact with the facilities design process, and will be involved in decisions on the specification of departmental infrastructure as well as for acquisition of equipment and hiring of faculty and program administrative staff. The Program will have an operating budget that is being sized for excellence in the area of faculty development and the provision of program resources.

The total compensation package includes a 12-month base salary, an expatriation allowance, and a benefits allowance that covers housing, utilities, initial furnishings, transportation (automobile purchase loan), health insurance and annual leave travel.

An appointment is desired in early summer, 2003, and should continue for at least three years. The Petroleum Institute is affiliated with the Colorado School of Mines, and additional information can be found at the PI provisional website: [www.mines.edu/pi](http://www.mines.edu/pi).

Interested candidates should submit a letter of application and a detailed resume to:

Ms. Dixie Termin

Center for the Development of the Petroleum Institute

1700 Illinois St., Colorado School of Mines

Golden, Colorado 80401 USA

Candidates are encouraged to submit applications as soon as possible but no later than January 31, 2003; transmission of materials by email is encouraged. Please send all electronic submissions to [piapp@mines.edu](mailto:piapp@mines.edu).

**EASTERN CONNECTICUT STATE UNIVERSITY  
ASSISTANT PROFESSOR: STRUCTURAL  
GEOLOGY/MINERALOGY AND PETROLOGY**

The Department of Environmental Earth Science at Eastern Connecticut State University invites applications for a tenure-track position in structural geology at the rank of assistant professor starting in the fall of 2003. The successful candidate will have a Ph.D. in geology by August 1, 2003 and will be committed to undergraduate education and research. Teaching responsibilities include structural geology, mineralogy/petrology, and introductory geology. Research interests that complement those of existing faculty (hydrogeology, GIS, sedimentology, and geomorphology) and a commitment to engaging undergraduate students in field-based research in New England is preferred. Send a letter of application, statement of teaching and research interests, curriculum vitae, unofficial transcripts and three letters of recommendation to Dr. James A. Hyatt, Chair of Structural Geology Search, Department of Environmental Earth Science, Eastern Connecticut State University, 83 Windham St., Willimantic, CT. 06226. Review of applications will begin immediately. ECSU is an AA/EOE and encourages women and minorities to apply. Departmental information is available at <http://www.easternct.edu/depts/earthsci>.

**THE UNIVERSITY OF TEXAS AT AUSTIN,  
FACULTY POSITION IN HYDROGEOLOGY**

The Department of Geological Sciences at The University of Texas at Austin seeks to fill a faculty position in hydrogeology. The specific area of research is open, but we would be particularly interested in a scientist with a research background in: (1) modeling of flow, contaminant transport, and reactions on a variety of scales; (2) groundwater/surface water interactions; or (3) integrating geophysical methodologies with groundwater analyses. The rank for this position is open, and candidates at all levels will be considered. Successful candidate will join the newly formed Jackson School of Geosciences, which includes the Department of Geological Sciences, the Bureau of Economic Geology, and the Institute for Geophysics. The School has a large and diverse community of geoscientists, excellent research facilities and support and, through the Environmental Science Institute, opportunity to interact with faculty from many disciplines. The selected candidate will demonstrate the potential to conduct a vigorous externally funded research program and should be an enthusiastic teacher who is well qualified to direct the research of MS and PhD students. The anticipated starting date for this position is August 2003; a PhD is required at the time of appointment. Please refer to <http://www.geo.utexas.edu> for additional information. To apply: please send a curriculum vitae, statement of research and teaching interests, and the names and contact information for four references to: Hydrogeology Search, Department of Geological Sciences, The University of Texas at Austin, 1 University Station C1100, Austin, Texas 78712-0254. Review of applications will begin December 1, 2002, and will continue until the position is filled. The University of Texas is an Equal Opportunity/Affirmative Action employer.

**ASSISTANT PROFESSOR  
LOW-TEMPERATURE GEOCHEMISTRY  
LAWRENCE UNIVERSITY**

Lawrence University, a private, selective undergraduate liberal arts institution with strong science programs and an acclaimed music conservatory (see [www.lawrence.edu](http://www.lawrence.edu)), invites applications for a tenure-track faculty position in geology at the assistant professor level, to begin September 2003. We seek an individual holding a PhD in the broad area of low-temperature geochemistry, including aqueous geochemistry, mineral surface chemistry, biogeochemistry, soil chemistry, or environmental geochemistry.

The appointee will be expected to teach geology and environmental science courses at the introductory through advanced undergraduate levels, to develop an active research program that involves geology and environmental studies students, and to participate in the university's multidisciplinary first-year core course. Special preference will be given to candidates who could teach optical mineralogy/crystallography.

The department has 3 tenure-track positions and maintains close ties with geology faculty at neighboring institutions. Facilities and equipment include a fully equipped geochemistry laboratory, SEM and XRD laboratories, an image analysis laboratory, and a vibracoring rig.

Applications, including c.v., statements of teaching and research interests, academic transcripts, and at least three letters of reference should be sent to: Chair, Geology Department, Lawrence University, Appleton, Wisconsin 54912, by 1 January 2003. An equal employment opportunity institution, Lawrence encourages applications from women and members of underrepresented groups.

**TENURE-TRACK POSITION IN  
MINERALOGY/PETROLOGY  
CALIFORNIA STATE UNIVERSITY, CHICO**

The Position: The Department of Geosciences invites applications for a tenure-track position in Mineralogy/Petrology starting in the Fall Semester 2003. The candidate must possess a Ph.D. in Geology with a specialty in Mineralogy/Petrology, with experience in field based igneous or metamorphic petrology, and must have the potential for excellent teaching, a demonstrated ability and willingness to teach field courses at the undergraduate level and demonstrated potential for research. More detailed information about the position is available at <http://rigel.csuchico.edu>.

As a university that educates students of various ethnic and cultural backgrounds, we value a diverse faculty and staff. CSU, Chico welcomes applicants who are knowledgeable about and interested in working within a cross-cultural learning environment.

The Department: The Department of Geosciences includes 11 full-time faculty, about 25 graduate students and 140 undergraduate majors and offers programs leading to degrees in Geology, Geosciences (with options in hydrology and science education), or Environmental Science. The Department has a wide range of field and laboratory equipment for research and instruction in all the above disciplines. The Department also maintains a computer laboratory equipped with workstations for student and faculty use. Campus support services, such as the library, are easily accessible.

The University: California State University, Chico, which serves approximately 16,000 students, is a fully accredited, state-supported member of the 24-campus CSU system.

The Community: Located in the Sacramento Valley near the foothills of the Sierra Nevada, Chico retains the charm of a small town with reasonable cost of living while offering excellent medical services, public and private schools, and many cultural and recreational activities.

Application/Nominations: Applicants should submit a letter of application which includes teaching and research interests and teaching philosophy, complete academic transcripts (unofficial, verifiable transcripts are acceptable), three letters of reference, samples of written and published material, and a curriculum vitae.

Application review begins January 10, 2003. Applications received after that date may be considered. Send application materials to: Chair, Search Committee, Department of Geosciences, California State University, Chico, Chico CA 95929-0205. Phone: 530-898-5262.

CSU, Chico only employs individuals lawfully authorized to work in the U.S. an EOE/AA/ADA employer.

**TWO FACULTY POSITIONS  
FLORIDA STATE UNIVERSITY  
MARINE GEOSCIENCE/GEOPHYSICS AND  
EARTH-ENVIRONMENT SYSTEMS**

The Department of Geological Sciences at Florida State University invites applications for two tenure-track faculty positions in the broadly defined areas of marine geoscience/geophysics and environmental systems, with emphasis on processes and dynamics. These positions, to start August 2003, will be filled at either the assistant or associate professor level and will result in a total of five early-career hires within four years in a growing department of 15 faculty. Research specialties are open; areas of interest include but are not limited to the following.

Marine Geoscience/Geophysics: geofluids, sedimentation and morphodynamics, paleo-marine systematics (e.g., paleoceanography), geophysical processes/phenomena, seismic stratigraphy, paleomagnetism

Earth-Environment Systems: isotope systematics, biogeochemistry, environmental fluids/transport phenomena, geochemical cycles.

The Department of Geological Sciences embraces a vision to educate scientists for the 21st century multi-disciplinary workplace, maintaining strong programs in traditional geological disciplines as well as environmentally related fields. Faculty and students are housed in the newly renovated Carraway Building, and at the National High Magnetic Field Laboratory, home of a state-of-the-art isotope geochemistry facility. Department members enjoy affiliations with the Geophysical Fluid Dynamics Institute, the Center for Earth Surface Processes Research, the Center for Materials Research and Technology, the Antarctic Research Facility and the School of Computational Science and Information Technology, in addition to collaborations with members of numerous departments across campus, particularly the Department of Oceanography. FSU was recently elected as a member of the Joint Oceanographic Institutions (JOI).

Applications should include a vita, a statement of research and teaching interests, and names of at least three references, including e-mail addresses and telephone numbers. Applicants at the associate level should

provide a list of at least five references. Applications sent electronically (pdf format) to [search\\_committee@gly.fsu.edu](mailto:search_committee@gly.fsu.edu) are highly preferred, but may be sent via normal mail to Search Committee, Department of Geological Sciences, Florida State University, Tallahassee, Florida 32306-4100. Copies of no more than two representative papers may be sent with applications. Review of applications will begin 15 November 2002. Representatives will be available to discuss the positions with candidates at the GSA Annual Meeting in Denver, and at the AGU Fall Meeting in San Francisco (contact David Furbish, [furbish@gly.fsu.edu](mailto:furbish@gly.fsu.edu) or Vincent Salters, [salters@magnet.fsu.edu](mailto:salters@magnet.fsu.edu)). Florida State University is an EO/AA employer committed to diversity in hiring and a public records agency.

**GEOLOGY INSTRUCTOR FOR  
DISTANCE LEARNING PROGRAM  
MISSISSIPPI STATE UNIVERSITY**

The Department of Geosciences at Mississippi State University invites applications for a new full-time, non-tenure track instructor (9-month appointment with additional summer teaching and salary available and expected) position. An M.S. degree in geology or related discipline is required. This position is with the Geoscience Distance Learning Programs and will begin 1 January 2003. The Instructor will be teaching a wide variety of geology courses in our Teachers In Geosciences distance learning program. Courses to be taught may include Geology of North America, geomorphology, rocks and minerals, earthquakes and volcanoes, and historical geology. Interest in distance learning techniques is essential. Extensive computer knowledge and an interest in leading summer field courses for teachers in various locations across the country are highly desirable. Instructional technology experience is also desirable.

The Geoscience Distance Learning Programs offer B.S. and M.S. degrees in Geoscience. The distance learning programs have enrollments of over 400 undergraduate and over 200 graduate students. The department presently offers seventeen undergraduate courses and twenty-two graduate courses by distance learning. Enrollments are expected to continue to increase and new courses are being added. More information on the distance learning programs can be found at <http://www.msstate.edu/dept/geosciences/distance.html>. The Geoscience Distance Learning Programs presently consist of six instructors and four professional/support staff members. The Department of Geosciences is growing rapidly and currently has twenty-eight faculty and staff. In addition, the department and the Distance Learning Programs have just moved into completely renovated and expanded facilities.

Candidates should submit a letter of application, curriculum vitae, copies of transcripts, and the names of three people who may be contacted for letters of recommendation. Screening of applicants will begin November 1 and continue until the positions are filled. Preliminary interviews may be scheduled at the GSA annual meetings in October. Women and minorities are encouraged to apply. Mississippi State University is an Affirmative Action/Equal Opportunity Employer. Apply: Dr. Mark S. Binkley, Head, Department of Geosciences, P. O. Box 5448, Mississippi State, MS, 39762. Voice (662) 325-3915. E-mail: [binkley@geosci.msstate.edu](mailto:binkley@geosci.msstate.edu).

**ASSISTANT PROFESSOR, GEOCHEMISTRY  
GEOLOGY DEPT., UNIVERSITY OF VERMONT**

Full time, tenure track position to begin September, 2003. Preferred candidates will approach geochemical problems using both field and analytical methods complementing departmental interests in crustal evolution, mountain systems, petrology, and surface processes. Expertise should include quantitative geochemical analysis of natural systems including fluid-rock interactions under a wide range of P/T conditions. Candidate should integrate, at the undergraduate and MS level, high-quality research and teaching that utilizes Vermont's unique and highly varied geologic setting. Responsibilities include developing a strong research program, advising MS and undergraduate research, teaching core 2nd year Earth Materials course, 3d year general geochemistry course, and graduate courses of the candidate's choosing. PhD. required. Questions and applications (only by PDF, <3 MB) to [geochem@zoo.uvm.edu](mailto:geochem@zoo.uvm.edu) including only CV, research and teaching interests, and contact information for three references by December 31, 2002. The University is an affirmative action, equal opportunity employer.

**STRATIGRAPHY/SEDIMENTOLOGY  
CALIFORNIA STATE UNIVERSITY, FULLERTON**

The Department of Geological Sciences, California State University, Fullerton, invites applications for a tenure-track position starting August 2003. We anticipate filling this position at the rank of Assistant Professor, however,

Department of Geosciences  
PRINCETON UNIVERSITY



## HARRY HESS FELLOWS PROGRAM

The Department of Geosciences at Princeton University announces competition for the Harry Hess Fellowships for the 2003-2004 academic year. This honorific postdoctoral fellowship program has been established to provide opportunities for outstanding young geoscientists to work in the field of their choice. Research may be carried out independently or in collaboration with members of the Geosciences Department. One or more Hess fellows are usually appointed each year. Applicants must have obtained a Ph.D. at the time of the start of the fellowship, but not more than five years before. Current areas of research include:

- Geochemistry
- Biogeochemical Cycles
- Paleontology
- Mineral Physics
- Tectonics
- Petrology
- Structural Geology
- Geophysics
- Seismology
- Geomicrobiology

Candidates should send a letter of application and the supporting materials listed below to the HESS FELLOWS COMMITTEE, c/o Professor F. A. Dahlen, Department of Geosciences, Guyot Hall, Princeton University, Princeton, NJ 08544. Applications will continue to be accepted until the available positions are filled, but no later than December 31, 2002.

- Curriculum vitae
- List of publications and preprints
- Brief statement of research interests and goals
- Name, address and email address of three referees familiar with the candidate's work

Hess fellowships provide a competitive annual salary, depending upon experience, along with an allowance for travel to meetings and research support. Initial awards are for one year, with a starting date that must be before January 1, 2004. Extensions for an additional year are generally granted depending upon satisfactory performance. Applications will continue to be accepted until the available positions are filled, but no later than December 31, 2002. Hess fellowship applicants will also be considered for other available postdoctoral positions in the Geosciences Department.

Princeton University is an Affirmative Action/Equal Opportunity employer and particularly welcomes applications from women and members of minority groups.

Information about the research activities of the Department of Geosciences may be viewed at <http://geoweb.princeton.edu>.

candidates with exceptional qualifications may be considered for appointment at a higher rank. The successful applicant will have the following credentials and capabilities:

A Ph.D. in Geology or a related discipline at the time of appointment;

A primary interest in teaching and achieving excellence in teaching;

A vigorous, field-based research program in stratigraphy/sedimentology that would allow involvement of undergraduate and graduate students.

A research emphasis in clastic sedimentology and/or sequence stratigraphy and an ability to interact with faculty in neotectonics, geomorphology, paleoclimatology and/or hydrology would be considered favorably.

Teaching responsibilities are sedimentation and stratigraphy, paleontology, and graduate-level basin anal-

ysis. Additional teaching responsibilities may include physical geology, historical geology, field geology, as well as graduate courses in the new faculty member's area of expertise. Research activities must result in publications in refereed journals.

CSU Fullerton is a large urban university dedicated to the preeminence of learning. Located 22 miles southeast of metropolitan Los Angeles, Fullerton is a full-service city renowned for its unique mix of residential, commercial and industrial, educational, and cultural environments that provide residents with an outstanding quality of life. The Department has ten full-time faculty with expertise in traditional and applied areas of geology. The nearby geological provinces provide abundant opportunities for field-based research, which the department emphasizes in its curriculum. We have about 50 undergraduate majors and

a small but growing MS graduate program. Other information is available from our web page at <http://geology.fullerton.edu/>.

To apply, please send (1) a detailed curriculum vita, (2) a letter of application that explains how you meet the qualifications outlined above, (3) a statement about teaching that includes a discussion of relevant course work and/or experience in preparation for teaching, a list of courses you would feel comfortable teaching, and a statement of your teaching philosophy, (4) a statement of your future research plans and goals, and (5) letters of recommendation from at least three references familiar with your teaching and research potential — referees should send their letters directly to the address below.

Send application to: Dr Diane Clemens-Knott, Chair, Search Committee, Department of Geological Sciences, California State University, PO Box 6850, Fullerton, California 92834-6850. Applications will be accepted until the position is filled. To receive serious consideration applications should be received by November 30, 2002.

California State University, Fullerton is an Affirmative Action/Equal Opportunity Employer. All personnel policies conform to the requirements of Executive Order 11246, the Americans with Disabilities Act (ADA) of 1990, Title IX of the Higher Education Amendments of 1972 and other federal regulations regarding nondiscrimination.

### OPTICAL MINERALOGY/GEOTECTONICS/ GEOHYDROLOGY/ENGINEERING GEOLOGY CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

The Geological Sciences Dept. invites applications for a tenure track faculty position at the Associate Professor level beginning September 2003. Applicants must have an earned doctorate in Geology with a specialty in one of the above mentioned fields and teaching expertise in two or more of the following areas: Optical Mineralogy, Geotectonics, Geohydrology and Engineering Geology, a minimum of five years of full-time, documented, effective, high quality college-level undergraduate teaching experience and a grant and publication record commensurate with an associate professor-level appointment. Applicants must be actively involved in the field study of the southwest U.S. and should have experience directing undergraduate research projects. Preference will be given to applicants who possess knowledge of GIS software and GIS/GPS applications to Geology and who can teach a broad range of general education and service courses. Successful candidates must be committed to working with a diverse student body. Responsibilities broadly include teaching and developing core courses in the above-mentioned fields as well as general education and service courses, directing undergraduates in field-oriented research in the southwest U.S., integrating GIS into the geoscience curriculum, advising students and carrying out committee assignments. Applicants must submit a resume, a statement of teaching and research interests, three recent letters of reference as well as names and contact information for two additional references, transcripts (unofficial OK), and a completed application form (supplied by the Dept.). Official transcripts are required of all finalists. Mail requests and materials to: Dr. John A. Klasik, Chair, Geological Sciences Department, Cal Poly Pomona, Pomona, CA, 91768. Initial screening: January 6, 2003, position open until filled or terminated. EO/AA employer.

### MARINE, EARTH, AND ATMOSPHERIC SCIENCES NORTH CAROLINA STATE UNIVERSITY 5 TENURE TRACK POSITIONS

The Dept. of Marine, Earth and Atmospheric Sciences (MEAS) at North Carolina State University (NCSU) invites applications for 5 tenure track faculty positions at the level of Assistant Professor in the fields of Air Quality, Geodynamics, Geological Oceanography, Coastal Physical Oceanography, and Terrestrial Mesozoic Studies. The successful candidates are expected to establish vigorous programs of scholarship and sponsored professional activity that should include, but are not limited to, active research involving high-quality graduate students, teaching at undergraduate and graduate levels, and involvement in various outreach programs. A PhD. degree in an appropriately related field is required for each position.

MEAS at NCSU is one of the largest interdisciplinary earth science departments in the nation with 32 full-time faculty. MEAS is a charter member of the Consortium for Oceanographic Research and Education (CORE) and part of the Duke/University of North Carolina Oceanographic Consortium, which operates the R/V CAPE HATTERAS, a 135-foot oceanographic research vessel. The department encompasses a rich variety of research opportunities, including the Center for Marine Science and Technology (CMASST) is a coastal research, teaching, and outreach facility located at Morehead City, NC), the Program for Air Quality, and the Program for the Exploration of the Dinosaurian World. In addition, we house the State

Climate Office and share space with the National Weather Service. The department has extensive computational resources, including access to the NC Supercomputer Center. North Carolina State University is located in Raleigh, which forms the eastern apex of the Research Triangle Park made up of many colleges, universities, government laboratories, research institutes, and a thriving private sector. Further details concerning the department and the University can be found at our websites <http://www.meas.ncsu.edu>, <http://www.ncsu.edu/>.

**AIR QUALITY:** Applicants should have expertise in one or more of the following areas: chemistry and physics of air pollution; urban/regional/global air quality modeling/forecasting; photochemical transformations; nucleation and growth of atmospheric aerosols; air pollution meteorology; and impact of air quality on climate. The potential for building upon existing research programs in the department and the University is highly desirable. A special opportunity exists for collaboration with the U.S. EPA (National Exposure Research Lab) and NOAA (Air Resources Lab) that are located nearby in Research Triangle Park. Exceptionally qualified candidates could be considered for higher rank. Search committee chair: Dr. V. Saxena.

**GEODYNAMICS:** We seek applicants who have a fundamental understanding of geological processes, possess the ability to build a potent research and teaching program that emphasizes quantitative approaches to these processes, and can develop linkages between crustal studies and other research programs in the department. Examples of interest include, but are not restricted to, the interaction of surface processes-tectonics-climate, sea level changes related to crustal motion, geologic hazards, and sedimentary basin evolution. Search committee chair: Dr. J. Hibbard.

**GEOLOGICAL OCEANOGRAPHY:** We seek a candidate with field interests and a strong background in areas such as continental margin processes, ocean basin evolution, or paleoceanography. Interactions between the successful candidate's research program and existing MEAS research programs (e.g., geochemistry, surface-earth processes and hydrogeology, as well as biophysical oceanography) are encouraged and highly desirable. Department resources include CMAST, the Oceanographic Remote Sensing Facility, on-campus sample storage and staging areas, as well as a machine shop. Search committee chair: Dr. D. DeMaster.

**Coastal Physical Oceanography.** We are particularly looking for candidates with strong backgrounds in field-based estuarine and coastal ocean processes. This position will be located on main campus and will have access to extensive marine science facilities both on campus and on the coast. Facilities available on main campus include the Oceanographic Remote Sensing Facility, the Ocean Science Technology and Engineering Facility (for equipment preparation, development and maintenance supporting field and laboratory activities), and a machine shop. Comparable facilities are available off-campus at CMAST for coordination and execution of coastal field activities of relevance to North Carolina. This is the first of three positions dedicated to developing coastal activities throughout CMAST. MEAS anticipates an exciting period of growth over the next few years at CMAST comes. Candidates must have a Ph.D. in physical oceanography or a closely related field. Post-doctoral experience is preferred. Search committee chair: Dr. John M. Morrison.

**TERRESTRIAL MESOZOIC STUDIES:** This position will be supported jointly by MEAS and the North Carolina Museum of Natural Sciences (<http://www.naturalsciences.org>). Individuals with specialties in paleo-climatology, -biology, -ecology and/or -surficial processes are encouraged to apply. The successful applicant is expected to participate in the Program for the Exploration of the Dinosaurian World (<http://www.dinoheart.org/center.html>). The Program is a consortium of scientists from the University and the Museum, as well as in other organizations in the US and abroad, which has as its objective the study of the evolution of terrestrial ecosystems through Mesozoic time.

Outreach responsibilities for this position will be directed towards activities with the Museum. Founded in 1879, the Museum is the largest natural sciences museum in the Southeast. In April 2000, the Museum moved into a new 7-story, 200,000-square-foot state-of-the-art facility. The mission of the Museum is to enhance the public's understanding and appreciation of the natural environment in ways that emphasize the diversity of North Carolina and the southeastern United States and relate the region to the natural world as a whole. Search committee chair: Dr. N. Blair.

Applicants should provide full curriculum vitae, a selection of reprints, separate statements of research and teaching goals that demonstrate commitment to interdisciplinary interests, and the names and contact information

of at least three references. Forward applications to Chair, (position title) Search Committee, Dept. of Marine, Earth and Atmospheric Sciences, Box 8208, North Carolina State University, Raleigh, NC, 27695-8208. Direct questions to [MEASsearch@ncsu.edu](mailto:MEASsearch@ncsu.edu) (subject = search chair). Review of applications will begin October 15, 2002 and will continue until the various positions are filled. NC State is an equal opportunity, affirmative action employer and especially solicits applications from women, underrepresented minorities, and persons who are physically challenged. Proper documentation of identity and employability will be required.

#### CALIFORNIA INSTITUTE OF TECHNOLOGY POSTDOCTORAL FELLOWSHIPS IN GEOLOGICAL AND PLANETARY SCIENCES

The California Institute of Technology announces two fellowships in earth and planetary sciences: The O.K. EARL POSTDOCTORAL FELLOWSHIP, and The TEXACO POSTDOCTORAL FELLOWSHIP.

These awards are from funds endowed by ORRIN K. EARL, JR. and by the TEXACO PHILANTHROPIC FOUNDATION. Each fellowship carries an annual stipend of \$42,000 plus a research expense fund of \$2,000 per year and one-way travel to Pasadena. The duration of each appointment will normally be for two years, contingent upon good progress in the first year, and beginning with the 2003-2004 academic year. Fellows are eligible to participate in Caltech's health and dental program.

These fellowships have been established to support the research of scientists typically within two years after receipt of the Ph.D. The intent of the program is to identify and support innovative and creative work in the earth and planetary sciences, with particular emphasis on interdisciplinary work. Applicants with training in physics, chemistry, biology or computer sciences are urged to apply. The Caltech faculty is currently active in geobiology, geochemistry, geology, geophysics, petrology, seismology, environmental science and engineering, and atmospheric and planetary sciences. It is expected that each fellowship holder will be hosted by a division professor (designated by the division chairman) who will contribute to the fellowship support both financially and by providing intellectual guidance.

Application forms may be obtained by writing to Prof. E.M. Stolper, Chair, Division of Geological and Planetary Sciences, Mail Code 170-25, California Institute of Technology, Pasadena, California 91125, or send email to: [mmedley@gps.caltech.edu](mailto:mmedley@gps.caltech.edu), or forms can be downloaded from our website: <http://www.gps.caltech.edu/positions/positions.html>.

COMPLETED APPLICATIONS WITH REFERENCES SHOULD ARRIVE AT CALTECH BY Friday, December 20, 2002.

Fellowship candidates will automatically be considered for other available postdoctoral positions at Caltech in their fields of interest.

Caltech is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and disabled persons are encouraged to apply.

#### GEOSCIENCE EDUCATION, OHIO UNIVERSITY

The Department of Geological Sciences at Ohio University invites applications for a tenure-track appointment at the assistant professor level in Geoscience Education to begin in September 2003, contingent on budgetary conditions. We are seeking an individual who is committed to teaching and pedagogical research, and who will enhance the active learning environment of the department's general education courses, coordinate the introductory laboratories, and develop the department's contribution to teacher education in collaboration with the College of Education. Preference will be given to those candidates with public school or junior college teaching experience, experience teaching geoscience courses designed for students preparing to be teachers, facility teaching with technology, and research interests in the teaching and learning of lower level college geoscience. The successful candidate will be expected to teach a variety of undergraduate geoscience courses including those designed for teacher education students, plan/conduct professional development for area public school teachers, and work with faculty in the College of Education. Excellence in undergraduate teaching and student advisement must be complemented by the development of a strong personal pedagogical research program supported by external funds. The successful applicant will possess a Ph.D. in geoscience and must show demonstrated potential for teaching and research in some aspect of geoscience education.

Applicants should send a vita, a description of teaching philosophy and experience, research interests, and the names and addresses of three referees to: Search Committee Chair, Department of Geological Sciences, 316 Clippinger Laboratories, Ohio University, Athens, Ohio 45701-2979. For further information concerning the

department and its faculty, visit the Ohio University web site at [www.ohiou.edu](http://www.ohiou.edu). Applications should be received before December 1, 2002, but will be considered until the position is filled. Women and minorities are especially encouraged to apply. Ohio University is an affirmative action/equal opportunity employer.

#### SEDIMENTARY GEOLOGY/PALEONTOLOGY DENISON UNIVERSITY

The Department of Geology and Geography invites applications for a tenure-track appointment, at the Assistant Professor level, to begin fall 2003. A Ph.D. is required. Primary teaching responsibilities include historical geology, sedimentology/stratigraphy, introductory physical geology, and an upper-level course in the candidate's area of expertise. Our department stresses a balance of classroom, field and laboratory experiences for our majors, and we seek a colleague who will contribute to all these components of our undergraduate curriculum. Denison is a selective liberal arts college strongly committed to and supportive of excellence in teaching and active faculty research, which involves undergraduate students.

Please submit a letter of application, including a discussion of your approach to teaching and research in a liberal arts setting, along with a vita, academic transcripts and contact information for three references to Dr. Tod A. Frolking, Department of Geology and Geography, Denison University, Granville, OH 43023; (740) 587-6217; [frolking@denison.edu](mailto:frolking@denison.edu). Please visit our website at <http://www.denison.edu/geology>. Application materials must arrive by November 15, 2002 for full consideration; interviews will be held on campus in January. Early applications are strongly encouraged as we hope to meet with candidates at the GSA meeting in Denver. Denison is an affirmative action/equal opportunity employer. Women and minorities are encouraged to apply.

#### EARTH SCIENCE TEACHER EDUCATION EASTERN MICHIGAN UNIVERSITY

The Department of Geography and Geology at Eastern Michigan University invites applications for a tenure-track faculty position at the assistant professor level in the field of earth science teacher education, effective August 2003. A Ph.D. is required at the time of appointment. Teaching experience at the K-12 level is a plus, but not required.

We seek a creative candidate to oversee the earth science for elementary teachers course, develop upper-level courses in earth science specifically geared for elementary teachers, teach methods courses for secondary teachers, and to act as a liaison between the Department and the College of Education, and the local K-12 community. Research in the field of science education is expected.

Applicants should send a letter of application, including a statement about how you meet the qualifications, your teaching and research interests, a detailed curriculum vitae that includes education, publications, experience; and the names, addresses, phone numbers, and e-mail addresses of at least three references familiar with your teaching and research potential. Send applications or requests for further information to: Posting #F0310, Eastern Michigan University, 202 Boone Hall, Ypsilanti, MI 48197.

The review of applications will begin November 15, 2002 and continue until the position is filled. Eastern Michigan is an EO/AA employer. Women and minorities are encouraged to apply. For additional information about the Department and the University see our website: [www.emich.edu/public/geo/welcome.html](http://www.emich.edu/public/geo/welcome.html).

#### GEOCHEMISTRY POSITION, UNIVERSITY OF OREGON

The Department of Geological Sciences invites applications for a faculty position to begin in Fall 2003. While it is likely that the position will be filled at the assistant professor level, exceptional applicants may be considered at the associate professor level. We seek an individual who applies light stable isotopic, trace element, or other inorganic geochemical techniques to the study of chemical processes on the Earth's surface or within the Earth's crust or hydrosphere.

The successful candidate will be expected to establish a laboratory appropriate for her or his research focus, develop an externally funded, academically oriented research program, and contribute to teaching at both the undergraduate and graduate levels.

Completion of the Ph.D. is required and postdoctoral research experience is desirable. Applicants should send a curriculum vitae, statements of teaching and research interests, and the names, postal and email addresses, and telephone numbers of three referees to Geochemistry Search Committee, Department of Geological Sciences, 1272 University of Oregon, Eugene, OR 97403-1272. We will begin reviewing completed applications November 15, 2002 and will continue until the position is filled.

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continued from p. 37

The University of Oregon is an equal opportunity/affirmative action institution committed to cultural diversity and compliance with the Americans with Disabilities Act.

**WELLESLEY COLLEGE  
ASSISTANT OR ASSOCIATE PROFESSOR**

The Geology Department at Wellesley College invites applications for a tenure-track faculty position at the rank of second-level assistant or first-level associate professor beginning September 2003. We seek an exceptional scientist whose teaching and research will expand our current geologically oriented program into some area of environmental problem solving. Applicants should have expertise in hydrology, low temperature geochemistry, soil science or civil and environmental engineering with geo-environmental emphasis. Candidates are also expected to have at least three years of undergraduate teaching experience and an established, externally funded research program that can engage undergraduate students.

Applicants should send their curriculum vitae, a statement of teaching and research interests and the names and contact information (including email address) of three referees to Dr. Margaret D. Thompson, Chair, Geology Department, Wellesley College, Wellesley, MA 02481. Applications will be accepted until December 1, 2002.

Wellesley College is an Equal Opportunity/Affirmative Action educational institution and employer; successful candidates must be able to work effectively in a culturally diverse environment. Applications from women, minorities, veterans, and candidates with disabilities are encouraged.

**TWO POSITIONS  
INDIANA UNIVERSITY NORTHWEST**

The Department of Geosciences seeks to fill two full-time, tenure track geologist positions at the Assistant Professor level beginning mid-August 2003 (pending final budgetary approval in late October 2002). The candidates should be broadly trained with a strong desire to work in an undergraduate department that focuses on excellence in teaching and research and involving students in research. Candidates are expected to incorporate field trips into courses and participate in a regional field course. IUN is developing an interdisciplinary MS degree in environmental studies and both faculty would be expected to contribute to the program. Normal teaching load is 3 courses

per semester. Opportunities, resources available for summer teaching and research. Ph.D. in geology required at time of appointment.

**Sedimentologist/Stratigrapher**—primary teaching in sedimentology, stratigraphy, hydrogeology, historical geology, introductory course in earth science and upper division courses in area of expertise.

**Surficial Geology**—primary teaching in geomorphology, introductory course in Earth sciences, upper division courses in area of expertise.

A detailed position announcement is available at: [www.iun.edu/~jobsnw](http://www.iun.edu/~jobsnw). Send letter of application, statement of teaching and research interest, detailed curriculum vitae, undergraduate and graduate transcripts and names and contact information (including e-mail) of three references to Dr. Kristin Huysken, Search Chair, Geosciences, IUN, 3400 Broadway, Gary, IN 46408-1197.

Applications should be received by January 15, 2003, to ensure full consideration. Additional information is available at: [www.iun.edu/~geos](http://www.iun.edu/~geos). AA/EEO Employer.

**Opportunities for Students**

**Ph.D. Student Assistantships.** Oregon State and Portland State Universities are offering fifteen Ph.D. research assistantships to explore all aspects of the Earth's subsurface microbial biosphere. Tuition and stipend are provided by the NSF IGERT program and the two universities. Students will work in interdisciplinary teams of engineers, oceanographers, microbiologists, microbial ecologists, geologists, soil scientists, and chemists to solve environmental problems, to understand global chemical cycles, and to determine the impact of subsurface microorganisms on surface ecosystems. More information can be found at: <http://oregonstate.edu/dept/igert/>, or Martin R. Fisk, College of Oceanic and Atmospheric Sciences, Oregon State University, [mfisk@coas.oregonstate.edu](mailto:mfisk@coas.oregonstate.edu). Students from all scientific backgrounds are encouraged to apply to departments represented by IGERT faculty at either institution. U.S. citizens or permanent residents can be supported by IGERT funds, however students of all nations can participate in the program. Review of applications starts 2/1/02. Oregon State and Portland State Universities are committed to equality in education.

**Research/Teaching Assistantships.** Graduate Program of Hydrologic Sciences. University of Nevada, Reno. Applications are encouraged for graduate teaching/research assistantships beginning July 1, 2003. Positions carry an annual stipend of approximately \$14,000 including tuition and fees. Students interested in the area of ground water, surface water and aqueous geochemistry are encouraged to apply. Additionally, funded research assistantship are available in paleohydrology, contaminant transport, watershed hydrology and numerical simulation, as well as scholarships and doctoral fellowships offered through UNR and the Desert Research Institute. Completed application packages are due January 10, 2003 and should be mailed to: Graduate Program of Hydrologic Sciences, Mail Stop 175, LMR 267, Reno, NV 89557-0180. Information on assistantships and fellowships in the Hydrologic Sciences Graduate Program can be found at [www.hydro.unr.edu](http://www.hydro.unr.edu) or by calling 775-784-6250.

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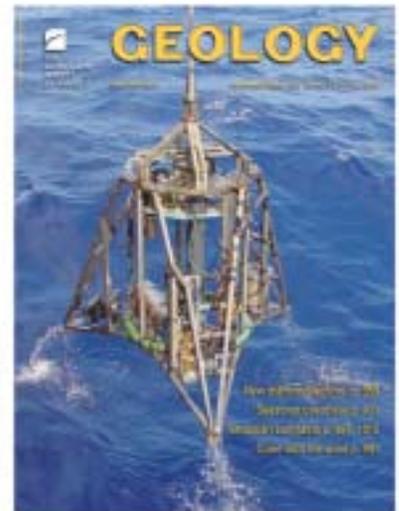
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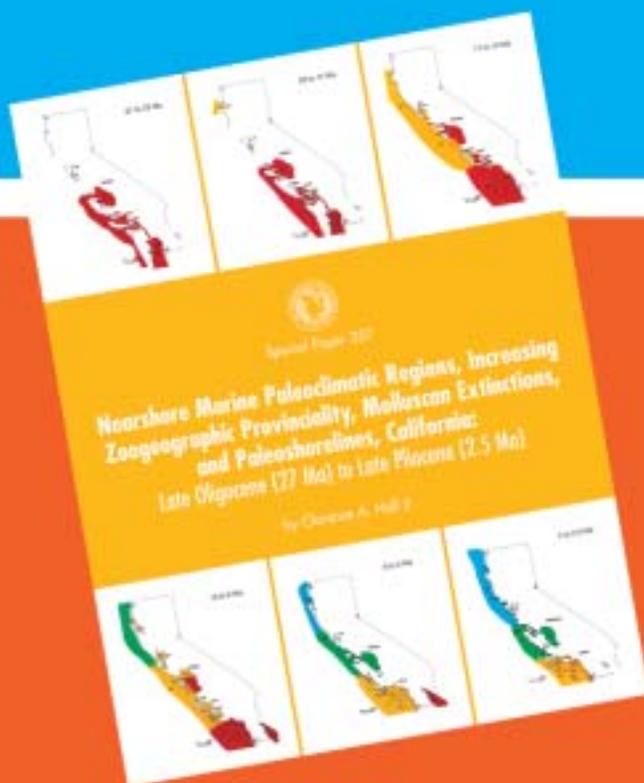
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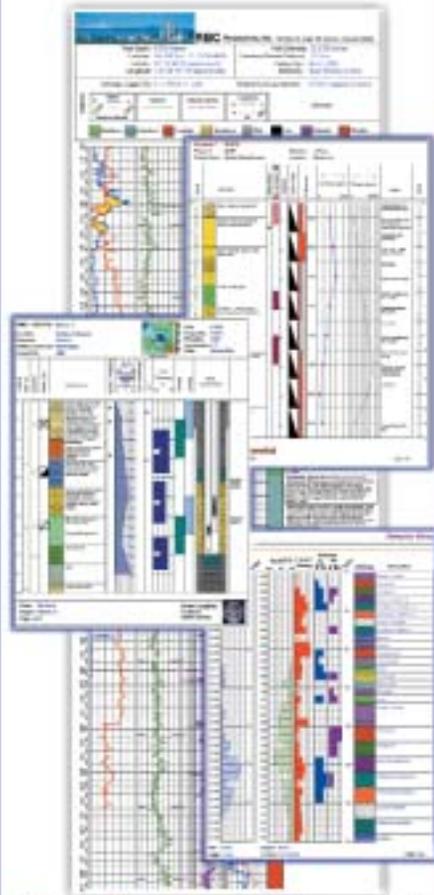
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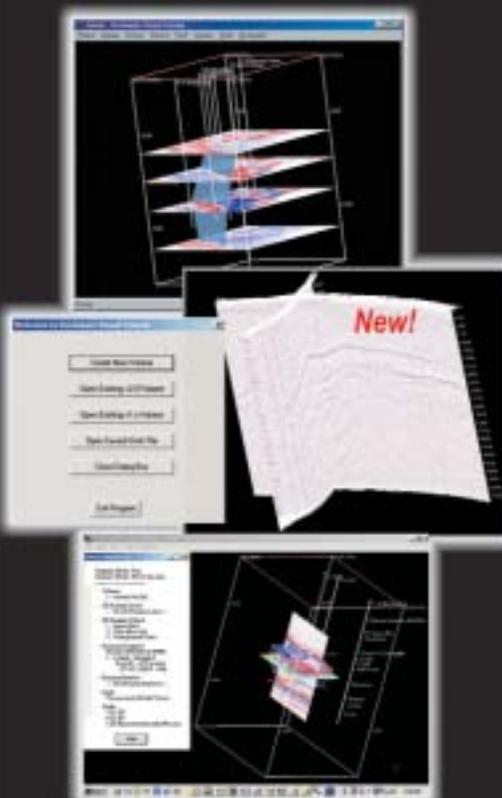
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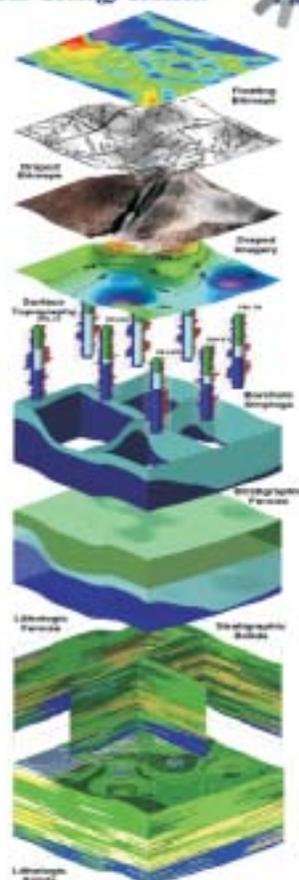
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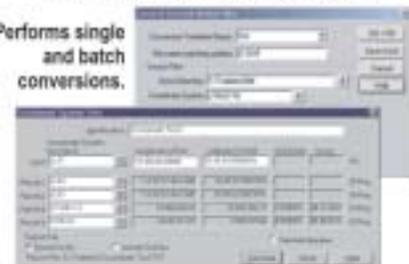
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