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## The non-equilibrium landscape of the southern Sierra Nevada, California

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**Cover:** Salmon Creek, tributary to the Kern River, southern Sierra Nevada, California. Upstream portions of tributary streams flow across a low-relief, relict landscape. Deep incision of river canyons into the relict landscape indicates a change in boundary conditions that propagate a wave of increased erosion rates through the stream network. Knickpoints, or abrupt changes in stream gradient, separate portions of the landscape that have adjusted to these new conditions from those that have not. Preservation of the relict landscape suggests that the adjustment to new erosional conditions is not complete; the non-equilibrium condition of the landscape contains information about both past and present conditions controlling the topography of the range. See "The non-equilibrium landscape of the southern Sierra Nevada, California," by M. Clark et al., p. 4–10.



## SCIENCE ARTICLE

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# The non-equilibrium landscape of the southern Sierra Nevada, California

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## ABSTRACT

The paleoelevation of the Sierra Nevada, California, is important to our understanding of the Cenozoic geodynamic evolution of the North America–Pacific plate boundary, and the current debate is fueled by data that argue for conflicting elevation histories. The non-equilibrium or transient landscape of the Sierra Nevada contains information about both past and present controls on the topography of the range. Using geomorphology and thermochronometry, two parts of the landscape of different geodynamic significance and age can be identified: (1) a long-lived, slowly eroding low-relief highland or relict landscape, which we relate to a period of lower relief and elevation from 80–32 Ma; and (2) younger, rapidly-incising river gorges created by at least two stages of elevation and relief increase since 32 Ma. Our data argue for moderate range elevation of ~1500 m at the cessation of arc magmatism in Late Cretaceous time, followed by two events at between 32 and 3.5 Ma and since 3.5 Ma that increased the range elevation to the 4000 m observed elevation today.

## INTRODUCTION

Topographic relief in active orogenic belts is a competition between erosional processes and lithospheric deformation. Recent models of orogenic evolution predict that when these two forces are in equilibrium, mountain belts will achieve a steady-state relative to topography, erosion, or mass flux (Willett and Brandon, 2002). However, many orogens contain high-elevation, low-relief fluvial landscapes that indicate the orogen has not completely adjusted to modern erosional conditions (Épüs and Chapin, 1975; Abbott et al., 1997;

Gubbels et al., 1993; Sugai and Ohmori, 1999; Clark et al., 2005) as in “type” steady-state orogens such as Taiwan. These low-relief landscapes are interpreted as paleolandscapes (or relict landscapes) that preserve information about erosional processes, erosion rate, and relief related to past tectonic and climatic conditions.

Landscape response to external forcing is largely controlled by the behavior of bedrock fluvial systems, and the topographic relief of mountain ranges, in the absence of significant glacial erosion, is set by the longitudinal profiles of rivers (Whipple et al., 1999; Densmore et al., 2005). Therefore, large-scale topography of a mountain range can be altered through the adjustment of fluvial channels and neighboring hillslopes to new boundary conditions. For example, an increase in uplift rate or drop in relative base level is expected to initiate an acceleration of stream incision that will propagate upstream through the drainage network followed by changes in river channel slope, hillslope relief, and mean erosion rates (Whipple and Tucker, 1999; Crosby and Whipple, 2005, and references therein).

Before complete adjustment to new boundary conditions, remnants of relict landscape are distinguishable from equilibrated regions by a contrast in hillslope and channel gradients, dominant erosional processes, and erosion rates. Non-equilibrium landscapes in active orogens suggest that under some conditions this transient condition can persist for up to several tens of m.y. Long response times may allow relict landscapes to become decoupled from modern tectonic conditions and therefore become passive markers to vertical displacements of Earth’s surface (Clark et al., 2005). This decoupling allows us

to use properties of the relict landscape to characterize paleorelief.

While elevation changes in the Sierra Nevada bear directly on several lithospheric-scale geodynamic processes proposed for the western Cordillera, the elevation history of the range remains hotly debated. Several studies argue for an increase in range elevation in late Cenozoic time. Sedimentary evidence suggests that an increase of up to 2 km since 10 Ma has occurred due to block faulting and westward tilting of the range (Le Conte, 1880; Huber, 1981; Unruh, 1991; Wakabayashi and Sawyer, 2001). Similarly, Stock et al. (2004, 2005) document accelerated river incision between 2.7 and 1.4 Ma in the Kings River canyon, which they relate to a tectonically driven increase in mean elevation. In contrast, apatite (U-Th)/He cooling ages were interpreted to suggest significant paleoelevation since Late Cretaceous time, lowering toward the present (House et al., 1997, 1998, 2001), and oxygen-isotope data from the western Basin and Range province suggest that the Sierra Nevada was a prominent orographic barrier since at least middle Miocene time (Poage and Chamberlain, 2002). Reconciliation of conflicting observations in the geologic, geomorphic, and thermochronometric records is needed to improve our understanding of the paleotopography, geodynamic history, and tectonic processes of the region. In the following sections, we address the current debate over the paleoelevation from a study combining geomorphologic analyses with low-temperature thermochronometry.

## TOPOGRAPHY OF THE SOUTHERN SIERRA NEVADA

The northern Sierra Nevada is a uniformly west-tilted fault block, but the southern Sierra Nevada is more complex (Huber, 1981; Unruh, 1991; Wakabayashi and Sawyer, 2001). Mean and peak elevations rise continuously southward to Mount Whitney and then decrease steeply. The eastern range front follows this trend with its highest relief at Mount Whitney. The morphology of the western margin is also more complicated in the south. North of 37°N, Cenozoic strata homoclinally lap off the

west flank of the range. South of 37°N, the range front is embayed by a zone of active subsidence between 37°N and 36°N and distorted by normal-fault-controlled uplifts, including the Bakersfield Arch farther south (Blackwelder, 1927; Gilbert, 1928; Saleeby and Foster, 2004) (Fig. 1). These differences suggest that the southern Sierra Nevada may have an elevation history distinct from the simple fault-block model proposed farther north.

Below the limit of Plio-Pleistocene glaciation, south of the San Joaquin River, we observe dissected low-relief upland surfaces developed on basement rocks (Fig. 1). These surfaces trace northward into a low-relief nonconformity at the base of a fluvial and volcanic Eocene to Miocene section that laps off the west flank of the northern Sierra (Fig. 1) (Huber, 1981). This observation suggests that the upland surfaces were formed by fluvial processes prior to Eocene time. The upland surfaces decrease in elevation southward from the latitude of Mount Whitney but do not dip westward, consistent with the southerly slope of this part of the range.

Some of the upland surfaces have been explained as a progression of erosional stages of the Sierra Nevada (Lawson, 1904, 1936; Matthes, 1937, 1960; Webb, 1946) or as products of unique weathering properties of granite (Wahrhaftig, 1965). These studies identified both small-scale planar features in the landscape as well as more extensive regions of low relief and related them qualitatively to the topographic evolution of the range, but the lack of dating techniques prohibited quantitative assessments of erosion rate or landscape age. We restrict our definition of “surface” to low-relief portions of the landscape that are within the fluvial network. *This is a critical distinction from some earlier studies* because we suggest that the relief on the upland surfaces is set by fluvial erosional processes responding to a common base level set by the major trunk streams. Because we consider upland surfaces to be remnants of a once continuous, relict fluvial landscape eroded to a common base level, we are able to correlate the erosion history of adjacent basins in order to interpret elevation changes that affected the entire range.

The relict landscape is characterized by low to moderate hillslope relief (local slopes mostly <10°; local relief <500 m) and is dominated by transport-limited (alluvial) rivers (Fig. 2). Many hillslopes are mantled by deeply weathered granite with occasional outcrops of intact bedrock. Tors and short

cliffs are common on hillslopes, especially at high elevation and in areas of jointed bedrock. Small basins of coarse grus produced by hillslope weathering are common along segmented reaches of streams, separated by short, narrow bedrock reaches. Isolated remnants of Miocene through Quaternary age

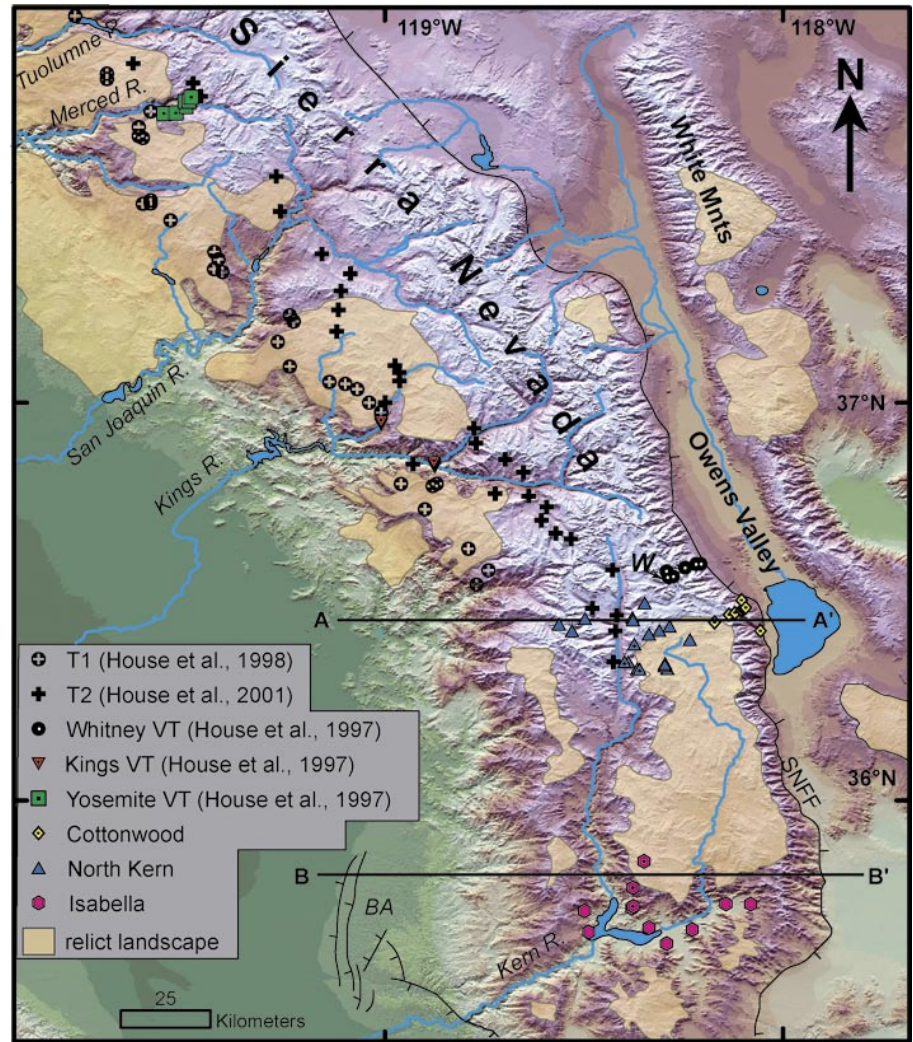


Figure 1. Shaded relief map of the southern Sierra Nevada, California. Locations of (U-Th)/He samples shown by symbols. Center dots indicate samples used for vertical transects (VT) in Fig. 4A. Horizontal profiles are shown by lines A and B (Fig. 4B). Low-relief, upland surfaces are outlined in orange. BA—Bakersfield Arch; SNFF—Sierra Nevada Frontal Fault; W—Mount Whitney.

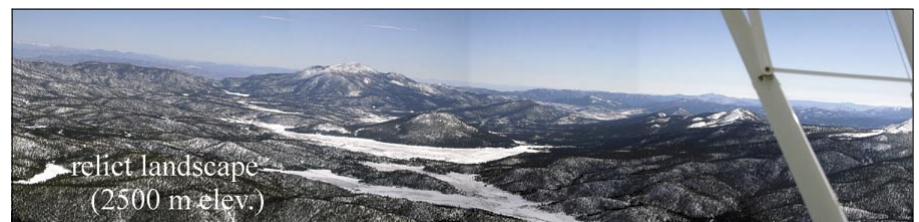


Figure 2. Example of the relict landscape of the southern Sierra Nevada.

volcanic rocks mantle these surfaces, which otherwise lack depositional cover (Bergquist and Nitkiewicz, 1982; Smith, 1964).

## FLUVIAL ANALYSES

We exploit the fact that fluvial systems erode to a common base level. Throughout Late Cretaceous to Miocene time, the paleoshoreline lay just west and south of the Sierra Nevada, suggesting that the major rivers of the range were graded to sea level (Cox, 1987; Nilsen, 1987; Bartow, 1984, 1991). We use short channel segments on the relict landscape to reconstruct paleorelief using a scaling law that relates local channel slope ( $S$ ) to drainage area ( $A$ ), where drainage area is a proxy for discharge, through the channel parameters of steepness ( $k_s$ ) and concavity ( $\theta$ ) (e.g., Flint, 1974):

$$S = k_s A^{-\theta} \quad (1)$$

We identify channel segments on the relict landscape as the upstream portion of the channel above major knickpoints or changes in concavity (Fig. 3). In the field, this transition is associated with an increase in local hillslope gradient and a change from alluvial-dominated to bedrock-dominated processes in the channel bed downstream of the relict landscape. Channel parameters measured from stream segments on the relict landscape are used to extrapolate the original stream profile downstream to the confluence with the major trunk rivers (Schoenbohm et al., 2004, and references therein; methods described in GSA Data Repository<sup>1</sup>). This reconstruction provides a measure of both paleorelief on tributary basins and the total amount of river incision below the relict landscape (Fig. 3).

Many stream profiles exhibit two major knickpoints, suggesting that two phases of increased river incision rate occurred in the formation of the modern steep river canyons. Using only the channel segment on the relict landscape (i.e., upstream of the highest knickpoint), average concavity values for the Kings and Kern rivers are  $\theta = 0.40 \pm 0.09$  ( $1\sigma$ ) and  $\theta = 0.41 \pm 0.1$  with normalized steepness values of  $k_{s(\text{norm})} = 28.5 \pm 12.8$  and  $k_{s(\text{norm})} = 25.1 \pm 12.3$ , respectively (Tables DR4 and DR5 [see footnote 1]). Steepness values vary strongly as a function of the concavity, so we calculate the normalized steepness value for each stream determined by a linear regression to slope-area data for a fixed concavity equal to the average concavity value for tributaries in that basin (Kirby et al., 2003, and references therein; see also supplemental text and Tables DR4 and DR5 in the GSA Data Repository [see footnote 1]). Relict tributary relief for the Kings River ranges from 270 to 1340 m, and total incision ranges from 730 to 1660 m. Relict tributary relief on the Kern River ranges from 150 to 970 m, and total incision ranges from 360 to 1380 m. The total amount of incision and paleotributary relief varies primarily as a function of distance along the main trunk river with maximum values located in the center of the drainage basin (Tables DR4 and DR5 [see footnote 1]). In the following sections, we examine long-term erosion rates in order to establish a chronology of relief production.

## EROSION RATES

Apatite (U-Th)/He thermochronometry constrains long-term erosion rates because helium ages record the time at which

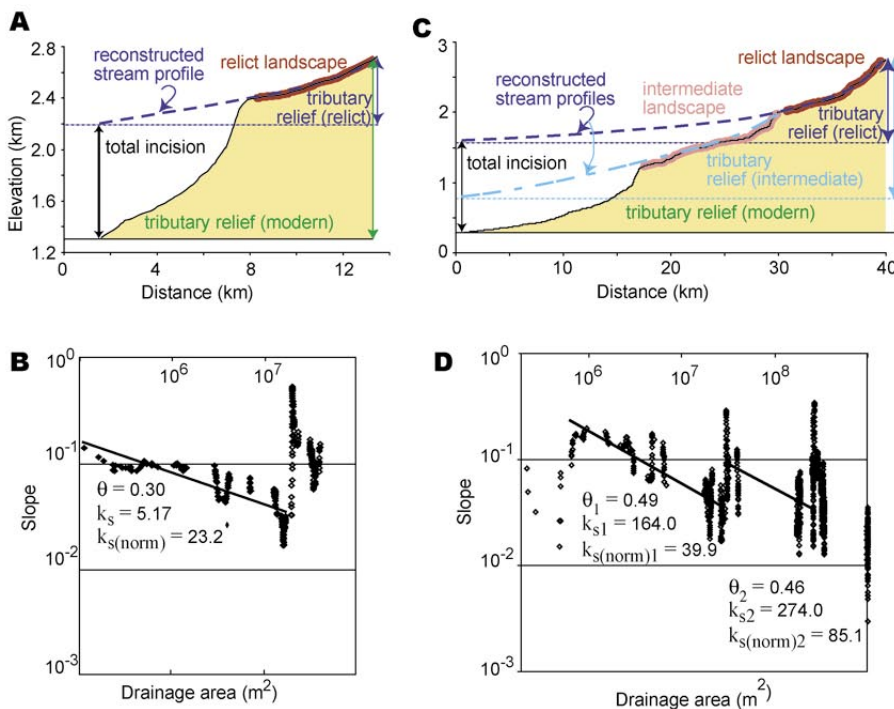


Figure 3. Examples of reconstructed tributary profiles. Solid lines in A and C are actual stream profiles; dashed lines are reconstructed profiles. The reconstructed profile is based on best-fit channel parameters (concavity [ $\theta$ ]; steepness [ $k_s$ ]) for a power-law relationship between drainage area and local channel slope (e.g., Flint, 1974) using channel segments on the relict landscape (red). Normalized steepness values [ $k_{s(\text{norm})}$ ] are also given for average concavity values (Tables DR4 and DR5; Figs. DR1 and DR2 [see text footnote 1]). (A) Durrwood Creek, tributary to Kern River. Relict tributary relief is the vertical distance between the channel head and the reconstructed channel at the confluence with the main trunk stream (blue). The vertical distance between the reconstructed channel at the confluence and the modern stream elevation is an estimate of the local channel incision below the relict landscape (Tables DR4 and DR5 [see text footnote 1]). (B) Slope-area plot for local channel segments along the stream profile. Line represents best fit to the data for the channel segment on the relict landscape [red in (A)]. (C) Bear Creek–Dinky Creek–N. Fork Kings River, tributary to Kings River, shows two major knickpoints on the channel profile. Middle channel segment represents an intermediate stage of relief production (pink). (D) Slope-area plot for local channel segments along the stream profile. Line represents best fit to the data for the channel segment on the relict landscape [red in (A) and (C)] and the intermediate landscape [pink in (C)].

<sup>1</sup>GSA Data Repository Item 2005166, methods and analytical techniques and references, Tables DR1–DR5 (stream analyses, sample locations, and age data), and Figures DR1 and DR2 (location maps), is available online at [www.geosociety.org/pubs/ft2005.htm](http://www.geosociety.org/pubs/ft2005.htm) or on request from Documents Secretary, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, or [editing@geosociety.org](mailto:editing@geosociety.org).

a rock cools through  $\sim 70^\circ\text{C}$ , or  $\sim 2\text{--}4$  km deep in the crust (Wolf et al., 1996; Farley, 2002). The slope of helium age versus elevation for samples collected along a vertical transect, such as along a ridge line or canyon wall, is a measure of erosion rate over m.y. time scales. Three new helium age transects were collected south of Mount Whitney (Fig. 1; Tables DR1 and DR2 [see footnote 1]). These transects yield erosion rates of  $0.04\text{--}0.06$  mm/yr during the time interval from 73 to 47 Ma for two profiles in the Kern River (N. Kern and Isabella) and from 53 to 11 Ma for one profile on the eastern escarpment (Cottonwood). These rates agree with those from Mount Whitney and northward (House et al., 1997, 2001) (Fig. 4A).

We use the average elevation of the relict landscape at each sampling locality as a measure of the paleoland surface and plot each transect as depth below this horizon (Fig. 4A; Table DR3 [see footnote 1]). The remarkable agreement among the profiles strongly indicates that the geothermal gradient and timing and rate of erosion are uniform across the entire study area. This observation is contrary to the expectations of Jones et al. (2004) that lateral variations in heat production are significant enough to perturb the age pattern. The helium ages suggest that  $<2$  km of erosion of the relict landscape has occurred since 80 Ma, a conclusion consistent with igneous geobarometry from the Whitney region (Ague and Brimhall, 1988). The slope of the age-depth profile indicates an average erosion rate of  $0.04$  mm/yr continuing at least until 32 Ma in the Kings River drainage and to 11 Ma on the eastern escarpment. The two eastern profiles are located in the footwall of a normal fault and expose deeper crustal sections than the river canyon transects to the west and south, and the slow post-32 Ma erosion they imply may or may not extend to the Kings and Kern River regions. Therefore, we conservatively estimate the period of slow erosion in the major river canyons to extend to 32 Ma, the youngest helium age on the Kings River transect (Fig. 4). These slow long-term erosion rates are similar to short term rates derived from cosmogenic isotopes. Granitic surfaces in the Kings River catchment eroded at  $0.012$  mm/yr over

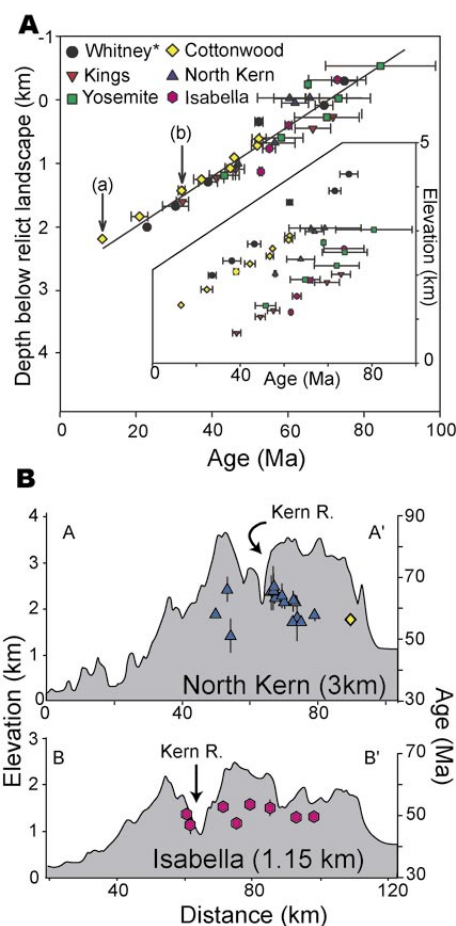


Figure 4. Apatite (U-Th)/He ages. (A) Ages versus depth below the average elevation of the relict landscape in the locality of the transect (see Tables DR1 and DR3 [see text footnote 1]). Some samples were collected from local highs that are above the average elevation of the relict landscape. Whitney, Yosemite, and Kings profiles (House et al., 1997, 2001) and Cottonwood, N. Kern and Isabella (this study). \*For Mount Whitney profile, as no relict landscape is recognized in this area, the mean elevation (4000 m) of the area was used. Arrows (a) and (b) represent youngest helium age for the eastern and western Sierra, respectively. Inset shows age versus elevation for each transect. (B) Horizontal transects compared to topography (gray, left vertical axis). Samples were collected at a constant elevation ( $\pm 100$  m) and are plotted as a function of distance along the profile versus age (right vertical axis). Profile locations are given in Figure 1.

the last 75 k.y. (Stock et al., 2004) and basin-averaged erosion rates from low-relief upland surfaces in the northern Sierra range from  $0.015$  to  $0.075$  mm/yr for time scales on the order of  $10^4\text{--}10^5$  yr (Riebe et al., 2000).

While helium ages record slow erosion rates from 80 to 32 Ma, late Pliocene–early Quaternary incision rates are much higher. Cosmogenic burial ages from cave sediments in the Kings River (Stock et al., 2004) indicate an incision rate of  $0.27$  mm/yr between 2.7 and 1.4 Ma, and volcanic capped river terraces in the central Kern River suggest an average incision rate of  $1.1$  mm/yr since 3.5 Ma (Dalrymple, 1963; Ross, 1986). However, these data directly record channel lowering, whereas the helium ages record an averaged erosion rate that encompasses both channel incision as well as local hillslope erosion. The acceleration of incision since at least 3.5 Ma in the southern Sierra can be related to the most recent propagation of an erosional signal through the fluvial network (Stock et al., 2005). This phase is likely related to the lowest elevation knickpoint on the tributary profiles (Stock et al., 2005) and to the prominent  $<3.5$  Ma basalt-capped river terrace along the main Kern River (Dalrymple, 1963; Ross, 1986). Our youngest helium age on the west side of the range demands that slow erosion ( $0.04$  mm/yr) continued until at least 32 Ma, so the initial onset of accelerated incision occurred sometime between 32 and 3.5 Ma.

## PALEORELIEF ESTIMATES

Variations in surface topography result in perturbation of shallow isotherms (e.g., Stüwe et al., 1994). Therefore, samples collected along a horizontal profile at constant elevation may show variations in helium age that relate to paleorelief (House et al., 1998, 2001). Apatite samples collected parallel to the western front of the range at 2000 m yield early Cenozoic helium ages that negatively correlate with the modern relief of major river basins (House et al., 1998, 2001). House et al. (1998, 2001) found that ages vary 20–30 m.y. over a 70 km wavelength across the canyons and interflaves of the San Joaquin and Kings rivers area. Assuming steady erosion of  $0.05$  mm/yr, these authors found the age variation to be consistent with 1–2 km of paleorelief (House et al., 2001). Ages from samples collected interior to the range and north of the San Joaquin–Kings area do not vary with topography, which is consistent

with negligible paleorelief (<1 km) in the upstream portions of the San Joaquin and Kings Rivers and north of the San Joaquin River.

We collected two new horizontal transects from the Kern River area (Fig. 1). The northern profile at 3000 m elevation (North Kern) yields ages in the range of 55–65 Ma with older ages near the Kern River. There is a systematic westward increase in age on the east side the river (Fig. 5A), but apatite quality and yield precluded the dense sampling necessary to evaluate the age variation west of the river. These age variations could be consistent with either west tilting or paleorelief on the Kern River drainage basin. Following the model of House et al. (2001), the North Kern age variation of ~10 m.y. may indicate ~1 km of paleorelief across this basin from ca. 80 to 43 Ma. The southern transect (Isabella) shows no age variation across the range (Fig. 5B). This lack of east-west age variation and the southerly slope of this portion of the range suggest that the southern Sierra Nevada is tilted south and not west.

Samples collected in the glaciated portion of the range (Whitney and North Kern samples at >36.4°N latitude) are not systematically younger than depth-equivalent samples in unglaciated areas. The sensitivity of our measurement and scatter of data between adjacent samples (conservatively, 10%) equates to variability of <8 m.y. (Fig. 4A). At an erosion rate of 0.04 mm/yr, an age variation of <8 m.y. suggests that no more than ~300 m of glacial erosion has occurred.

Estimates of paleorelief from the helium data are consistent with the reconstructed tributary relief on the relict landscape (Fig. 3), suggesting that the relict landscape is similar to the Late Cretaceous landscape. Using average channel parameters for tributaries on the relict landscape, we reconstruct the paleoelevation profile for the main Kern and Kings Rivers. The height of these reconstructed channels, plus a typical 100 m hillslope relief at the channel head, provides an estimate of the paleocrest elevation of the southern Sierra Nevada. Using Equation (1), we calculate the channel profile by assuming sea-level elevation at the modern bedrock-alluvial transition at the western edge of the range, which would have been near or at the Cretaceous shoreline (Cox, 1987; Nilsen, 1987; Bartow, 1984, 1991) and by assuming no changes in drainage-basin areal geometry. Our calculations yield  $1390 \pm 680$  m and  $1500 \pm 630$  m elevation for the paleo-headwaters of

the Kern and Kings Rivers, respectively (Fig. 5). The Kern and Kings rivers are oriented ~90° to each other and share a drainage divide. Therefore, we expect the headwaters of each of these rivers to lie at approximately the same elevation. The close agreement between our two profiles provides an internal consistency check on our reconstructions.

## DISCUSSION

By comparison with modern ranges like the Andes, House et al. (2001) scaled the 1–2 km of paleorelief implied by thermochronometry to a range crest elevation of 3–4 km. We estimate the paleoelevation of the range using a different approach: using the helium data to suggest that the relict landscape is representative of the Sierran landscape in Late Cretaceous time, and reconstructing the fluvial relief of the Kings and Kern rivers based on the properties of the relict landscape (Fig. 5). Because the Late Cretaceous shoreline is shown in the subsurface west of the current eastern edge of the San Joaquin Valley (Bartow, 1991), the Kings River would have graded to sea level and the paleofluvial relief of the main river can be used to estimate ~1500 m ( $\pm 650$  m) crestal elevation of the range in Late Cretaceous time, or ~2500 m less than today.

Two prominent knickpoints on many stream profiles and an extensive bedrock terrace level developed along the main Kern River suggest that the increase in late Cenozoic elevation was associated with at least two phases of rapid river incision (Fig. 3C). The most recent pulse began  $\leq 3.5$  Ma in the Kern River (Dalrymple, 1963; Ross, 1986) and between 2.7 and 1.4 Ma in the central Kings River (Stock et al., 2004), both of which account for ~350–400 m of most recent incision in the central portions of these basins. At present, we lack data that allow us to determine when accelerated incision first began within the interval of 32–3.5 Ma. Application of the  $^4\text{He}/^3\text{He}$  thermochronology method, which is sensitive to even lower temperatures (40 °C), is one promising alternative (Shuster and Farley, 2004).

The youngest phase of accelerated erosion ( $\leq 3.5$  Ma) is consistent with both Pliocene climate change (Small and Anderson, 1995; Zhang et al., 2001) and removal of a dense, eclogitic root from beneath the range (Jones et al., 1994; Ducea and Saleeby, 1996; Farmer et al., 2002; Saleeby and Foster, 2004; Jones et al., 2004; Zandt et al., 2004; Boyd et al., 2004). The timing of the earlier pulse is needed to assess its

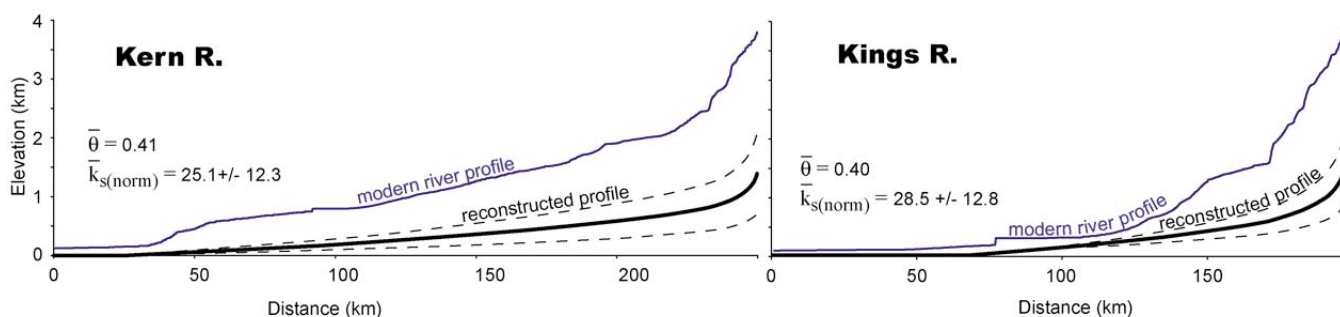


Figure 5. Modern (blue) and reconstructed (black) river profiles for trunk streams. Reconstructed profile is calculated from average concavity ( $\bar{\theta}$ ) and average normalized steepness [ $k_{s(\text{norm})}$ ] values determined from channel segments on the relict landscape (Tables DR4 and DR5; Figures DR1 and DR2 [see text footnote 1]). Dashed lines show  $\pm 1\sigma$  of normalized steepness values.



possible relation to any one of several different proposed tectonic and geodynamic phenomena, such as (1) an early stage of lithospheric foundering and replacement by buoyant asthenosphere (Ducea and Saleeby, 1996); (2) passage of the slab-window (Atwater and Stock, 1998); (3) early faulting related to the opening of Owens Valley (Maheo et al., 2004); or (4) upwelling of asthenospheric mantle observed in the adjacent region beneath the Owens Valley and the eastern Mojave Desert (DePaolo and Daly, 2000). Estimates of paleoelevation of the range crest are not consistent with a decrease in elevation during Cenozoic time caused by evacuation of silicic crust eastward to the extending Basin and Range province (Wernicke et al., 1996). Moderate elevations (~1500 m) could explain the mid-Miocene orographic barrier (Poage and Chamberlain, 2002), but do not support a model of decreasing elevation in late Cenozoic time.

## CONCLUSION

The non-equilibrium condition of the Sierra Nevada allows us to quantitatively construct the topographic evolution of the Sierra Nevada using modern topography, field observations, thermochronometry, and cosmogenically derived erosion rates. Helium ages suggest that a constant erosion rate of 0.04 mm/yr prevailed from ca. 80 to ca. 32 Ma, and variations in helium ages across major drainage basins suggest that 1–2 km of maximum relief existed during this time period (House et al. 2001; this study). We posit that this landscape is represented by low-relief, upland surfaces preserved throughout the southern range. This 1–2 km of relief probably represents the fluvial relief on major tributaries of the ancestral Kings and San Joaquin Rivers. Longitudinal river profiles and channel slope–drainage area relationships suggest that two episodes of accelerated river incision followed this initial period of slower erosion. Reconstruction of channel profiles that originate on the relict landscape suggests that 150–1660 m of relief existed in tributary basins. In particular, reconstructed relief on the largest tributary basins where thermochronometric data were collected is between 1000 and 1300 m, which is in excellent agreement

with the 1–2 km of paleorelief inferred from the helium data from the same localities. Using channel parameters measured from stream segments on the relict landscape, we can reconstruct the total paleorelief on the Kings and Kern Rivers and suggest that a modest range elevation of 1500 m existed between Late Cretaceous and Miocene time. Based on published data, ~350–400 m of our calculated 1380–1660 m maximum incision in the central Kings and Kern Rivers occurred in the past 3.5 m.y. Rapid incision beginning between ca. 32 and 3.5 Ma may relate to either protracted surface uplift associated with Basin and Range faulting or density changes in the lithosphere, such as by convective removal of a lithospheric root, by upwelling asthenosphere, or by passage of a slab window.

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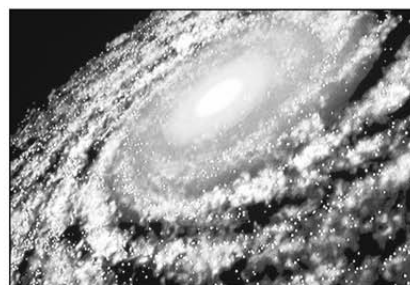
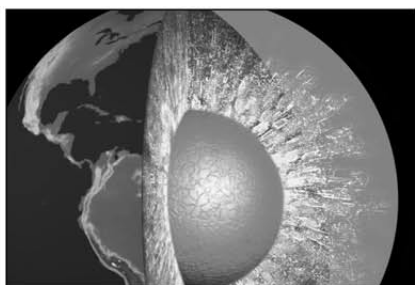
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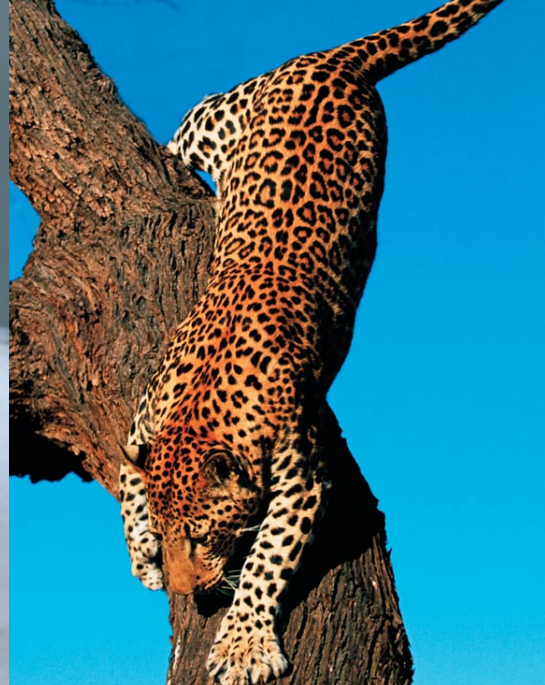
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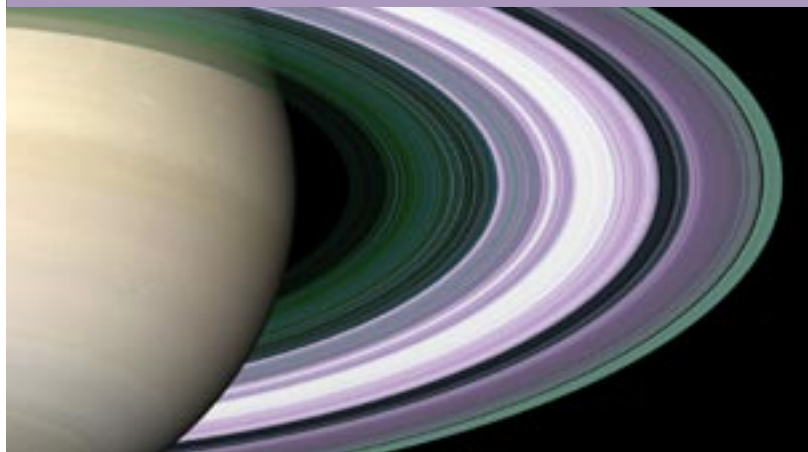


Image Courtesy of NASA/JPL

See, listen to, and ask questions of top mission scientists:

**Torrence Johnson**, chief scientist for the Solar System Exploration Programs Directorate at NASA's Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.

**Rosalyn Lopes**, principal scientist at NASA's Jet Propulsion Laboratory, lead scientist for Geophysics and Planetary Geosciences, and

investigation scientist for the Cassini Titan Radar Mapper, Pasadena, Calif.

**Alfred McEwen**, member of the Cassini Imaging team and professor, Department of Planetary Sciences, University of Arizona, Tucson, Ariz.

**Carolyn Porco**, leader of the Cassini Imaging science team and director of the Cassini Imaging Central Laboratory for Operations (CICLOPS), Space Science Institute, Boulder, Colo.

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## Saturn & Its Moons: A Ring-Side View from Cassini-Huygens

Monday, 17 October 2005  
7:00–8:30 p.m.

Salt Palace Convention Center  
Ballroom AC

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## ~ Speaker Ready Room ~

The Speaker Ready Room will be open beginning Friday, 14 Oct., through Wednesday, 19 Oct. (see hours of operation) to accommodate all speakers submitting PowerPoint presentations. GSA provides a networked computer system to allow a smoother transition for speakers making oral presentations. All presentations will be downloaded to a main file server and then uploaded to the specific computer in the technical session room in which the speaker will be making his or her presentation. Each speaker will advance his or her own presentation from the podium. Speakers may submit their PowerPoint presentations on any format (CD-ROM, floppy disk, zip disk, thumb drive, compact flash card, SD card, multi-media card, or memory stick).

All PowerPoint presentations **MUST** be submitted to AVHQ (GSA's official audio-visual contractor) either in advance of the meeting via AVHQ's Web site ([www.avhqspeakerservices.com](http://www.avhqspeakerservices.com)) **OR** onsite in the Speaker Ready Room. If you are a Sunday session speaker and are unable to get to the Speaker Ready Room the day or evening before giving your presentation, please come to the Speaker Ready Room first thing Sunday morning.

## ~ Speaker Ready Room Hours ~

Salt Palace Convention Center  
Meeting Room 253 AB

Friday, 14 Oct., 1–6 p.m.  
Saturday, 15 Oct., 7 a.m.–8 p.m.  
Sunday, 16 Oct., 6 a.m.–6 p.m.  
Mon.–Wed., 17–19 Oct., 6:30 a.m.–6 p.m.

For presentation submission prior to meeting, please upload to the AVHQ Web site: [www.avhqspeakerservices.com](http://www.avhqspeakerservices.com).

## ~ GSA Annual Meeting Program ~

# SLC 2005: Science • Learning • Colleagues

## 257 Technical Sessions

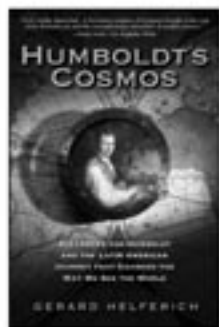
All sessions will be held at the Salt Palace Convention Center and are oral unless indicated as poster sessions. Check the GSA Web site—[www.geosociety.org](http://www.geosociety.org)—for updates, detailed listings, abstracts, and the titles and authors database.

NO.	TIME	DESCRIPTION ( <i>SPONSORS</i> )	LOCATION
<b>SATURDAY, 15 OCTOBER 2005</b>			
1	8 a.m.	T1. Centennial Celebration Symposia for the Society of Economic Geologists I ( <i>Society of Economic Geologists</i> )	250 AB
2	1 p.m.	T1. Centennial Celebration Symposia for the Society of Economic Geologists II ( <i>Society of Economic Geologists</i> )	250 AB
<b>SUNDAY, 16 OCTOBER 2005</b>			
3	8 a.m.	Paleontology I: Paleocology—Energetics, Environment, and Evolution	151 ABC
4	8 a.m.	Sediments, Carbonates	257
5	8 a.m.	Tectonics I	150 G
6	8 a.m.	P4. Speaking Out for Evolution: Rationale and Resources for Supporting the Teaching of Evolution ( <i>Paleontological Society; Society of Vertebrate Paleontology</i> )	Ballrooms AC
7	8 a.m.	T2. Advances in Geophysics and New Techniques: Lithospheric and Crustal Architecture, Ore Deposit Visualization, and New Technologies in Analytical Techniques and Mineral Processing ( <i>Society of Economic Geologists</i> )	Ballroom H
8	8 a.m.	T12. Environmental Issues Related to Oil and Gas Exploration and Production I ( <i>GSA Hydrogeology Division; International Association of GeoChemistry [IAGC]</i> )	250 DE
9	8 a.m.	T14. Flowpaths Integrating Terrestrial and Aquatic Components of Catchment Ecosystems ( <i>GSA Hydrogeology Division; GSA Geobiology and Geomicrobiology Division</i> )	251 C
10	8 a.m.	T18. Innovations and New Frontiers in Hydrologic Modeling I ( <i>GSA Hydrogeology Division; National Ground Water Association; International Association of Hydrogeologists; GSA Engineering Geology Division</i> )	250 AB
11	8 a.m.	T19. Innovative Methods of Estimating Recharge in Humid Climates ( <i>GSA Hydrogeology Division</i> )	251 AB

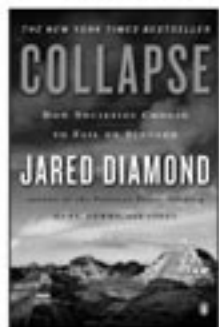
NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
12	8 a.m.	T32. Water Resource Management and Planning for Fractured and Karstic Aquifers ( <i>GSA Hydrogeology Division</i> )	250 C
13	8 a.m.	T36. Debris Flows Initiated by Runoff and Erosion: Processes, Recognition, and Hazard Implications ( <i>GSA Engineering Geology Division</i> )	251 D
14	8 a.m.	T55. Advances and Applications of Tephrochronology and Tephrostratigraphy I: In Honor of Andrei M. Sarna-Wojcicki ( <i>GSA Quaternary Geology and Geomorphology Division</i> )	Ballroom E
15	8 a.m.	T63. Timing and Nature of Mountain Glacier Advances throughout the Last Glacial Cycle ( <i>Mountain Glacier Working Group, International Quaternary Union</i> )	150 ABC
16	8 a.m.	T69. Refining the Global Neoproterozoic Geologic Record ( <i>GSA Sedimentary Geology Division; GSA Geobiology and Geomicrobiology Division</i> )	151 G
17	8 a.m.	T86. Collaboration for the Dissemination of Geologic Information among Colleagues ( <i>Geoscience Information Society</i> )	Ballroom J
18	8 a.m.	T97. Innovation, Evaluation, and Best Practices in Informal Geoscience Education ( <i>National Association of Geoscience Teachers; GSA Geoscience Education Division; Association of Earth Science Editors</i> )	251 E
19	8 a.m.	T119. Mercury in Coal: Origins to Emissions ( <i>GSA Coal Geology Division; GSA Geology and Society Division</i> )	254 B
20	8 a.m.	T120. Experimental, Theoretical, Stable Isotope, and Predictive Studies of Sulfide Oxidation Processes in the Field and Laboratory	251 F
21	8 a.m.	T122. Dynamics of Metamorphic and Hydrothermal Processes: From Grain-Scale to Mountain Belt I	150 DEF
22	8 a.m.	T123. Mars Analogue Research and Instrument Field Testing ( <i>GSA Planetary Geology Division</i> )	151 DEF
23	8 a.m.	T136. Out of the Tethys: The Making of Asia	Ballroom D
24	8 a.m.	T141. Geology and EarthScope ( <i>GSA Structural Geology and Tectonics Division; Integrated Solid Earth Sciences [ISES]; Mineralogical Society of America</i> )	Ballroom B
25	8 a.m.	T151. The Echinoderm Legacy of N. Gary Lane ( <i>Paleontological Society</i> )	Ballroom F
26	8 a.m.	Limnogeology (Posters)	Hall C
27	8 a.m.	Marine/Coastal Science (Posters)	Hall C

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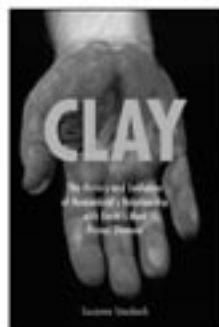
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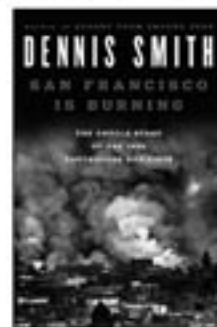
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NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
28	8 a.m.	Tectonics (Posters)	Hall C
29	8 a.m.	T74. Waves of Destruction: Historical and Geological Records of Tsunamis and Their Effects (Posters) ( <i>GSA Sedimentary Geology Division</i> )	Hall C
30	8 a.m.	T93. The National Geologic Map Database (Posters) ( <i>U.S. Geological Survey; Association of American State Geologists</i> )	Hall C
31	8 a.m.	T134. Mesozoic and Cenozoic Crustal Evolution of Alaska and Western Canada (Posters)	Hall C
32	3:30 p.m.	Coal Geology	254 B
33	1:30 p.m.	Geoscience Education I	251 E
34	1:30 p.m.	Paleontology II: How Do They Do That? Biomechanics and Development	151 ABC
35	3:30 p.m.	Petrology, Metamorphic	150 DEF
36	1:30 p.m.	Planetary Geology: A Solar System Tour	257
37	1:30 p.m.	P1. 2004 South Asian Tsunami ( <i>GSA Geophysics Division; GSA International Division; GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Divisions; GSA Geology and Society Division</i> )	Ballrooms AC
38	1:30 p.m.	P8. Water Resources Science and Public Policy ( <i>GSA Hydrogeology Division; GSA Geology and Society Division; Geology and Public Policy Committee</i> )	251 AB
39	1:30 p.m.	T3. Advances in the Understanding of Tectonic Settings and Structural Control of Ore Deposits ( <i>Society of Economic Geologists</i> )	Ballroom H
40	1:30 p.m.	T12. Environmental Issues Related to Oil and Gas Exploration and Production II ( <i>GSA Hydrogeology Division; International Association of GeoChemistry [IAGC]</i> )	250 DE
41	1:30 p.m.	T18. Innovations and New Frontiers in Hydrologic Modeling II ( <i>GSA Hydrogeology Division; National Ground Water Association; International Association of Hydrogeologists; GSA Engineering Geology Division</i> )	250 AB
42	1:30 p.m.	T20. Innovative Monitoring and Modeling Techniques for Assessing the Performance of Passive Remediation Projects for Contaminated Water and Soil ( <i>GSA Hydrogeology Division</i> )	251 C
43	1:30 p.m.	T28. Stream-Hyporheic Interactions: Hydrology, Geochemistry, and Biology ( <i>GSA Hydrogeology Division</i> )	250 C
44	1:30 p.m.	T41. Geologic Remote Sensing ( <i>GSA Engineering Geology Division</i> )	251 D
45	1:30 p.m.	T56. Carving the Western Landscape: The Evolution of the Colorado Drainage from Source to Sink ( <i>GSA Quaternary Geology and Geomorphology Division</i> )	Ballroom E
46	1:30 p.m.	T60. Dendrogeology: Geologic Applications of Tree-Ring Studies ( <i>GSA Archaeological Geology Division</i> )	254 B
47	1:30 p.m.	T65. Establishment of an Integrated and Calibrated Chronostratigraphic Framework for High Resolution Sequence Stratigraphic Analysis, Stratal Correlation, and Sedimentary Basin Geohistory Reconstruction ( <i>GSA Sedimentary Geology Division</i> )	151 G
48	1:30 p.m.	T76. The Bureau of Land Management's National Landscape Conservation System as Outdoor Laboratories: New Research in Grand Staircase–Escalante National Monument and the Surrounding Area	151 DEF
49	1:30 p.m.	T82. Taphonomy: Process and Bias through Time ( <i>Paleontological Society</i> )	Ballroom F
50	1:30 p.m.	T106. Methods of Assessing Teaching and Learning in the Geosciences ( <i>National Association of Geoscience Teachers</i> )	251 F
51	1:30 p.m.	T115. Holocene Climate Change in Western North America: Spatial-Temporal Phasing of Climate Modes, Events, and Transitions ( <i>GSA Limnogeology Division; GSA Archaeological Geology Division</i> )	150 ABC
52	1:30 p.m.	T117. Terrestrial and Extraterrestrial Environments for Microbial Survival I ( <i>GSA Geobiology and Geomicrobiology Division</i> )	Ballroom J
53	1:30 p.m.	T122. Dynamics of Metamorphic and Hydrothermal Processes: From Grain-Scale to Mountain Belt II	150 DEF
54	1:30 p.m.	T129. The Yellowstone Hotspot: Its Influence on the Magmatic and Tectonic Evolution of the Western U.S. ( <i>GSA Geophysics Division; GSA Structural Geology and Tectonics Division</i> )	Ballroom D
55	1:30 p.m.	T142. Controversies, Conundrums, and Innovative Approaches in Extensional Tectonics: A Tribute to Ernie Anderson ( <i>GSA Structural Geology and Tectonics Division</i> )	Ballroom B
56	1:30 p.m.	T148. What is a Magma Chamber? The Role of Sheets in the Assembly of Intrusions I ( <i>GSA Structural Geology and Tectonics Division</i> )	150 G
57	1:30 p.m.	Paleontology (Posters) I	Hall C
58	1:30 p.m.	Stratigraphy (Posters)	Hall C
59	1:30 p.m.	T98. Innovations in Geological Mapping (Posters) ( <i>GSA Engineering Geology Division; GSA Geology and Society Division; GSA Hydrogeology Division; Geology and Public Policy Committee; Association of American State Geologists; GSA Quaternary Geology and Geomorphology Division</i> )	Hall C

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
60	6 p.m.	T104. It's About Time: Teaching the Temporal Aspects of Geoscience (Posters) ( <i>National Association of Geoscience Teachers; GSA Geoscience Education Division</i> )	Hall C
<b>MONDAY, 17 OCTOBER 2005</b>			
61	8 a.m.	Archaeological Geology	251 F
62	8 a.m.	Geoscience Education II	251 E
63	8 a.m.	Paleontology III: At the Interface of Paleontology and Geology	151 ABC
64	8 a.m.	P7. The Wasatch Range–Great Salt Lake Hydroclimatic System ( <i>GSA Hydrogeology Division; International Association of Hydrogeologists–U.S. National Chapter; American Geophysical Union; GSA Quaternary Geology and Geomorphology Division; Friends of the Great Salt Lake</i> )	Ballrooms AC
65	8 a.m.	T4. Sources of Porphyry Copper Deposits: Magmas, Metals, and Fluids I ( <i>Society of Economic Geologists</i> )	Ballroom H
66	8 a.m.	T8. Artificial Recharge of Groundwater—Hydrogeologic Characterization and Implementation ( <i>GSA Hydrogeology Division</i> )	250 C
67	8 a.m.	T13. Fault Zone Controls on Fluid Movement, Earth Resources, and Processes: Perspectives from Field, Laboratory, and Modeling Studies I ( <i>GSA Hydrogeology Division; GSA Structural Geology and Tectonics Division; GSA Geophysics Division</i> )	251 AB
68	8 a.m.	T15. Groundwater Quality and Quantity Interconnections: The Effects of Natural and Anthropogenic Contamination on Groundwater Availability (Posters) ( <i>GSA Hydrogeology Division; National Ground Water Association/Association of Ground Water Scientists and Engineers</i> )	Hall C
69	8 a.m.	T25. Arsenic Occurrence and Fate in Hydrogeologic Systems I ( <i>GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division</i> )	250 DE
70	8 a.m.	T33. Water, Solute, and Sediment Fluxes through Carbonate and Karst Aquifers ( <i>GSA Hydrogeology Division; GSA Sedimentary Geology Division; Karst Waters Institute</i> )	250 AB
71	8 a.m.	T37. Debris-flow Processes, Stratigraphy, Geomorphology, and Societal Response ( <i>GSA Engineering Geology Division; GSA Geology and Society Division</i> )	251 D
72	8 a.m.	T48. Geology in the National Forests—Stewardship, Education, and Research	150 DEF
73	8 a.m.	T52. Sources, Transport, Fate, and Toxicology of Trace Elements in the Environment ( <i>International Association of GeoChemistry</i> )	150 ABC
74	8 a.m.	T55. Advances and Applications of Tephrochronology and Tephrostratigraphy II: In Honor of Andrei M. Sarna-Wojcicki ( <i>GSA Quaternary Geology and Geomorphology Division</i> )	Ballroom E
75	8 a.m.	T64. Comparative Carbonate Sedimentology I: A Tribute to the Career of R.N. Ginsburg ( <i>GSA Sedimentary Geology Division</i> )	151 G
76	8 a.m.	T75. Weathering, Sedimentation, and Diagenesis in Major Element Cycles I ( <i>GSA Sedimentary Geology Division</i> )	151 DEF
77	8 a.m.	T79. Jurassic Marine Paleobiology: Tracing the Roots of the Modern Biota ( <i>Paleontological Society</i> )	Ballroom F
78	8 a.m.	T81. Protists in Extreme Environments: Fossil Evidence to Physiological Adaptations ( <i>Cushman Foundation; Paleontological Society</i> )	254 B
79	10 a.m.	T94. Conservation and Management of Geoheritage Resources: National and Regional Perspectives ( <i>GSA International Division; GSA Geology and Society Division; National Park Service; Geology and Public Policy Committee</i> )	Ballroom E
80	8 a.m.	T102. International Undergraduate Field Trips: Logistics, Challenges, and Successes	251 C
81	8 a.m.	T103. Is it Science? Strategies for Addressing Creationism in the Classroom and the Community I ( <i>National Association of Geoscience Teachers; GSA Geology and Society Division; Geology and Public Policy Committee; GSA Geoscience Education Division</i> )	Ballroom J
82	8 a.m.	T118. The Peña Blanca Uranium District, Chihuahua: A Natural Analogue for the Transport of Radionuclides in a Nuclear Waste Repository in Unsaturated, Welded Tuff I ( <i>Geology and Public Policy Committee</i> )	257
83	8 a.m.	T121. Thermochronology: Techniques, Applications, and Interpretations I	Ballroom B
84	8 a.m.	T130. The Yellowstone Hotspot: Integrated Field, Geochemical, and Geophysical Studies ( <i>GSA Geophysics Division; Geochemical Society</i> )	Ballroom D
85	8 a.m.	T144. The Edges of Extension: Boundaries of the Basin and Range Province as Natural Laboratories for Studying Tectonic and Structural Processes ( <i>GSA Structural Geology and Tectonics Division; GSA Geophysics Division</i> )	150 G
86	8 a.m.	Geomicrobiology: Terrestrial and Extraterrestrial Environments for Microbial Survival (Posters)	Hall C
87	8 a.m.	Geophysics/Tectonophysics/Seismology (Posters)	Hall C

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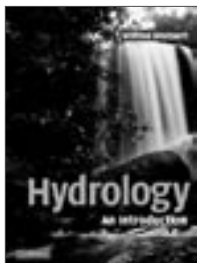
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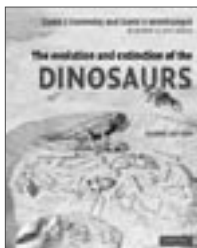


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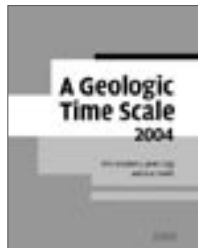
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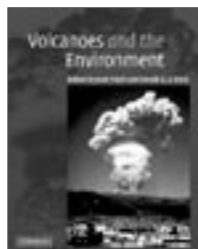
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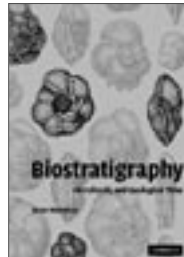


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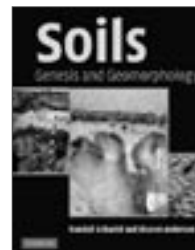


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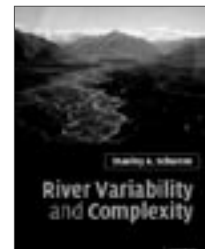
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88	8 a.m.	Planetary Geology (Posters)	Hall C
89	8 a.m.	Structural Geology (Posters)	Hall C
90	8 a.m.	T28. Stream-Hyporheic Interactions: Hydrology, Geochemistry, and Biology (Posters) ( <i>GSA Hydrogeology Division</i> )	Hall C
91	8 a.m.	T29. Surface and Subsurface Geologic Characterization of the Edwards and Trinity Carbonate Aquifer Systems, Central Texas (Posters) ( <i>GSA Hydrogeology Division</i> )	Hall C
92	8 a.m.	T69. Refining the Global Neoproterozoic Geologic Record (Posters) ( <i>GSA Sedimentary Geology Division; GSA Geobiology and Geomicrobiology Division</i> )	Hall C
93	8 a.m.	T99. Imparting Hands-on Geological Education: Reaching out to Undergraduates and K–12 Students (Posters)	Hall C
94	8 a.m.	T106. Methods of Assessing Teaching and Learning in the Geosciences (Posters) ( <i>National Association of Geoscience Teachers</i> )	Hall C
95	8 a.m.	T115. Holocene Climate Change in Western North America: Spatial-Temporal Phasing of Climate Modes, Events, and Transitions (Posters) ( <i>GSA Limnogeology Division; GSA Archaeological Geology Division</i> )	Hall C
96	8 a.m.	T122. Dynamics of Metamorphic and Hydrothermal Processes: From Grain-Scale to Mountain Belt (Posters)	Hall C
97	8 a.m.	T123. Mars Analogue Research and Instrument Field Testing (Posters) ( <i>GSA Planetary Geology Division</i> )	Hall C
98	8 a.m.	T142. Controversies, Conundrums, and Innovative Approaches in Extensional Tectonics: A Tribute to Ernie Anderson (Posters) ( <i>GSA Structural Geology and Tectonics Division</i> )	Hall C
99	3:30 p.m.	History of Geology	257
100	1:30 p.m.	Quaternary Geology I	150 ABC
101	1:30 p.m.	Structural Geology I: Folds, Faults, and Fracturing	150 G
102	1:30 p.m.	P6. The Return to Saturn: Results from Cassini-Huygens ( <i>GSA Planetary Geology Division</i> )	Ballrooms AC
103	1:30 p.m.	T5. The Evolving Earth: Implications for Ore Deposit Formation, Evolution, and Benefaction ( <i>Society of Economic Geologists</i> )	Ballroom H
104	1:30 p.m.	T9. Bedrock Infiltration: Advances in Understanding Vadose-Zone Processes, Percolation through Macropores and Shallow Soils, and Recharge to Consolidated-Rock Aquifers ( <i>International Association of Hydrogeologists; GSA Hydrogeology Division</i> )	250 AB
105	1:30 p.m.	T10. Chemistry, Ecology, and Groundwater Hydrology of Lakes, Streams, Playas, and Springs: Observations at the Interface ( <i>GSA Hydrogeology Division; GSA Limnogeology Division; GSA Geobiology and Geomicrobiology Division</i> )	251 D
106	1:30 p.m.	T13. Fault Zone Controls on Fluid Movement, Earth Resources, and Processes: Perspectives from Field, Laboratory, and Modeling Studies II ( <i>GSA Hydrogeology Division; GSA Structural Geology and Tectonics Division; GSA Geophysics Division</i> )	251 AB
107	1:30 p.m.	T15. Groundwater Quality and Quantity Interconnections: The Effects of Natural and Anthropogenic Contamination on Groundwater Availability ( <i>GSA Hydrogeology Division; National Ground Water Association/Association of Ground Water Scientists and Engineers</i> )	250 C
108	1:30 p.m.	T25. Arsenic Occurrence and Fate in Hydrogeologic Systems II ( <i>GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division</i> )	250 DE
109	1:30 p.m.	T30. The Hydrosystem of the Great Salt Lake Basin: New Frontiers for Observing and Modeling Human-Impacted Hydrologic, Climatic, and Geomorphologic Processes I ( <i>GSA Hydrogeology Division; American Geophysical Union</i> )	251 C
110	3:30 p.m.	T44. Seismogenic Landslides ( <i>GSA Engineering Geology Division</i> )	254 B
111	1:30 p.m.	T66. Petrographic Methods Applied to Sedimentary Rocks: To Celebrate the 80th Birthday of Bob Folk ( <i>GSA Sedimentary Geology Division; Society for Sedimentary Geology [SEPM]</i> )	151 DEF
112	1:30 p.m.	T70. Resolving the Late Paleozoic Gondwanan Ice Age in Time and Space: Integration of Southern and Northern Hemisphere Records I ( <i>GSA Sedimentary Geology Division</i> )	151 G
113	1:30 p.m.	T75. Weathering, Sedimentation, and Diagenesis in Major Element Cycles II ( <i>GSA Sedimentary Geology Division</i> )	151 G
114	1:30 p.m.	T95. Conservation and Management of Global Geoh heritage Resources: International Perspectives ( <i>GSA International Division; GSA Geology and Society Division; National Park Service; U.S. Geological Survey; Geology and Public Policy Committee</i> )	Ballroom F
115	1:30 p.m.	T107. Minorities, Women, and Persons with Disabilities in the Geosciences: Avenues to Success ( <i>Committee on Minorities and Women in the Geosciences</i> )	251 E
116	1:30 p.m.	T113. Strategies for Teaching Introductory Geoscience in Large Lecture Classes ( <i>National Association of Geoscience Teachers</i> )	251 F

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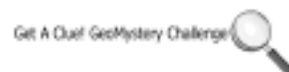


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NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
117	1:30 p.m.	T116. Causes and Effects of the Paleocene-Eocene Thermal Maximum and Other Paleogene Hyperthermal Events I ( <i>GSA Limnogeology Division</i> )	Ballroom E
118	1:30 p.m.	T117. Terrestrial and Extraterrestrial Environments for Microbial Survival II ( <i>GSA Geobiology and Geomicrobiology Division</i> )	Ballroom J
119	1:30 p.m.	T118. The Peña Blanca Uranium District, Chihuahua: A Natural Analogue for the Transport of Radionuclides in a Nuclear Waste Repository in Unsaturated, Welded Tuff II ( <i>Geology and Public Policy Committee</i> )	151 ABC
120	1:30 p.m.	T132. High-Pressure Mineral Physics: To Honor Ho-Kwang Mao, Roebling Medalist I ( <i>Mineralogical Society of America; Geophysical Laboratory of the Carnegie Institution of Washington and COMPRES; Consortium for Materials Properties Research in Earth Sciences</i> )	150 DEF
121	1:30 p.m.	T135. Orogenic Plateaus from Top to Bottom ( <i>GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Sedimentary Geology Division</i> )	Ballroom D
122	1:30 p.m.	T146. Young and Active Transtensional Deformation along the Western Margin of North America: Walker Lane Belt/Eastern California Shear Zone to the Gulf of California ( <i>GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Quaternary Geology and Geomorphology Division</i> )	Ballroom B
123	1:30 p.m.	Archaeological Geology (Posters)	Hall C
124	1:30 p.m.	Geoscience Education (Posters)	Hall C
125	1:30 p.m.	Geoscience Information: Resources and Dissemination (Posters)	Hall C
126	1:30 p.m.	Mineralogy/Crystallography (Posters)	Hall C
127	1:30 p.m.	Petrology and Volcanology (Posters)	Hall C
128	1:30 p.m.	Remote Sensing/Geographic Info System (Posters)	Hall C
129	1:30 p.m.	T56. Carving the Western Landscape: The Evolution of the Colorado Drainage from Source to Sink (Posters) ( <i>GSA Quaternary Geology and Geomorphology Division</i> )	Hall C
130	1:30 p.m.	T64. Comparative Carbonate Sedimentology: A Tribute to the Career of R.N. Ginsburg (Posters) ( <i>GSA Sedimentary Geology Division</i> )	Hall C
131	1:30 p.m.	T111. Sigma Gamma Epsilon Student Research (Posters) ( <i>Sigma Gamma Epsilon</i> )	Hall C
132	1:30 p.m.	T126. Accretionary Orogens in Space and Time (Posters) ( <i>GSA Geophysics Division; International Lithosphere Program</i> )	Hall C

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During GSA, visit us at **Booth #227**, or join us

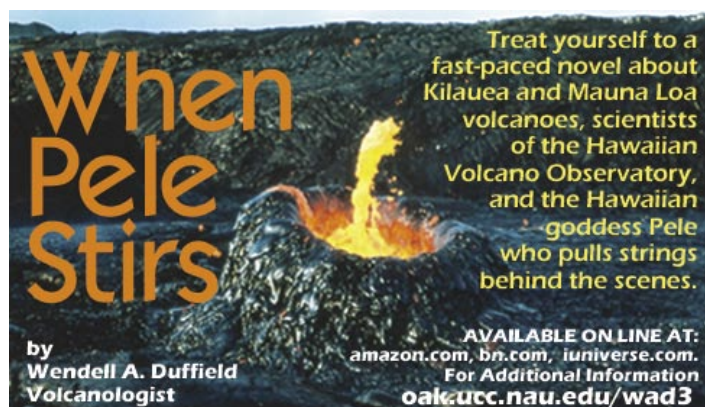
### Conversazione

Monday, October 17 at 7:00 p.m. at

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**RSVP** If you are interested in attending our *Conversazione*, contact Kimm Harty ([kimmharty@utah.gov](mailto:kimmharty@utah.gov)) or Mike Hylland ([mikehylland@utah.gov](mailto:mikehylland@utah.gov)) before October 3.



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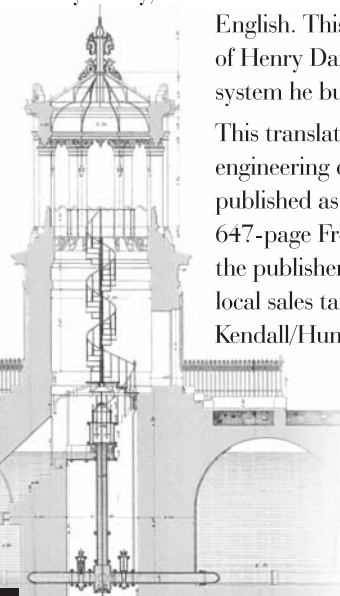

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NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
<b>TUESDAY, 18 OCTOBER 2005</b>			
133	8 a.m.	Geomorphology	257
134	8 a.m.	Paleontology IV: Macroevolution—Origin, Inheritance, and Selection of Characters	151 ABC
135	8 a.m.	Petrology, Igneous	251 F
136	8 a.m.	Sediments: Clastic Sedimentology and Stratigraphy	151 DEF
137	8 a.m.	P2. Research Opportunities, New Frontiers, and the Questioning of Paradigms in Structural Geology and Tectonics: Celebrating the 25th Anniversary of the SGT Division ( <i>GSA Structural Geology and Tectonics Division; NSF Tectonics Program</i> )	Ballrooms AC
138	8 a.m.	T4. Sources of Porphyry Copper Deposits: Magmas, Metals, and Fluids II ( <i>Society of Economic Geologists</i> )	Ballroom H
139	8 a.m.	T7. A Tribute to Hans-Olaf Pfannkuch: From Darcy to the Modern World of Environmental and Contaminant Hydrogeology I ( <i>GSA Hydrogeology Division; American Institute of Hydrology; Minnesota Ground Water Association</i> )	250 C
140	8 a.m.	T11. Dissolution, Precipitation, and Redox Reaction Kinetics in Aquifers ( <i>GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division</i> )	251 AB
141	8 a.m.	T24. Naturally Occurring Perchlorate (and Other Oxyanions) in the Hydrologic Cycle—Origins, Accumulation, Transformations, and Transport ( <i>GSA Hydrogeology Division; GSA Geobiology and Geomicrobiology Division</i> )	251 C
142	8 a.m.	T31. The Role of Colloids and Semicrystalline/Amorphous Materials in Environmental Cycling of Trace Elements ( <i>GSA Hydrogeology Division</i> )	250 DE
143	8 a.m.	T34. Springs: Keys to Understanding Geochemical Processes in Aquifers ( <i>GSA Hydrogeology Division; International Association of Hydrogeologists; Karst Waters Institute</i> )	250 AB
144	8 a.m.	T40. Genesis, Behavior, Mapping, and Treatment of Collapsible Soils ( <i>GSA Engineering Geology Division</i> )	251 D
145	8 a.m.	T45. What Goes Up Must Come Down: The Science and Policy of Dam Removal ( <i>GSA Engineering Geology Division; Geology and Public Policy Committee</i> )	254 B
146	8 a.m.	T49. Geology in the National Parks: Research, Mapping, and Resource Management ( <i>National Park Service</i> )	150 ABC

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
147	8 a.m.	T53. The Changing Planet I: A Special Tribute Session Celebrating the Contributions of Fred T. Mackenzie	Ballroom D
148	8 a.m.	T57. Paleoenvironmental Records in and around the Bonneville Basin: From Glacial/Interglacial Cycles to Anthropogenic Impacts ( <i>GSA Limnogeology Division; GSA Quaternary Geology and Geomorphology Division; GSA Archaeological Geology Division</i> )	Ballroom E
149	8 a.m.	T67. Reading the Record of the Rocks: Resolving the Tectonic and Eustatic Signals in Stratigraphic Successions I: In Honor of Don Swift on His 70th Birthday ( <i>Society for Sedimentary Geology [SEPM]</i> )	151 G
150	8 a.m.	T85. Traces of Life: Micro- to Macroscopic Evidence of Past and Present Biogenic Activity and Their Implications ( <i>Paleontological Society; GSA Geobiology and Geomicrobiology Division</i> )	Ballroom F
151	8 a.m.	T88. Does Geology Serve Society? Let's Count the Ways! ( <i>Geology and Society Division; Geology and Public Policy Committee; Critical Issues Caucus</i> )	251 E
152	8 a.m.	T100. Integrating Research into Undergraduate Geoscience Coursework ( <i>National Association of Geoscience Teachers</i> )	Ballroom J
153	8 a.m.	T121. Thermochronology: Techniques, Applications, and Interpretations II	Ballroom B
154	8 a.m.	T124. The Lunar Exploration Initiative: Current Science Knowledge and Future Exploration ( <i>GSA Planetary Geology Division</i> )	150 G
155	8 a.m.	T132. High-Pressure Mineral Physics: To Honor Ho-Kwang Mao, Roebling Medalist II ( <i>Mineralogical Society of America; Geophysical Laboratory of the Carnegie Institution of Washington and COMPRES: Consortium for Materials Properties Research in Earth Sciences</i> )	150 DEF
156	8 a.m.	Environmental Geoscience (Posters)	Hall C
157	8 a.m.	Geochemistry (Posters)	Hall C
158	8 a.m.	Hydrogeology (Posters) I: Recharge and Vadose Processes	Hall C
159	8 a.m.	Paleoclimatology/Paleoceanography (Posters)	Hall C
160	8 a.m.	Paleontology (Posters) II	Hall C
161	8 a.m.	T9. Bedrock Infiltration: Advances in Understanding Vadose-Zone Processes, Percolation through Macropores and Shallow Soils, and Recharge to Consolidated-Rock Aquifers (Posters) ( <i>International Association of Hydrogeologists; GSA Hydrogeology Division</i> )	Hall C



**ANNUAL**  
Campus Representatives  
Appreciation Breakfast  
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Salt Palace Convention Center  
Room 254 A

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NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
162	8 a.m.	T10. Chemistry, Ecology, and Groundwater Hydrology of Lakes, Streams, Playas, and Springs: Observations at the Interface (Posters) ( <i>GSA Hydrogeology Division; GSA Limnogeology Division; GSA Geobiology and Geomicrobiology Division</i> )	Hall C
163	8 a.m.	T13. Fault Zone Controls on Fluid Movement, Earth Resources, and Processes: Perspectives from Field, Laboratory, and Modeling Studies (Posters) ( <i>GSA Hydrogeology Division; GSA Structural Geology and Tectonics Division; GSA Geophysics Division</i> )	Hall C
164	8 a.m.	T25. Arsenic Occurrence and Fate in Hydrogeologic Systems (Posters) ( <i>GSA Hydrogeology Division; Geochemical Society; GSA Geobiology and Geomicrobiology Division</i> )	Hall C
165	8 a.m.	T135. Orogenic Plateaus from Top to Bottom (Posters) ( <i>GSA Structural Geology and Tectonics Division; GSA Geophysics Division; GSA Sedimentary Geology Division</i> )	Hall C
166	8 a.m.	T143. Great Basin Tectonics and Metallogeny (Posters) ( <i>U.S. Geological Survey</i> )	Hall C
167	1:30 p.m.	Geochemistry	251 AB
168	2:30 p.m.	Mineralogy/Crystallography	150 DEF
169	1:30 p.m.	Paleontology V: Extinction—Theory and Observation	151 ABC
170	1:30 p.m.	Precambrian Geology	257
171	1:30 p.m.	Tectonics II	150 G
172	1:30 p.m.	P3. Science, Politics, and Environmental Policy ( <i>GSA Geology and Society Division; Geology and Public Policy Committee; U.S. Geological Survey Science Impact Program</i> )	Ballrooms AC
173	1:30 p.m.	T7. A Tribute to Hans-Olaf Pfannkuch: From Darcy to the Modern World of Environmental and Contaminant Hydrogeology II ( <i>GSA Hydrogeology Division; American Institute of Hydrology; Minnesota Ground Water Association</i> )	250 C
174	1:30 p.m.	T30. The Hydrosystem of the Great Salt Lake Basin: New Frontiers for Observing and Modeling Human-Impacted Hydrologic, Climatic, and Geomorphologic Processes II ( <i>GSA Hydrogeology Division; American Geophysical Union</i> )	251 C

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NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
175	1:30 p.m.	T42. Mine Rock Piles and Pyritically Altered Areas: Their Slope Stability and Effect on Water Quality ( <i>GSA Engineering Geology Division; Geochemical Society</i> )	254 B
176	1:30 p.m.	T50. Geology of Parks and Public Lands: Effective and Innovative Informal Earth Science Education for the Masses ( <i>National Park Service; Bureau of Land Management; Association of Earth Science Editors</i> )	250 AB
177	1:30 p.m.	T53. The Changing Planet II: A Special Tribute Session Celebrating the Contributions of Fred T. Mackenzie	250 DE
178	1:30 p.m.	T62. Ice Free versus Cold-Based Ice: Cosmogenic Nuclides, Trimlines, and Ice Sheet History of Differentially Weathered Landscapes ( <i>GSA Quaternary Geology and Geomorphology Division</i> )	150 ABC
179	1:30 p.m.	T64. Comparative Carbonate Sedimentology II: A Tribute to the Career of R.N. Ginsburg ( <i>GSA Sedimentary Geology Division</i> )	151 G
180	1:30 p.m.	T67. Reading the Record of the Rocks: Resolving the Tectonic and Eustatic Signals in Stratigraphic Successions II: In Honor of Don Swift on His 70th Birthday ( <i>Society for Sedimentary Geology [SEPM]</i> )	151 DEF
181	1:30 p.m.	T78. Habitat Partitioning above, on, and within the Substrate ( <i>Paleontological Society; GSA Geobiology and Geomicrobiology Division</i> )	Ballroom F
182	1:30 p.m.	T84. Thinking about Fossils: The Emergence and Development of Paleontological Thought in North America from Native American Customs to the End of the Great Western Surveys ( <i>GSA History of Geology Division; History of Earth Sciences Society [HESS]; GSA Archaeological Geology Division; Paleontological Society; Society of Vertebrate Paleontology</i> )	251 D
183	1:30 p.m.	T89. Efficient and Effective Practices in Using Web Sites and Technologies to Support and Manage Information, Student Learning and Recruitment, and Public Education ( <i>National Association of Geoscience Teachers</i> )	251 E
184	1:30 p.m.	T92. Keys to Opportunities with the National Park Service ( <i>National Park Service; Geological Society of America; American Geological Institute; Association for Women Geoscientists</i> )	251 F
185	1:30 p.m.	T114. We Can Continue to Do Better: More Alternatives to the Same Old Lab-Lecture Format in the College Classroom I ( <i>GSA Geoscience Education Division; National Association of Geoscience Teachers</i> )	Ballroom J
186	1:30 p.m.	T116. Causes and Effects of the Paleocene-Eocene Thermal Maximum and Other Paleogene Hyperthermal Events II ( <i>GSA Limnogeology Division</i> )	Ballroom E
187	1:30 p.m.	T125. 4-D Evolution of the Continents: Integrated Solutions through Cyberinfrastructure ( <i>GSA Geophysics Division; GSA Structure and Tectonic Division</i> )	Ballroom D
188	1:30 p.m.	T143. Great Basin Tectonics and Metallogeny ( <i>U.S. Geological Survey</i> )	Ballroom H
189	1:30 p.m.	T145. The Nature, Significance, and Evolution of Transtensional Tectonic Regimes ( <i>GSA Structural Geology and Tectonics Division</i> )	Ballroom B
190	1:30 p.m.	Quaternary Geology and Geomorphology (Posters)	Hall C
191	1:30 p.m.	T22. Interactions of Groundwater and Surface Water at the Land-Sea Margin (Posters) ( <i>GSA Hydrogeology Division</i> )	Hall C
192	1:30 p.m.	T24. Naturally Occurring Perchlorate (and Other Oxyanions) in the Hydrologic Cycle—Origins, Accumulation, Transformations, and Transport (Posters) ( <i>GSA Hydrogeology Division; GSA Geobiology and Geomicrobiology Division</i> )	Hall C
193	1:30 p.m.	T33. Water, Solute, and Sediment Fluxes through Carbonate and Karst Aquifers (Posters) ( <i>GSA Hydrogeology Division; GSA Sedimentary Geology Division; Karst Waters Institute</i> )	Hall C
194	1:30 p.m.	T34. Springs: Keys to Understanding Geochemical Processes in Aquifers (Posters) ( <i>GSA Hydrogeology Division; International Association of Hydrogeologists; Karst Waters Institute</i> )	Hall C
195	1:30 p.m.	T49. Geology in the National Parks: Research, Mapping, and Resource Management (Posters) ( <i>National Park Service</i> )	Hall C
196	1:30 p.m.	T71. Sedimentary Basins in Transition: Stratigraphic and Structural Records of Plate Tectonic Reconfiguration (Posters) ( <i>GSA Sedimentary Geology Division</i> )	Hall C
197	1:30 p.m.	T85. Traces of Life: Micro- to Macroscopic Evidence of Past and Present Biogenic Activity and Their Implications (Posters) ( <i>Paleontological Society; GSA Geobiology and Geomicrobiology Division</i> )	Hall C
198	1:30 p.m.	T101. Interdisciplinary Education: Applications of GIS and the Infusion of Spatial Concepts across the Curriculum (Posters) ( <i>National Association of Geoscience Teachers</i> )	Hall C
199	1:30 p.m.	T108. Museum-College Connections: Rich Opportunities for Earth Science Education (Posters) ( <i>National Association of Geoscience Teachers</i> )	Hall C
200	1:30 p.m.	T121. Thermochronology: Techniques, Applications, and Interpretations (Posters)	Hall C
201	1:30 p.m.	T131. Geophysical Studies for Improving Management of Land, Water, Environment, and Hazards (Posters) ( <i>GSA Geophysics Division; GSA Hydrogeology Division; GSA Engineering Geology Division</i> )	Hall C



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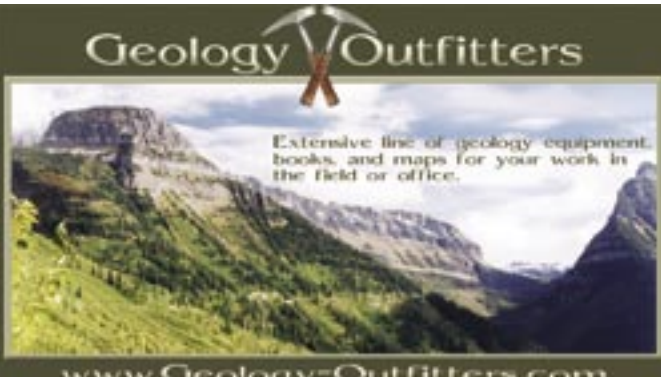
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Get A Clue! GeoMystery Challenge

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
<b>WEDNESDAY, 19 OCTOBER 2005</b>			
202	10 a.m.	Economic Geology I	Ballroom H
203	8 a.m.	Environmental Geoscience	254 B
204	8 a.m.	Hydrogeology I: Tracers and other Field Techniques	251 C
205	8 a.m.	Paleoclimatology/Paleoceanography I	251 F
206	8 a.m.	Paleontology VI: Partitioning Taxa—Patches, Gradients, and Regions	151 ABC
207	8 a.m.	Quaternary Geology II	150 ABC
208	8 a.m.	Structural Geology II: Pseudotachylites, Shear Zones, and Vorticity	150 G
209	8 a.m.	T6. Borates, Uranium, Mineral Sands, and Bulk Commodities: Deposit Models, Processes, and Descriptions ( <i>Society of Economic Geologists</i> )	Ballroom H
210	8 a.m.	T16. Hydrogeology and Climate Change: Insights from the Past ( <i>GSA Hydrogeology Division</i> )	250 C
211	8 a.m.	T22. Interactions of Groundwater and Surface Water at the Land-Sea Margin ( <i>GSA Hydrogeology Division</i> )	250 DE
212	8 a.m.	T23. Nano- to Field-Scale Processes Governing the Transport of Microbes and Colloids in the Subsurface I ( <i>GSA Hydrogeology Division</i> )	251 AB
213	8 a.m.	T26. Quantifying Controls on Microbial Reaction Rates in Subsurface Environments I ( <i>GSA Hydrogeology Division; National Ground Water Association; GSA Geobiology and Geomicrobiology Division</i> )	250 AB
214	8 a.m.	T43. Recognition and Characterization of Neogene Faults ( <i>GSA Engineering Geology Division; GSA Structural Geology and Tectonics Division</i> )	Ballroom E
215	8 a.m.	T51. Investigation of Sources and Fates of Anthropogenic Inputs to the Environment through Isotopic Systematics	151 DEF
216	8 a.m.	T58. Recent Advances in Numerical Dating Techniques for Developing Quantitative Chronostratigraphies in Arid and Semi-Arid Environments ( <i>INQUA [International Union for Quaternary Research]: Working Group on Dryland Dating</i> )	Ballrooms AC
217	8 a.m.	T68. Recent Advances in the Application of Sedimentology and Stratigraphy to Tectonic Problems ( <i>GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Division</i> )	151 G
218	10 a.m.	T70. Resolving the Late Paleozoic Gondwanan Ice Age in Time and Space: Integration of Southern and Northern Hemisphere Records II ( <i>GSA Sedimentary Geology Division</i> )	151 DEF

## GeoScience Educators' Social Reception

Sat., 15 Oct., 5–7 p.m.  
Location: Marriott, Salon F

The GSA Education Committee, the National Association of Geoscience Teachers, the GSA Division of Geoscience Education, Cutting Edge, DLESE, and others would like to invite all educators to a relaxing forum for socializing, sharing ideas, and meeting other geoscience community members interested in education.

*Come and meet the GSA Education Staff.*

Appetizers and cash bar provided.

## Education Share-a-thon

Pick up FREE education materials!  
Share your favorites! Meet other  
educators and  
learn about their activities.  
Come share in the success  
of others!

Join us at our booth  
in the Exhibit Hall

Sun., 16 Oct., 5:30–7:30 p.m.  
Mon.–Tues., 17–18 Oct.,  
9 a.m.–5:30 p.m.

Wed., 19 Oct.,  
9 a.m.–2 p.m.

NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
219	8 a.m.	T83. The Dawn of Animal Life: Evolutionary and Paleocological Patterns in the Neoproterozoic-Cambrian Animal Fossil Record ( <i>Paleontological Society; GSA Geobiology and Geomicrobiology Division</i> )	Ballroom F
220	8 a.m.	T90. From Rocks to Records: Geological Preservation for the Profession and the Public Good ( <i>GSA Geology and Society Division</i> )	251 D
221	8 a.m.	T96. Geological Monitoring in National Parks ( <i>National Park Service</i> )	251 E
222	10 a.m.	T105. Let's Rock Their World: Integrating Planetary Science Data into Undergraduate Geoscience Courses ( <i>GSA Planetary Geology Division; GSA Geoscience Education Division; On the Cutting Edge; National Association of Geoscience Teachers</i> )	251 D
223	8 a.m.	T110. REU at 25: Its Impact on Undergraduate Geoscience Education ( <i>National Association of Geoscience Teachers; Council on Undergraduate Research, Geoscience Division</i> )	Ballroom J
224	8 a.m.	T126. Accretionary Orogens in Space and Time I ( <i>GSA Geophysics Division; International Lithosphere Program</i> )	Ballroom B
225	8 a.m.	T127. Geometry and Evolution of Extensional Basins and Their Influence on Fluid Flow, Sedimentation, Seismicity, and Magmatism ( <i>GSA Geophysics Division; GSA Structural Geology and Tectonics Division</i> )	Ballroom D
226	8 a.m.	T150. Fracturing and Faulting of the Clastic Rocks of the Colorado Plateau	150 DEF
227	8 a.m.	Economic Geology (Posters)	Hall C
228	8 a.m.	Hydrogeology (Posters) II: Field and Modeling Syntheses	Hall C
229	8 a.m.	Precambrian Geology (Posters)	Hall C
230	8 a.m.	Sediments (Posters)	Hall C
231	8 a.m.	T35. Riparian Corridors in Semi-Arid and Arid Environments: Results and Approaches of Integrative Studies in Support of Scientifically Based Management and Restoration, with Emphasis on the Great Basin (Posters)	Hall C
232	8 a.m.	T42. Mine Rock Piles and Pyritically Altered Areas: Their Slope Stability and Effect on Water Quality (Posters) ( <i>GSA Engineering Geology Division; Geochemical Society</i> )	Hall C
233	8 a.m.	T72. Sedimentology Goes to Mars (Posters) ( <i>GSA Planetary Geology Division; GSA Sedimentary Geology Division</i> )	Hall C
234	8 a.m.	T114. We Can Continue to Do Better: More Alternatives to the Same Old Lab-Lecture Format in the College Classroom (Posters) ( <i>GSA Geoscience Education Division; National Association of Geoscience Teachers</i> )	Hall C
235	1:30 p.m.	Economic Geology II	Ballroom H
236	1:30 p.m.	Engineering Geology	251 D
237	1:30 p.m.	Geophysics/Tectonophysics/Seismology	151 G
238	1:30 p.m.	Hydrogeology II: Modeling and Parameter Measurement	251 C
239	1:30 p.m.	Paleoclimatology/Paleoceanography II	150 DEF
240	1:30 p.m.	Paleontology VII: Life's Responses to Climate Change	151 ABC
241	1:30 p.m.	Volcanology	251 F
242	1:30 p.m.	P5. The 2004–2005 Eruption of Mount St. Helens: New Insights and Hazard Management of an Extraordinary Dacitic Dome-Growth Eruption ( <i>GSA Quaternary Geology and Geomorphology Division; GSA Geophysics Division; GSA Engineering Geology Division</i> )	Ballrooms AC

*Back by popular demand!*

## GSA's 2005 Hall of Fame

Science and Learning—Colleagues Who Make a Difference

On display at the Salt Palace Convention Center

Once again, GSA will be highlighting its 2005 awardees in the annual Hall of Fame. This meeting-long display honors GSA's current and past geoscience award winners, AGI's current and past Medal in Memory of Ian Campbell recipients, the GSA Divisions' current and past awardees, GSA Fellows and Honorary Fellows, GSA's 50-year members, our Allied and Associated Society award recipients, and our top student grant recipients. Take a moment to acknowledge your colleagues, mentors, students, and maybe even yourselves, for all the hard work and well-deserved recognition!



NO.	TIME	DESCRIPTION (SPONSORS)	LOCATION
243	1:30 p.m.	T23. Nano- to Field-Scale Processes Governing the Transport of Microbes and Colloids in the Subsurface II ( <i>GSA Hydrogeology Division</i> )	251 AB
244	1:30 p.m.	T26. Quantifying Controls on Microbial Reaction Rates in Subsurface Environments II ( <i>GSA Hydrogeology Division; National Ground Water Association; GSA Geobiology and Geomicrobiology Division</i> )	250 AB
245	1:30 p.m.	T27. Seafloor Hydrogeology: Investigating Fluid Flow through the Oceanic Crust and Seafloor Sediments ( <i>GSA Hydrogeology Division</i> )	250 DE
246	1:30 p.m.	T35. Riparian Corridors in Semi-Arid and Arid Environments: Results and Approaches of Integrative Studies in Support of Scientifically Based Management and Restoration, with Emphasis on the Great Basin	250 C
247	1:30 p.m.	T54. This Changing Planet: Explaining Geologic Hazards to the Media, Policy Makers, and the General Public ( <i>GSA Engineering Geology Division; GSA Geology and Society Division; Association of Earth Science Editors; National Park Service; Geology and Public Policy Committee</i> )	254 B
248	1:30 p.m.	T61. Glacial Geology and Lake Sedimentology: In Memory of Geoffrey O. Seltzer ( <i>GSA Limnogeology Division</i> )	Ballroom E
249	1:30 p.m.	T72. Sedimentology Goes to Mars ( <i>GSA Planetary Geology Division; GSA Sedimentary Geology Division</i> )	151 DEF
250	1:30 p.m.	T80. Paleoenvironments and Taphonomy of Cambrian Lagerstätten ( <i>Paleontological Society</i> )	Ballroom F
251	1:30 p.m.	T114. We Can Continue to Do Better: More Alternatives to the Same Old Lab-Lecture Format in the College Classroom II ( <i>GSA Geoscience Education Division; National Association of Geoscience Teachers</i> )	Ballroom J
252	1:30 p.m.	T126. Accretionary Orogens in Space and Time II ( <i>GSA Geophysics Division; International Lithosphere Program</i> )	150 ABC
253	1:30 p.m.	T137. The Backbone of America from Patagonia to Alaska: Plateau Uplift, Shallow Subduction, and Ridge Collision ( <i>GSA International Division</i> )	Ballroom D
254	1:30 p.m.	T148. What is a Magma Chamber? The Role of Sheets in the Assembly of Intrusions II ( <i>GSA Structural Geology and Tectonics Division</i> )	150 G
255	1:30 p.m.	T149. Rheological Information from Naturally Deformed Materials: New Approaches to Understanding Bulk Ductile Behavior ( <i>GSA Structural Geology and Tectonics Division</i> )	Ballroom B
256	1:30 p.m.	T43. Recognition and Characterization of Neogene Faults (Posters) ( <i>GSA Engineering Geology Division; GSA Structural Geology and Tectonics Division</i> )	Hall C
257	1:30 p.m.	T68. Recent Advances in the Application of Sedimentology and Stratigraphy to Tectonic Problems (Posters) ( <i>GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Division</i> )	Hall C

## *You are Invited*

### TO MEET THE AUTHORS AND A BOOK SIGNING

#### **2005 Guest Authors**

GSA Bookstore, Headquarters,  
Exhibit Hall—Just follow the crowd!

Sun., 16 Oct., 5:30–7:30 p.m.

Visit the Members' Corner  
and Combined Publishers Display  
featuring books from a wide variety of publishers.

Sarah Andrews—*Dead Dry*

Donald Baars—*A Travelers' Guide to  
the Geology of the Colorado Plateau*

Marcia Bjornerud—*Reading the Rocks*

Wendell Duffield—*Volcanoes of Northern Arizona*

Robert Fillmore—*Geology of the  
Parks of Southern Utah*

Wayne Ranney—*Carving Grand Canyon*

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#### **Special Guest Author**

Simon Winchester—*A Crack in the Edge of the World:  
America and the Great California Earthquake of 1906*

~ Graduate School Information Forum ~

## Salt Palace Convention Center, Exhibit Hall

Sun., 16 Oct., 8 a.m.–7:30 p.m.; Mon.–Wed., 17–19 Oct., 8 a.m.–5:30 p.m.

Searching for the right graduate school? Meet with university representatives from across the nation at GSA's Graduate School Information Forum. The schools participating (as of press time) are listed below.

For a complete list of schools, contact Kevin Ricker at +1-303-357-1090, [kricker@geosociety.org](mailto:kricker@geosociety.org).

To check if a school has a booth in the Exhibit Hall, go to [www.geosociety.org/meetings/2005/xibits.htm](http://www.geosociety.org/meetings/2005/xibits.htm).

INSTITUTION	SUN.	MON.	TUES.	WED.	INSTITUTION	SUN.	MON.	TUES.	WED.
Binghamton		⊙			Texas A&M University	⊙	⊙	⊙	⊙
Brooklyn College		⊙			Texas Tech University	⊙			
Central Washington University	⊙	⊙			University of Alabama		⊙		
Colorado School of Mines	⊙				University of California–Davis	⊙	⊙	⊙	
Cornell University	⊙	⊙			University of Florida	⊙	⊙	⊙	
Duke University	⊙	⊙	⊙	⊙	University of Idaho		⊙	⊙	
East Carolina University	⊙	⊙			University of Iowa	⊙			
Idaho State University	⊙	⊙			University of Kansas	⊙	⊙		
Illinois State University	⊙	⊙			University of Massachusetts	⊙	⊙		
Indiana University	⊙	⊙			University of Memphis	⊙	⊙	⊙	⊙
Iowa State University	⊙				University of Minnesota		⊙		
Kansas State University	⊙	⊙			University of North Carolina–Chapel Hill	⊙	⊙		
Kent State University	⊙	⊙	⊙		University of Notre Dame	⊙	⊙	⊙	
Miami University, Ohio	⊙	⊙			University of Oklahoma	⊙	⊙	⊙	
Northern Arizona University		⊙			University of Texas–El Paso	⊙	⊙	⊙	
Oklahoma State University	⊙	⊙	⊙		University of Wisconsin–Madison	⊙	⊙	⊙	
Oregon State University	⊙	⊙	⊙		Utah State University	⊙	⊙	⊙	⊙
Penn State University		⊙			Virginia Tech	⊙	⊙	⊙	
Purdue University	⊙	⊙			Western Michigan University	⊙	⊙	⊙	
Rice University	⊙	⊙	⊙						
Rutgers University	⊙	⊙							

### Breakfast with GSA's President and Executive Director

Marriott Salt Lake City Downtown,  
Guest Hospitality Suite  
Mon., 17 Oct., 8–8:30 a.m.

Come to the Guest Hospitality Suite to meet William A. Thomas, GSA's president, and Jack Hess, GSA's executive director. Breakfast will be provided for those guests who have paid the guest program registration fee.

### IS TRIVIA YOUR THING?

Get your team together (or just come along and join a team) and take part in the 2nd Annual GSA Geoscience Trivia Night.

Come have a fun time, learn a little,  
and meet great people.

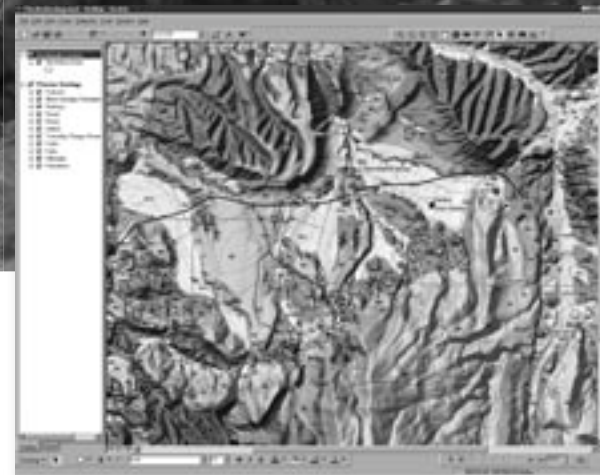
Free entry, plenty of prizes!

Tuesday night, 18 Oct., 7.30–9.30 p.m.

Location: Hilton, Alpine West

Salt Lake City, Utah  
(includes a cash bar)

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## ~ Guest Program ~

### Guest Hospitality Suite

Sun.–Wed., 16–19 Oct., 8 a.m.–5:30 p.m.  
Marriott Salt Lake City Downtown, Sundance Room

We extend a warm welcome to all guests at the 2005 Annual Meeting in Salt Lake City! The guest or spouse registration fee of US\$80 per person is for nongeologist spouses or friends of professional and/or student meeting registrants. Registered guests are invited to visit the Guest Hospitality Suite, a resource center with abundant information on Salt Lake City and the surrounding area. Local experts will be on hand to answer your questions. Light refreshments will be served throughout the day. We hope you enjoy your stay in Salt Lake City!

**Badges:** While at the Salt Palace Convention Center and the Marriott Salt Lake City Downtown, please wear your GSA guest badge. It is required for admission to the Guest Hospitality Suite and the Exhibit Hall.

**Exhibit Hall:** Guest registration includes access to the Exhibit Hall.

**Refreshments:** Refreshments in the Guest Hospitality Suite are reserved only for those who have paid the guest registration fee of US\$80.

**Technical Sessions:** The guest registration fee does not provide access to technical sessions. Any guest wishing to see a specific presentation should sign in with the hostess in the Guest Hospitality Suite.

**It's not too late to register! Go to [www.geosociety.org/meetings/2005](http://www.geosociety.org/meetings/2005) to learn more.**

### Tours

*You must be registered for either the entire GSA meeting or the Guest Program in order to participate in guest tours, seminars, and activities.*

All guest tours depart from and return to the Marriott Salt Lake City Downtown.

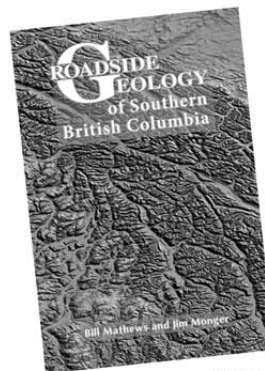
**Please arrive 15 to 20 minutes before scheduled departure.** The Salt Lake City area has a great deal to offer and the formal tours can only cover a small portion of what is available to see and do. You may enjoy visiting other area attractions with fellow guest attendees or go it alone on a self-guided tour. The Guest Hospitality Suite hostess and the Salt Lake City Convention & Visitors Bureau representatives (desk in the main concourse of the Salt Palace Convention Center) can provide you with more information and activity suggestions.

### Ticketed Tours

Tickets are being sold in advance for the following tours. However, you may check with the registration desk, located in the South Foyer of the Salt Palace Convention Center, for ticket availability.

	TIME	COST
<b>SATURDAY, 15 OCT.</b>		
Bird Watching: Your Lifetime Ticket to the Theater of Nature [101]	8 a.m.–noon	US\$39
<b>SUNDAY, 16 OCT.</b>		
Mormon Tabernacle Choir and Crossroads of the West Tour [102]	8:30 a.m.–1 p.m.	US\$39
Utah Olympic Park and Park City Gallery Stroll [103]	10 a.m.–4 p.m.	US\$49
<b>MONDAY, 17 OCT.</b>		
Alps of Utah (includes lunch) [104A]	9 a.m.–4 p.m.	US\$61
Alps of Utah (lunch not included) [104B]	9 a.m.–4 p.m.	US\$49
Best of Salt Lake City Tour [105]	12:30–4 p.m.	US\$34

## ROADSIDE GEOLOGY of Southern British Columbia



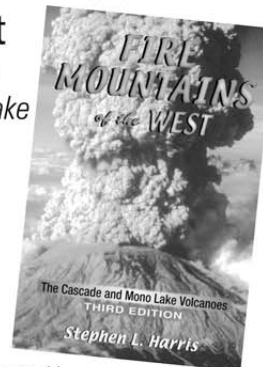
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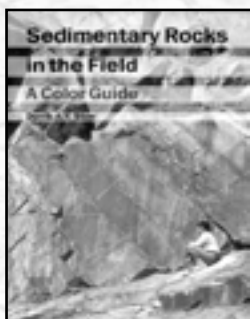
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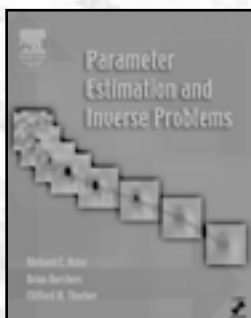
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## TIME

## COST

### TUESDAY, 18 OCT.

The Great Salt Lake and Kennecott Copper Mine [106]	9 a.m.–1 p.m.	US\$29
Utah Olympic Park and Park City [107]	1–5 p.m.	US\$39

### WEDNESDAY, 19 OCT.

Gardner Village Shopping Tour [108]	10 a.m.–1 p.m.	US\$29
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## Seminars

Payment of the guest registration fee entitles you to also attend the guest seminars offered for no additional charge. Guest Program registrants are invited to attend the following seminars and workshops:

### The Art of Entertaining

Marriott Salt Lake City Downtown, Sundance Rm, Mon., 17 Oct., 10–11 a.m. Enjoy the morning while getting advice and lessons from a private chef and entertainment guru. For more than nine years, Mary Crafts has been the host of KBYU's Culinary Creations. You will learn tips on what Mary does best—the art of entertaining! Mary tackles the question of centerpieces, table settings, and the newest trends in décor and service styles. Mary is not an academy-trained chef. Everything she knows, she has learned through more than twenty years of hosting and professional catering. She creates her dishes using regular ingredients and cooking techniques anyone can master. Her private catering company, Culinary Crafts, has won many awards, including being named by the *New York Times* as the “unquestioned favorite” in a nationwide dessert sampling.

### What is Genealogy?

Marriott Salt Lake City Downtown, Sundance Rm, Tues., 18 Oct., 10–11 a.m. Learn about one of the fastest growing pastimes in the United States: genealogy. Salt Lake City is home to the world's largest storehouse of family records, the Family History Library, which is located near the Salt Palace Convention Center. During this session, you'll be introduced to “What is genealogy?” and observe a demonstration of how you can access information about your ancestral past.

### Temple Square Gardening

Marriott Salt Lake City Downtown, Sundance Rm, Wed., 19 Oct., 10–11 a.m. The gardens at Temple Square are among the most beautiful in the world. They were designed to look lovely all year long, to be perfect from any angle, and to need as little maintenance as possible. They were recently voted one of the top 10 gardens in the world. This beautifully landscaped 10-acre plot of ground in the heart of downtown Salt Lake City is one of Utah's most visited attractions. Each year, more than a million people tour the gardens at Temple Square. Pros offer inside secrets of the beauty of Temple Square gardens, along with down-to-earth advice on how to get similar results at home.

## REGISTRATION GRANTS



Sponsored by Subaru of America, Inc.

### Graduate Students of Utah State Universities

Subaru grants are available to cover one-half of the registration fees for GSA Member and non-Member graduate students of Utah state universities.

### College Faculty of Utah Two-Year State Colleges

Subaru grants are available to cover one-half of the registration fees for GSA Member and non-Member earth science and geology faculty of Utah state two-year colleges.

Please go to the GSA Web site for additional information and to apply.  
[www.geosociety.org/meetings/2005/rSubaru.htm](http://www.geosociety.org/meetings/2005/rSubaru.htm)

## Registration

**Standard Registration Deadline:**  
12 September 2005.

**Cancellation Deadline:**  
19 September 2005.

From 13 September to 9 October, you will still be able to register online, by mail, or by fax at on-site rates.

**Online:** [www.geosociety.org/meetings/2005/reg.htm](http://www.geosociety.org/meetings/2005/reg.htm)

**Mail:** GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA

**Fax:** +1-303-357-1071

After 9 October, registrations will not be accepted via mail, fax, or phone. Please plan to register on-site at the Salt Palace Convention Center, South Foyer, starting at 7 a.m., Saturday, 15 Oct.

### If you register before 12 September:

If you are located within the United States, your badge will be mailed to you about two weeks before the meeting.

**IMPORTANT: Remember to bring your badge and registration confirmation with you to the meeting.** Badge holders and programs will be available at the Salt Palace Convention Center, South Foyer, beginning Sat., 15 Oct., at 7 a.m. For your convenience, a pick-up desk with badge holders and programs will also be available in the Hilton Salt Lake City Center Hotel and the Marriott Salt Lake City Downtown Hotel.

### If you register after 12 September or are located outside of the United States:

You will need to pick up your badge, badge holder, and program on-site at the GSA registration desk in the Salt Palace Convention Center, South Foyer, beginning Sat., 15 Oct., at 7 a.m.

## Earth

A Narrative in Verse



By John Dickey

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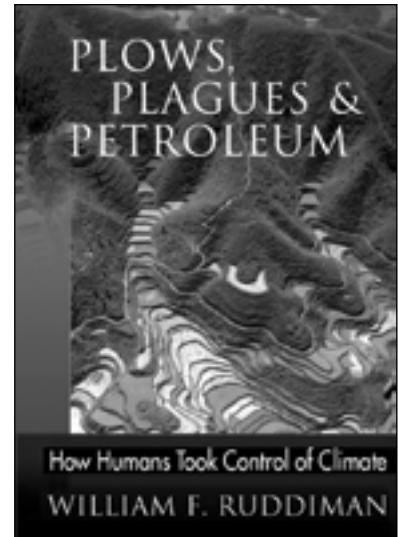
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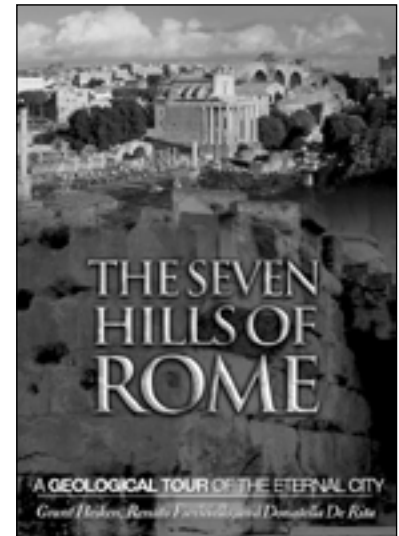
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## Upcoming Special Meetings

### *External Controls on Deep Water Deposition*

(March 27-29, 2006, London, UK)

### *Giant Hydrocarbon Reservoirs of the World: Core Workshop*

(Planned—April 8 and 9, 2006 @ AAPG/SEPM Meeting)

### *Quaternary Reefs and Platforms*

(Planned—April 13-14, 2006 @ AAPG/SEPM Meeting)

### *Application of Earth System Modelling to Exploration*

(July 11-13, 2006, Snowbird, Utah)

GSA Booth  
# 944

## Latest Publications

- Special Publication #80

### *Aquifer Characterization*

Edited by: John Bridge and David Hyndman

- Special Publication #81

### *Cyclostratigraphy: Approaches and Case Histories*

Edited by: Bruno D'Argenio, A. G. Fischer, I. Premoli-Silva, H. Weissert,  
and V. Ferreri

- Special Publication #82

### *The Deposition of Organic-Carbon-Rich Sediments: Models, Mechanisms, and Consequences,*

Edited by: Nicholas B. Harris

- Concepts in Sedimentology and Paleontology #8

### *Carbonate Sedimentology and Sequence Stratigraphy*

By: Wolfgang Schlager

- Special Publication #83 (out soon!)

### *Deltas – Concepts, Models, and Examples*

Edited by: Liviu Giosan and Janok Bhattacharya

- Special Publication #84 (out soon!)

### *Incised Valleys in Time and Space,*

Edited by: Robert Dalrymple, Dale Leckie and Rod Tillman



## TRAVELING TO SALT LAKE CITY

Traveling to Salt Lake City is simple and convenient. Salt Lake City is known as the "Crossroads of the West" due to its easy access by road, rail, and air. Interstates 15 & 80, and U.S. Highway 89 go through the city. Amtrak provides a link to the east and west by rail. By air, half the U.S. population is within two and a half-hour's distance. Salt Lake City International Airport is closer to the city it serves than nearly any other airport.

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### AIR TRAVEL

Salt Lake City International Airport (Airport code—SLC) is one of the largest airports in the world and is served by most major airlines. The airport is located 7 miles east of downtown Salt Lake City. The following airlines have been contracted to provide convention rates to and from Salt Lake City for the 2005 GSA Annual Meeting & Exposition. You can save up to 15% on published airfares by booking through the group reservation desks at the numbers listed below.

#### Frontier Airlines

www.frontierairlines.com  
+1-800-243-6297

Ticket Designator #**MC058B**

Frontier Airlines is offering discounts of 10% off all published round-trip fares. Call +1-800-908-9068 and reference Ticket Designator Number **MC058B**.

#### United Airlines

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Meeting ID #**530GJ**

United Airlines is offering a 5% discount off the lowest applicable discount fare, including first class, or a 10% discount off full fare unrestricted coach fares purchased 7 days in advance. An additional 5% discount will apply when tickets are purchased at least 30 days in advance of your travel date. Discounts also apply on Shuttle by United and United Express. United's convenient schedule and discounted fares are available through United's Meeting Desk or your travel agent. Call +1-800-521-4041 and reference Meeting ID Number **530GJ**. Dedicated reservationists are on duty seven days a week, 8 a.m.–10 p.m. EST.

#### Delta

While Salt Lake City is Delta's third largest hub, Delta has discontinued their meeting discount program as of 5 January 2005.

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### TRANSPORTATION OPTIONS TO/FROM SALT LAKE CITY INTERNATIONAL AIRPORT

There is a ground transportation desk located at the far end of the baggage claim in both terminals at which ground transportation options and information can be obtained. Ground transportation can also be arranged at the ground transportation desks. For more information, contact SLC's Ground Transportation Information Center, +1-801-575-2477.

---

### CAR RENTAL

#### Enterprise Rent-A-Car

Corporate Office: +1-800-325-8007; Salt Lake City:  
+1-801-537-7433; www.enterprise.com  
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You may book reservations online at www.enterprise.com; simply enter your special account number, **CUT4401**, in the optional account box and hit enter, then enter the first 3 letters of your event name, **GEO**, and hit enter. You may also book through Enterprise's National Reservations Center at **1-800-Rent-a-Car**. All renters must be at least 21 years of age and have a valid driver's license and credit card in their possession when they pick up the rental vehicle.

---

### SHUTTLE SERVICE

#### Express Shuttle

+1-800-397-0773 or +1-801-596-1600  
www.xpressshuttleutah.com

Shuttles operate daily from 4 a.m. to 12:30 a.m., serving all of downtown Salt Lake City. The cost is US\$7.00 per person each way. Travel time is about 10 minutes depending on hotel and number of stops. To arrange passage, stop at the Express Shuttle counter on the same level as the baggage claim.

---

### TAXIS

There is a ground transportation desk located at the far end of the baggage claim in both terminals.

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Ute Cab +1-801-359-7788  
Yellow Cab +1-801-521-2100

#### Wheelchair-Accessible Buses, Shuttles, Taxis, or Vans

All of the buses and the TRAX system are wheelchair accessible. The following company will pick you up with prior notice at Salt Lake City International Airport and provide specialized transportation. Please make arrangements before your arrival.

Handi Van Inc. +1-801-281-8416

## TRANSPORTATION OPTIONS IN SALT LAKE CITY

GSA will NOT be providing shuttle service from the hotels to the convention center, but Salt Lake City does have the following inexpensive—or free—options for getting around downtown. Alternative arrangements to/from the GSA hotels and the Salt Palace will be provided by GSA for the elderly or disabled. For more information, contact Erin Pitner, [epitner@geosociety.org](mailto:epitner@geosociety.org), +1-303-357-1006.

### Public Transportation Services

Once you arrive, getting around the city is easy. The airport is just 10 minutes from downtown. The Utah Transit Authority provides mass transit throughout the Salt Lake area, including the airport and mountain resorts.

### CITY BUSES

Most buses run 6 a.m.–midnight on weekdays and 7 a.m.–midnight on Saturday. Sunday service has limited regular routes.

Salt Lake Area: RIDE-UTA (+1-888-743-3882)

In State Toll Free: +1-888- RIDE-UTA (+1-888-743-3882)

Outside of Utah: +1-801-RIDE-UTA (+1-801-743-3882)

Hours: Mon.–Sat., 6 a.m.–7 p.m. CLOSED SUNDAY.

### TRAX LIGHT-RAIL

Salt Lake City has a light-rail system known as TRAX. The 15-mile line runs between 10000 South in Sandy (South Salt Lake Valley) and the Delta Center in Downtown Salt Lake City.

Trains stop every 10 to 30 minutes from 5:30 a.m. to 11 p.m. on weekdays and on Saturday until 1 a.m. No service on Sundays. There are also free park and ride lots at most stations excluding downtown.

**Fares:** The standard one-way fare within the valley is US\$1.25. A large section of the downtown area, including Temple Square and the area just west of the State Capitol, is a

fare-free zone and there is no charge if commuters or visitors enter and exit a bus or TRAX between the designated streets. Full-fare tickets may be purchased from vending machines or when boarding the bus. These tickets are valid for two hours from the time of purchase and can be used as often as necessary on both buses and light rail. A full day pass is valid for unlimited rides on buses and TRAX for US\$2.50. These passes may also be bought at vending machines or from pass sales outlets at supermarkets and other retailers. They are self-validating and can be purchased in quantity and used as needed.

## GENERAL MEETING INFO

### ACCESSIBILITY FOR REGISTRANTS WITH SPECIAL NEEDS

GSA is committed to making the Annual Meeting accessible to all people interested in attending. If you need auxiliary aids or services because of a disability, check the appropriate box on the registration form. If you have suggestions or need further information, contact Kevin Ricker, [kicker@geosociety.org](mailto:kicker@geosociety.org), +1-303-357-1090. Please let us know your needs by 15 September.

### TOURIST INFORMATION

For general information about sightseeing, accommodations, restaurants, and shopping in Salt Lake City, visit [www.visitsaltlake.com/home.shtml](http://www.visitsaltlake.com/home.shtml), or see the GSA Meeting Web site for additional area information.

### WEATHER AND CLIMATE

The average maximum daytime temperature for Salt Lake City in October is 53 °F (~11 °C), with an average rainfall of 1.4 inches (3.5 cm). Low humidity and lots of sunshine are two favorable aspects of Utah's weather: The sun shines in SLC an average of 237 days a year, with about 14 days of clear skies in October.



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### Attention Students!

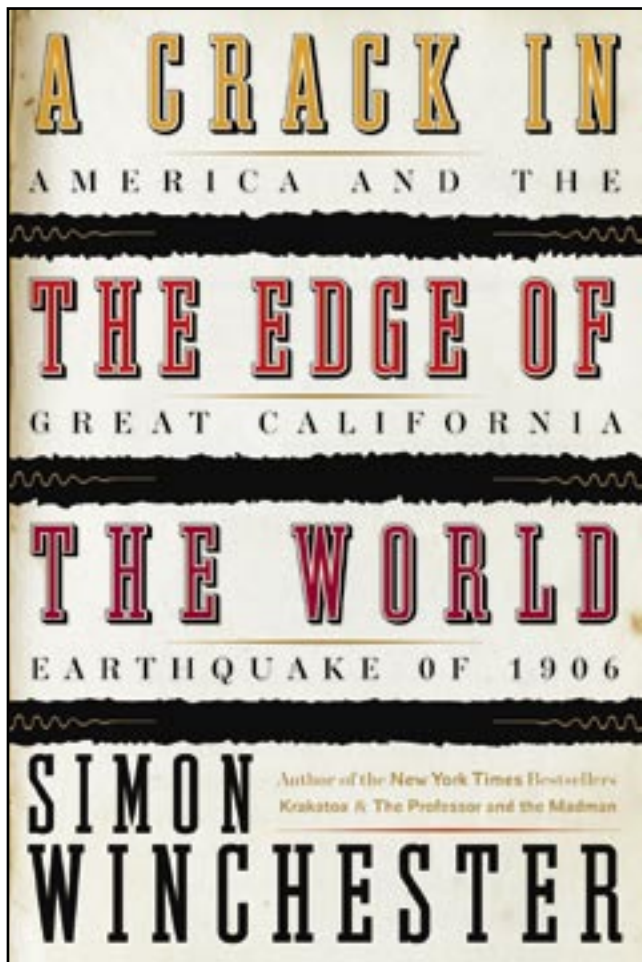
Various travel grants are available to help get you to the GSA Annual Meeting in Salt Lake City.

Go to the GSA Web site to see how you can experience the GSA Annual Meeting for less!

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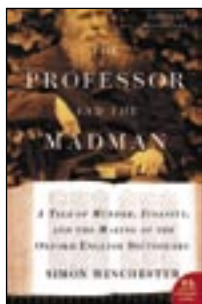
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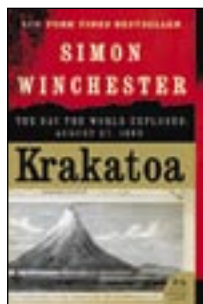
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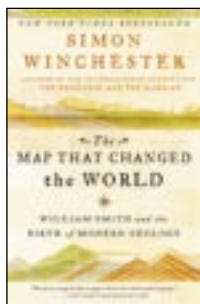
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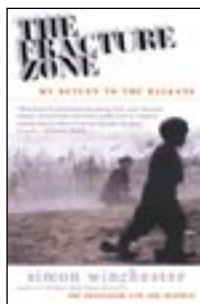
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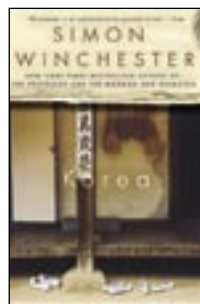
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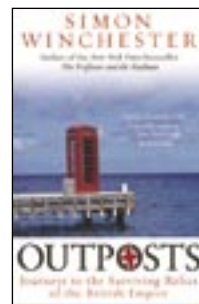
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## Pardee Keynote Symposia

The Pardee Keynote Symposia are special events of broad interest to the geoscience community. They represent topics on the leading edge of a scientific discipline or area of public policy, address broad fundamental issues, and are interdisciplinary. Selection was on a competitive basis. This year's eight Pardee Keynote Symposia were reviewed and accepted by the Annual Program Committee.

ALL SYMPOSIA WILL BE HELD AT THE SALT PALACE CONVENTION CENTER.

### Speaking Out for Evolution: Rationale and Resources for Supporting the Teaching of Evolution

(*Paleontological Society; Society of Vertebrate Paleontology*)  
Sun., 16 Oct., 8:00 a.m., Ballroom A/C

### 2004 South Asian Tsunami

(*GSA Geophysics Division; GSA International Division; GSA Sedimentary Geology Division; GSA Structural Geology and Tectonics Divisions; GSA Geology and Society Division*)  
Sun., 16 Oct., 1:30 p.m., Ballroom A/C

### Water Resources Science and Public Policy

(*GSA Hydrogeology Division; GSA Geology and Society Division; Geology and Public Policy Committee*)  
Sun., 16 Oct., 1:30 p.m., Room 251 AB

**The Wasatch Range–Great Salt Lake Hydroclimatic System**  
(*GSA Hydrogeology Division; International Association of Hydrogeologists–U.S. National Chapter; American Geophysical Union; GSA Quaternary Geology and Geomorphology Division; Friends of the Great Salt Lake*)

Mon., 17 Oct., 8 a.m., Ballroom A/C

### The Return to Saturn: Results from Cassini-Huygens

(*GSA Planetary Geology Division*)

Mon., 17 Oct., 1:30 p.m., Ballroom A/C

### Research Opportunities, New Frontiers, and the Questioning of Paradigms in Structural Geology and Tectonics:

#### Celebrating the 25th Anniversary of the SGT Division

(*GSA Structural Geology and Tectonics Division; NSF Tectonics Program*)

Tues., 18 Oct., 8 a.m., Ballroom A/C

### Science, Politics, and Environmental Policy

(*GSA Geology and Society Division; Geology and Public Policy Committee; U.S. Geological Survey Science Impact Program*)

Tues., 18 Oct., 1:30 p.m., Ballroom A/C

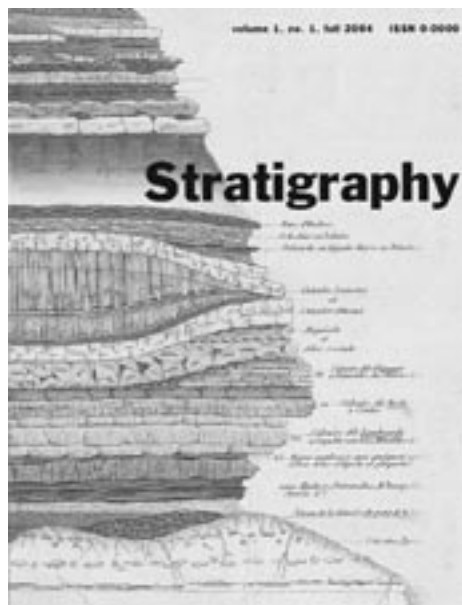
### The 2004–2005 Eruption of Mount St. Helens: New Insights and Hazard Management of an Extraordinary Dacitic Dome-Growth Eruption

(*GSA Quaternary Geology and Geomorphology Division; GSA Geophysics Division; GSA Engineering Geology Division*)

Wed., 19 Oct., 1:30 p.m., Ballroom A/C

The Pardee Keynote Symposia are made possible by a grant from the Joseph T. Pardee Memorial Fund.

"Stratigraphy explains geology" – Y. Gladenkov



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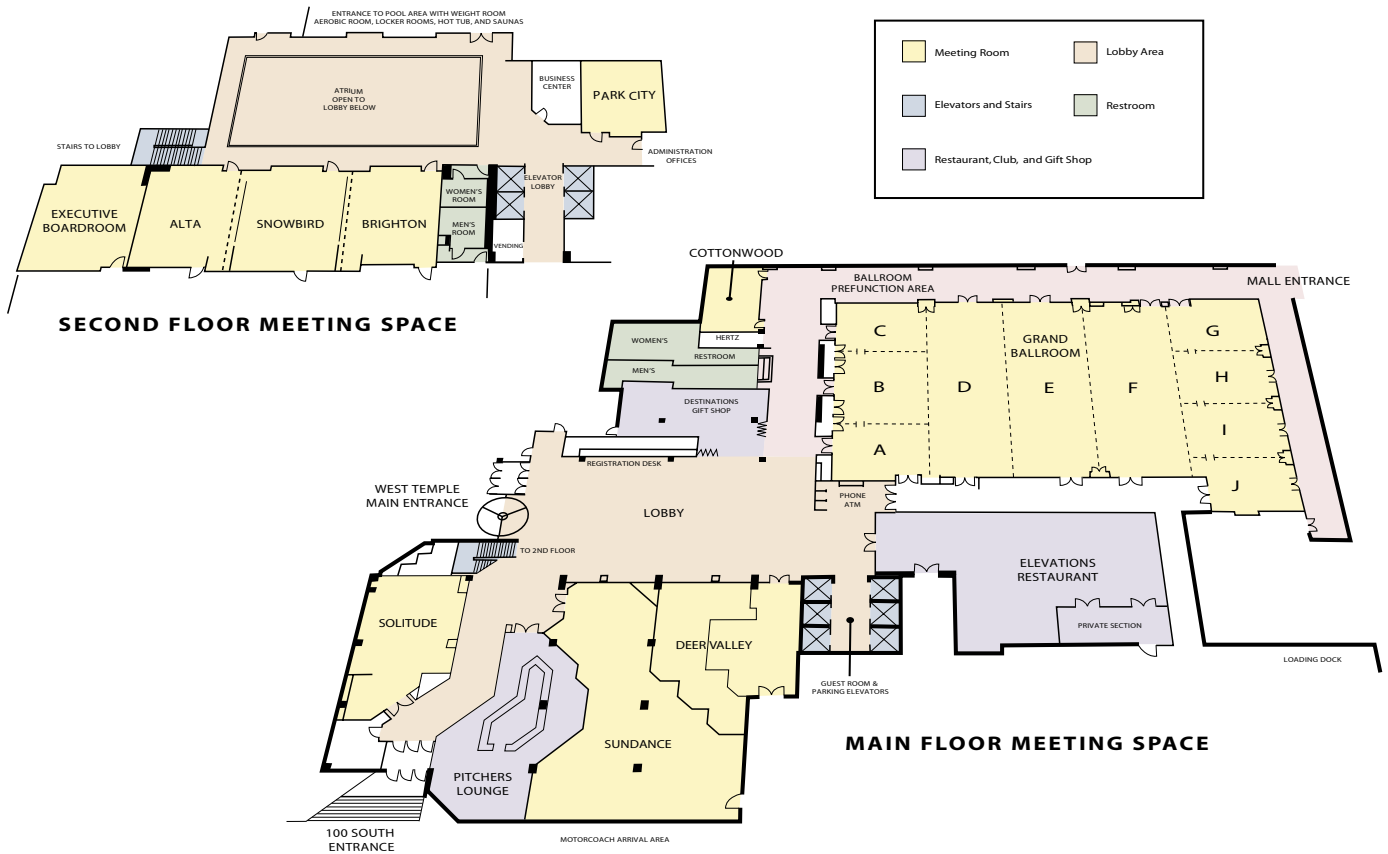
## 2005 AGI Medal In Memory of Ian Campbell Awarded to Samuel S. Adams

The Ian Campbell Medal is given in recognition of singular performance in and contribution to the profession of geology. Candidates are measured against the distinguished career of Ian Campbell, whose service to the profession touched virtually every facet of the geosciences. Campbell was a most uncommon man of remarkable accomplishment and widespread influence. In his career as a geologist, educator, administrator, and public servant, he was noted for his candor and integrity.

The presentation of the medal to Samuel S. Adams will include a citation by William L. Fisher at the **Presidential Address and Awards Ceremony, Sat., 15 Oct., 7–9 p.m.**, Hilton Salt Lake City Center, Grand Ballroom.



# Marriott Floor Map



## NOTICE of Council Meeting

Meetings of the GSA Council are open to Fellows, Members, and Associates of the Society, who may attend as observers, except during executive sessions. Only councilors and officers may speak to agenda items, except by invitation of the chair.

The next meeting of the Council will be at 1 p.m., Saturday, 15 Oct., and at 1 p.m., Tuesday, 18 Oct., at the 2005 GSA Annual Meeting in Salt Lake City, Utah.

## GSA Presidential Address and Awards Ceremony

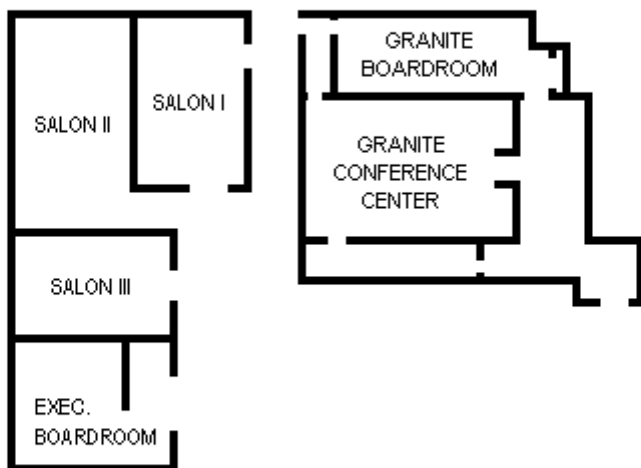
Sat., 15 Oct., 7–9 p.m.  
Hilton Salt Lake City Center,  
Grand Ballroom

You're invited to attend the Presidential Address on Saturday evening. Bill Thomas will speak on *Tectonic Inheritance at a Continental Margin*. Following this address, the citations and responses for GSA's 2005 Penrose, Day, and Donath medals, AGI's Medal in Memory of Ian Campbell, and GSA's Public Service and Distinguished Service awards will be presented.

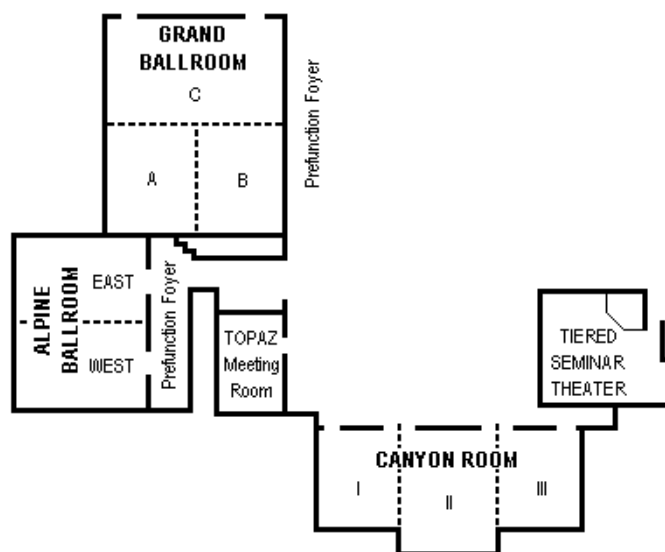
Please join us in recognizing all of our award recipients including GSA's Division award recipients and GSA's newly elected Fellows and Honorary Fellows on stage, followed by a reception. We hope to see you all at what we anticipate to be a wonderful evening.

## Hilton Floor Map

Hilton Salt Lake City Center—Lobby Level



Hilton Salt Lake City Center—Second Level



### All Students Invited!

## PRESIDENT'S STUDENT BREAKFAST RECEPTION

SUN., 16 OCT. 2005, 7–8:30 A.M.

HILTON SALT LAKE CITY CENTER, GRAND BALLROOM

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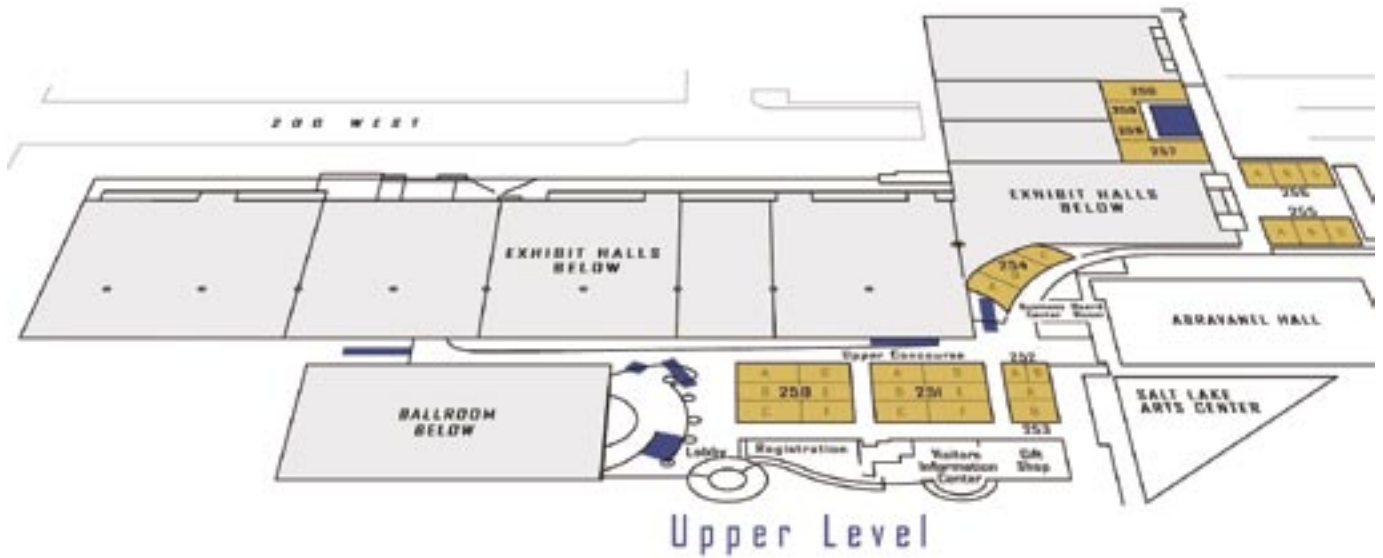
GSA President Bill Thomas invites all students registered for the meeting to attend a free breakfast buffet sponsored by ExxonMobil Corporation.

Bill and members of the GSA leadership, as well as ExxonMobil staff members, will be on hand to answer questions and address student issues. This will also be a time to recognize the **Subaru Outstanding Woman in Science** awardee, **Michelle Walvoord**, as well as acknowledge other student Division awardees and student research grant recipients. Also, for the first time,

the breakfast will include a testimonial from a GSA GeoCorps™ America student intern.

Each student registered for the meeting will receive a complimentary ticket for the breakfast buffet. This is one of the most popular events at the meeting for students, and with good reason! Take this opportunity to network with fellow students, meet the officers of GSA, and recognize fellow student award recipients.

≈ Salt Palace Convention Center Floor Map ≈



# GSA MENTOR PROGRAMS

at the 2005 Salt Lake City Annual Meeting

Looking for a job—now or in the future?

## Plan to attend the Careers Roundtable Discussions Mentor Program

Join this group of mentors for one-on-one career advice, networking opportunities, and job-market perspectives. They represent a broad range of geoscience-related professions including academics, industry, and government agencies. This FREE come-and-go event is open to everyone. **Registration not required.** Sun., 16 Oct., 1–3 p.m., Salt Palace Convention Center, Ballrooms GI. For more information, contact Karlon Blythe, kblythe@geosociety.org.

## Attention Students Pursuing a Hydrogeology Career Path—This Mann Mentor Program is for You!

The Mann Mentors in Applied Hydrogeology Program underwrites the cost for up to 25 students to attend the distinguished Hydrogeology Division Luncheon and Awards Presentation. That's right—no cost to students. **Eligible students are those who have: (1) ticked the box on their membership application indicating their professional interest in hydrology/hydrogeology, AND (2) registered for the Annual Meeting by 12 September 2005.** The lucky recipients of these tickets will have the chance to

meet with some of the nation's most distinguished hydrogeologists. FREE tickets will be awarded to the first 25 students who respond to an **e-mail invitation**, based on the eligibility criteria above. **Registration required.** Tues., 18 Oct., noon–3 p.m., Hilton, Grand Ballroom C. For more information, contact Karlon Blythe, kblythe@geosociety.org.

## Students: check out the GEOLOGY IN GOVERNMENT MENTOR PROGRAM!

A **FREE lunch** for undergraduate and graduate students will be held at GSA's Salt Lake City meeting. This popular annual event will feature a select panel of mentors representing various government agencies. Mentors will invite questions from the students, offer advice about preparing for a career, and comment on the prospects for current and future job opportunities within their agencies. Mon., 17 Oct., 11:30 a.m.–1 p.m., Hilton, Grand Ballroom C. **Registration not required.** Every student registered for the Annual Meeting will receive a ticket to this event along with their badge; however, attendance is limited, so arrive early! For more information, contact Karlon Blythe, kblythe@geosociety.org.

Looking for QUALIFIED CANDIDATES  
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## GSA EMPLOYMENT SERVICE CENTER

Access an online database of hundreds of professionals in over 30 specialties who are actively seeking career positions at all levels, and let GSA arrange the interviews.

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GSA Annual Meeting, 16–19 October 2005  
Salt Palace Convention Center, Ballroom GI,  
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Interview services range from a one-half day booth rental to multiple days, starting at \$400.

Visit our Web site for other options:

- Message Service at the Annual Meeting + Résumé Search
- Résumé Search only

[www.geosociety.org/Employment\\_Service](http://www.geosociety.org/Employment_Service)  
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GSA Annual Meeting 16–19 October 2005  
Salt Palace Convention Center, Ballroom GI,  
Salt Lake City, Utah

### POST OR RENEW YOUR PROFILE EARLY FOR BEST EXPOSURE!

Registration: \$35 Members; \$75 Non-Members

\*Interviewing at the GSA Annual Meeting is optional and is included in the Employment Service Center registration fee.

[www.geosociety.org/Employment\\_Service](http://www.geosociety.org/Employment_Service)  
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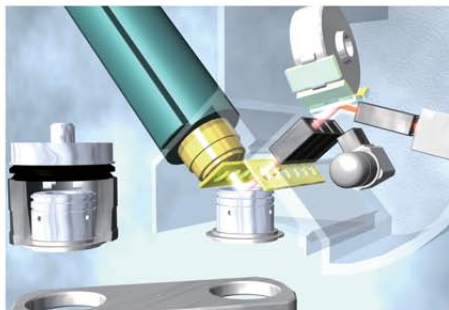
**It's not too late to register!**

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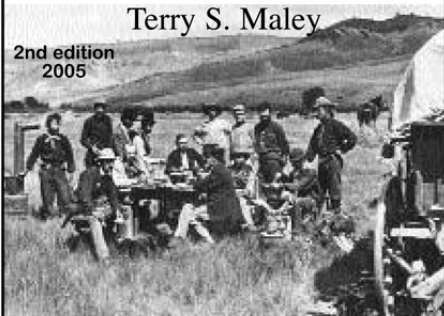


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## Call for Applications

# Apply for the GSA-USGS Congressional Science Fellowship for 2006-2007

Opportunities to serve as a Congressional Science Fellow are rare, unique experiences. This position may be a good fit for you.

It will enable you to work directly with national leaders and put your expertise and experience to work helping shape science and technology policy on Capitol Hill.

The Congressional Science Fellow will be selected from top competitors early in 2006. Prospective candidates should be GSA members with a broad geoscience background and excellent written and oral communication skills. Minimum requirements are a Master's degree with at least five years professional experience or a Ph.D. at the time of appointment.

If you possess this professional background, have experience in applying scientific knowledge to societal challenges, and share a passion for helping shape the future of the geoscience profession, GSA invites your application. The fellowship is open to U.S. citizens or permanent U.S. residents.

### Deadline to apply: 1 February 2006

For application information, visit [www.geosociety.org/science/csf/](http://www.geosociety.org/science/csf/), or contact Ginger Williams, GSA Headquarters +1-303-357-1040, [gwilliams@geosociety.org](mailto:gwilliams@geosociety.org).

## Annual Meeting Sponsor



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## Beginning 2006: Changes to GSA Graduate Student Research Grant Eligibility

GSA's student grant program works to maintain a high level of support for students and to award grants to nearly 50% of applicants. To sustain and surpass these efforts and to open up funding for new GSA Student Members, we have modified the eligibility for receiving grant funds. Students may now only receive GSA graduate student research grant money *once* at the Master's level and once at the Ph.D. level. Grant applicants who do not receive funding are always welcome to reapply.

Please see [www.geosociety.org/grants/gradgrants.htm](http://www.geosociety.org/grants/gradgrants.htm) for further details. The 2006 online application system will be up by mid-November 2005 and online applications will be due by Wed., 1 February 2006, at 11:59 p.m. (MST).

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**Come see us in Booth #211 at the GSA Annual Meeting 2005!**

Get A Clue! GeoMystery Challenge

## Call for Applications and Nominations for *GEOLOGY* Co-Editor

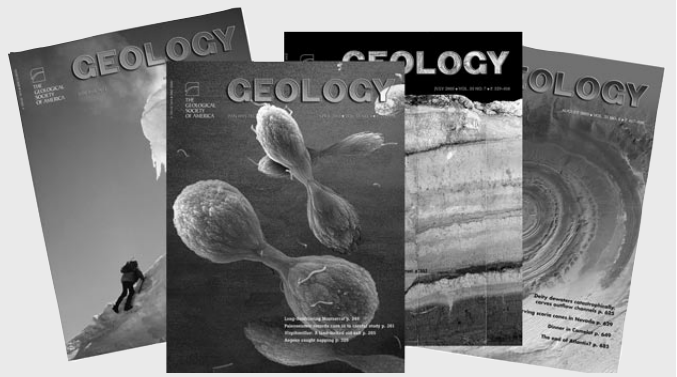
GSA is soliciting applications and nominations for the position of co-editor of *GEOLOGY*, an internationally recognized geoscience journal. The co-editor will serve a four-year term, beginning in January 2006 (exact start date to be negotiated), and will be one of a three-editor team. A co-editor with expertise and broad interests in tectonics and structural geology would best complement the continuing editors' strengths, but fields are flexible.

Desirable characteristics for the successful candidate include:

1. Broad interest and experience in geosciences;
2. International recognition;
3. Progressive attitude; willing to take risks and encourage innovation;
4. Familiar with many earth scientists and their work;
5. Sense of perspective and humor;
6. Organized and productive;
7. Willing to work closely with GSA headquarters staff;
8. Able to make decisions;
9. Familiar with new trends in geosciences; and
10. Willing to consider nontraditional research in geosciences.

GSA provides the editor with a small stipend as well as expenses for administrative assistance, mail, telephone, and Internet. The editor will work out of his or her current location at work or home—no move is necessary.

If you would like to be considered, please submit a curriculum vitae and a brief letter describing why you are suited for the position. If you would like to nominate someone for the position, submit a letter of nomination and the individual's written permission and CV. **Send nominations and applications to Jon Olsen, Director of Publications, GSA, P.O. Box 9140, Boulder, CO 80301, [jolsen@geosociety.org](mailto:jolsen@geosociety.org), by 7 October 2005.**



# What's So Hard About Keeping Meeting Costs Down?

## Answers to FAQs on Meeting Costs from the GSA Meetings Department

We know that all attendees are looking for that perfect balance of quality, comfort, convenience, and affordability in their hotel accommodations and meeting experience. GSA strives to achieve this balance at every GSA meeting. While the following explanations pertain primarily to the annual meeting, the same issues also come into play in planning GSA Section and specialty meetings.

### Some definitions to lay the groundwork:

- **GSA official (contracted) hotel:** A hotel with which GSA has contracted reserved meeting space and/or sleeping rooms for its meeting.
- **Room block:** The number of hotel sleeping rooms an organization reserves via contract and guarantees will be occupied by its meeting attendees.
- **Attrition:** Hotels place a hold on sleeping rooms two to ten years out for an organization's contracted meeting. A contract attrition clause is an insurance policy for the hotel, guaranteeing them revenue from the sleeping rooms and/or a penalty paid by the organization if it does not fulfill its sleeping room block. This penalty can be substantial!

### Why does it matter if I stay at a hotel other than the GSA official (contracted) hotels?

In order to get the convention center space we need, we must contract with a number of hotels (the number varies by city) and sometimes specific hotels. To get the meeting space we need at the headquarters hotel, we often have to take a large block of sleeping rooms and guarantee that we will fulfill that block. If we do not fulfill the block, we may have to give back some of the meeting space and/or pay an attrition penalty.

In 2002, GSA narrowly avoided a \$251,000 penalty at one of our contracted

hotels because attendees were not reserving rooms in the hotel. GSA and the hotel worked together to offer a new, lower room rate, and GSA attendees began making reservations with that hotel. If GSA had had to pay the \$251,000 penalty, GSA Members and other annual meeting attendees would have felt its impact. We could have seen cuts in educational programs and member benefits, increased membership fees, staff cuts, and higher meeting registration fees. For example, if that penalty were to have been covered entirely by annual meeting registration fees, professional attendees would have seen a \$75 increase for the 2003 meeting, and students and others would have seen an increase of ~25%–30%.

### How does GSA choose its contract hotels?

In some cities, there is only one possible headquarters hotel. In cities where there are multiple choices, we choose headquarters hotels based on a number of factors, including an adequate amount of meeting space, distance from the convention center, sleeping room rates, hotel and service quality, and the suitability of negotiated contract terms.

After the headquarters hotel is established, GSA meetings staff work to secure a good mix of viable options for attendees. Sometimes, in the case of many smaller hotels, it may not be cost-effective (in terms of staff time) to contract with a hotel that can only offer 10–50 sleeping rooms. Some hotels don't contract with groups at all; they rely entirely on transient (individual traveler) business. Some cities are simply overbuilt. Also, if GSA contracts with too many hotels, we invite attrition penalties.

### I found a cheaper rate on a Web site for one of GSA's contracted hotels.

Book it! But make the reservation in the name of the meeting attendee. Then send an e-mail to [meetings@geosociety.org](mailto:meetings@geosociety.org) to let us know. Generally, there are very few of these rooms available at the lower price. Not all attendees can get this rate, and the hotel will not offer this rate to GSA in a contract.

Many of the larger hotel chains are providing a new "Guaranteed Best Rate" incentive on their Web sites. This is a guarantee that you will not find a lower rate on another discount travel Web site such as Expedia, Travelocity, or Orbitz. This does not apply to sites like Hotwire or

### *We all want the same things in GSA's meetings:*

an excellent scientific program, a large group of enthusiastic attendees, a comfortable and efficient meeting facility with adequate space and number of rooms, an interesting location for field trips and touring—and we want all that at a LOW COST for registration and rooms. Four out of five ain't bad, and whether the cost is low or high depends on our understanding. GSA does obtain the best facilities in the best locations at the lowest available cost. So, why is that "lowest cost" as high as it is? Suggestions for bringing the cost down are many: meet in smaller, less expensive cities; find less expensive hotels; free lunch for everyone; etc. Realistically, GSA can't meet in a smaller city with a smaller convention facility; we were at capacity for meeting rooms in Seattle in 2003, for example. No one wants to meet in facilities that require scheduling technical sessions in multiple venues scattered around the city. The cost of the convention center is part of a contract that includes the use of a specified number of rooms in specific hotels. GSA must guarantee that those rooms will be occupied in order to obtain the use of the conference center at a specific rate. If the hotel rooms are not used by GSA registrants, GSA is subject to a penalty of several tens of thousands of dollars. Here's the problem: if we don't contract with the hotels through the convention center, the price of the convention center is greater; a cost that could only be covered by increased registration fees. The solution is the present conventional (no pun intended) arrangement. But, here's the next problem: if GSA registrants don't fill the hotel rooms, GSA must pay the penalty, which can only be budgeted through increased registration fees. The happy solution: GSA obtains the best deal it can for the convention center and hotels, and GSA registrants fill the convention hotel rooms. It may not be cheap, but it is the best we can do.

William A. Thomas, GSA President



Priceline, where you bid for a hotel that is not revealed until after the bid is accepted, or on package deals that include airline or car rental.

All of our hotel contracts include a clause that states that the hotel cannot offer a lower rate to anyone else (excluding airlines, government, long-term corporate contracts, and the discount travel sites mentioned above) during the GSA Annual Meeting without offering it to our attendees. However, this occasionally happens if the room revenue manager of the hotel is not aware of our contract clause. Generally, these lower rates are offered less than 30 days out when the hotel begins to see that it is not going to sell out, although some hotels won't wait that long. Our hotel contracts also protect GSA with a clause that provides for GSA to get credit for any meeting attendee who stays in a contracted hotel, no matter how the reservation was made or what rate was paid. *However, the reservation must be made in the name of the meeting attendee in order for GSA to get credit.* If it is in the name of an unregistered spouse, GSA does not get the credit.

#### **I can't afford to stay at the more expensive hotels.**

GSA contracts with several different hotels to accommodate a wide range of rates for our attendees. By making your reservations early, you can usually get into the less expensive hotels. Hotel reservations can be made as early as 1 June, and the less expensive hotels are the first to sell out. If you wait until the deadline, it is unlikely that you will be able to get a room at the lower-priced properties.

#### **Why can't you add more rooms at the less expensive hotels?**

Most hotels will not contract more than a certain percentage of rooms to groups; many times hotels have other contracts (government, airline, or corporate) to fulfill. Also, GSA gets a discount off the group rate, and hotels don't want to sell all of their rooms at that lower price.

In addition, GSA has to fulfill its room blocks in all of the contracted hotels. More rooms at the less expensive hotels jeopardizes fulfillment of block commitments at the other hotels. We then face attrition penalties at every hotel where commitments are not met.

#### **I must have the government rate.**

If the government per diem rate is lower than the GSA contracted rate, you can still stay in GSA contracted hotels. Whether you call the hotel directly or book on their Web site, please ensure the reservation is in the name of the meeting attendee. If possible, ask the reservation agent to note that you are attending the GSA Annual Meeting.

#### **I have to use our company travel agent to book my hotel.**

If your travel agent will not make your reservation via the GSA Housing Bureau, please ensure that the reservation is made in the name of the meeting attendee.

#### **Why do the field trips and short courses cost so much?**

GSA does not create the budgets for our field trips and short courses with the intent to make a profit on these events. We budget to break even and cover our costs. We know that field trips and short courses are important to you, and we do everything we can to keep the costs down but at the same time provide a quality event for you to attend and enjoy.

#### **What determines whether the meeting is held in October or November?**

October is prime convention season, when rates are highest and space is in highest demand. Groups that can offer a city the highest economic impact and that can book many years out are the most valued. The GSA Annual Meeting is very "meeting-space intensive": in most cities, we take over the entire convention center and there is nothing left to be sold to other groups. Unfortunately, because attendees often book their sleeping rooms on the

Internet or outside of the GSA contracted hotels, it is becoming more difficult to demonstrate how valuable the GSA meeting is to various cities. This can affect the dates and space we are able to reserve. Sometimes, we can get a significant reduction in convention center rental by holding the meeting in early November.

#### **Why can't the GSA Annual Meeting be held in cities like Raleigh, North Carolina?**

The GSA Annual Meeting requires a large amount of meeting space at both the convention center and headquarters hotels. Many of the less expensive cities are not large enough to hold the GSA Annual Meeting. As convention centers and headquarters hotels are being expanded and more flights are offered in these smaller cities, they will be considered for future annual meetings. Portland, Oregon, is one of the cities that expanded its convention center, and now it will be the site of the 2009 Annual Meeting.

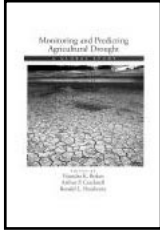
#### **Where do we go next?**

In a survey conducted in 2002, past annual meeting attendees were asked in what cities they would likely attend a GSA Annual Meeting. The most popular cities (in order) were Denver, Seattle, Portland (Oregon), Salt Lake City, San Francisco, and Boston. Three of these six cities are quite expensive, not only in hotel prices, but also convention center rental, labor, and food. They are some of the most popular locations for conventions, and their prices reflect this. We must hold meetings where attendees want to go, but at the same time in cities where costs can be controlled. We hope you will see from the list of future Annual Meeting sites below that GSA is striving hard to meet these needs.

## Future GSA Annual Meetings

2006	Philadelphia (October 22–25)
2007	Denver (October 28–31)
2008*	Chicago (October 26–30)
2009	Portland, Ore. (October 18–21)
2010	Denver (October 31–November 3)
2011	Minneapolis (October 9–12)

\* Joint meeting with American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.



**Monitoring and Predicting Agricultural Drought**  
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VIJENDRA K. BOKEN,  
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The editors of this book have assembled a team of expert contributors from all continents to make a global study, describing biometeorological models and monitoring methods for agricultural droughts. This will be an essential collection for those who must advise governments or international organizations on the current scope, likelihood, and impact of agricultural droughts.

2005 496 pp.  
0-19-516234-X \$124.50



**Paleolimnology**  
The History and Evolution of Lake Systems

ANDREW S. COHEN

This book describes the origin and formation of lakes in order to give context to the question of how lacustrine deposits form. It explains the process of sedimentation in lakes and the chemistry of those deposits and describes how the age of lake deposits are determined.

2003 528 pp.  
0-19-513353-6 \$124.50



**Geology and Health**  
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EDITED BY H. CATHERINE W.  
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*Geology and Health* is an integrated collection of papers from earth scientists, biologists, and medical specialists on health issues of concern to people worldwide, demonstrating how human health and well-being now and in the future can benefit through coordinated scientific efforts.

2003 192 pp.  
0-19-516204-8 \$75.00

*Forthcoming!*

**Weighing the World**  
The Quest to Measure the Earth

EDWIN DANSON

*Weighing the World* is a revealing behind-the-scenes look at the scientific events leading to modern map making written by one of the world's master surveyor. At the start of the century there were no maps, anywhere in the world. The answers to questions about the nature of the Earth were complete mysteries. Danson presents the stories of the scientists and scholars that had to scale the Andes, cut through tropical forests and how they handled the hardships they faced in the attempt to revolutionize our understanding of the planet.

November 2005 272 pp.  
0-19-518169-7 \$30.00

*Forthcoming!*

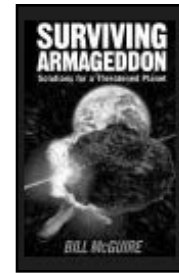
**After the Earth Quakes**  
Elastic Rebound on an Urban Planet

SUSAN ELIZABETH HOUGH  
AND ROGER G. BILHAM

Elastic rebound is one of the most basic tenets of modern earthquake science, the term that scientists use to describe the build-up and release of energy along faults. *After The Earth Quakes* focuses on this theme, using a number of pivotal and intriguing historic earthquakes as illustration. The book concludes with a consideration of projected future losses on an increasingly urbanized planet, including the near-certainty that a future earthquake will someday claim over a million lives. This grim prediction impels us to take steps to mitigate earthquake risk, the innately human capacity for rebound notwithstanding.

October 2005 416 pp.  
0-19-517913-7 \$39.95

*New!*



**Surviving Armageddon**  
Solutions for a Threatened Planet

BILL MCGUIRE

What do earthquakes, magma, asteroid 1950DA and global warming have in common? Not only are they all natural disasters already under way, but they are ones scientists are now working to prevent, predict, or at least limit their impact on civilization as we know it. This book provides solutions rather than problems to natural and man-made disasters that threaten our planet, and concludes optimistically with ways to use technology to protect our society from global catastrophe, as well as to foster an environment where all life on earth can thrive.

July 2005 240 pp.  
0-19-280571-1 \$24.99

*Forthcoming!*

**Civilized Life in the Universe**  
Scientists on Intelligent Extraterrestrials

GEORGE BASALLA

This book is a selective and fascinating history of scientific speculation about intelligent extraterrestrial life. From Plutarch to Stephen Hawking, some of the most prominent western scientists have had quite detailed perceptions and misperceptions about alien civilizations. Basalla traces the influence of one speculation on the next, showing an unbroken but twisting chain of ideas passed from one scientist to the next, and from science to popular culture.

December 2005 224 pp.  
0-19-517181-0 \$29.95

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# SOUTH-CENTRAL

40th Annual Meeting of the South-Central  
Section GSA

School of Geology and Geophysics and  
Oklahoma Geological Survey  
University of Oklahoma, Norman, Oklahoma

6–7 March 2006

The University of Oklahoma (OU) is the largest public university in Oklahoma, enrolling over 24,000 students from more than 100 countries. The South-Central Section meeting will include two days of technical presentations (oral and poster) and student activities, plus a very active pre-meeting program—six field trips and four workshops (two designed especially for teachers) are planned. Three “less”-technical tours of campus geoscience collections will also be held. In addition, GSA members and guests will want to visit the Fred Jones Museum of Art, which houses the largest collection of French Impressionist paintings ever donated to a public university. The Sam Noble Oklahoma Museum of Natural History displays the largest dinosaur skull (*Pentaceratops*) ever found and the oldest piece of art found in North America. Bizzell Library houses a world-class history of science collection. The Geologic Gallery of the School of Geology and Geophysics and the Laurence S. Youngblood Energy Library in Sarkeys Energy Center contain superb mineral and fossil displays. And no visit to Norman would be complete without visiting the Barry Switzer Center, celebrating the seven-time national football champion OU Sooners. For more information on what to see and do on the OU campus, go to [www.visit.ou.edu/vc\\_vtstart.htm](http://www.visit.ou.edu/vc_vtstart.htm).

The School of Geology and Geophysics (SGG) currently has 15 academic faculty members, 78 undergraduate students, and 75 graduate students. The vision of the school is to be “a preeminent center of excellence for study and research in geology and geophysics, with emphasis in applied areas such as energy. Students shall be provided with a high quality education that stresses the fundamentals of science within a creative, interdisciplinary environment, and that prepares them for success in their professional careers by instilling knowledge, skills, confidence, pride, principled leadership, and the ability to contribute to the wise stewardship of the earth and its resources.”

The Oklahoma Geological Survey (OGS) is an applied research and public-service agency authorized by the state constitution. Its charter is to investigate the land, water, mineral, and energy resources of Oklahoma and to disseminate the results of those investigations. The OGS engages in a wide variety of field investigations throughout Oklahoma either independently or with other state and federal agencies.

## LOCATION AND TRAVEL INFORMATION

Norman is located 20 miles south of Oklahoma City (OKC) near the boundary between the Cherokee Shelf and the Anadarko Basin. Surface strata consist of Leonardian (Lower Permian) redbeds overlain by Quaternary deposits associated with the Canadian River. Outcrops of the Garber-Wellington aquifer, a principal source of water for the OKC metro currently being studied because of its locally high arsenic content, occur on the east side of Norman.

OU is located just south of the center of Norman and is easily accessed by Interstate 35. The meeting will be held at the Oklahoma College of Continuing Education (OCCE) just south of the main campus. Registration parking will be immediately south of the OCCE Forum building and north of Timberdell Avenue. A map of the OU campus is available at [www.ou.edu/visitorcenter/vc\\_campus\\_map.htm](http://www.ou.edu/visitorcenter/vc_campus_map.htm).

## ACCOMMODATIONS

A block of rooms has been reserved at the Sooner Hotel and Suites, located next to OCCE. Rooms cost about US\$55 (1–2 beds per room) per night at the hotel; a cottage is about US\$91 (2 rooms, 1 bed per room) per night. To obtain these rates, you must phone the hotel at +1-405-325-7459 and state that you are affiliated with OU–GSA. The deadline for reserving rooms is 1 February 2006.

A complete list and map of other Norman motels can be found at [www.visitnorman.com/lodging.html](http://www.visitnorman.com/lodging.html). All of these require driving as none are within walking distance of campus.

## REGISTRATION

**Standard Registration Deadline: 31 January 2006**

**Cancellation Deadline: 6 February 2006**

GSA Headquarters will handle meeting registration. Registration will be available online at [www.geosociety.org](http://www.geosociety.org) beginning December 2005. On-site registration will be available at OCCE during the meeting. Further details will be published in the December 2005 issue of *GSA Today*. Standard registration for professional members and students will be approximately US\$100 and US\$50, respectively.

Admission to the Sam Noble Oklahoma Museum of Natural History is free to registrants with their OU–GSA Badges. The museum will conduct a limited number of small-group, behind-the-scenes tours on a first-come, first-served, sign-up basis. Registrants will also be able to tour the history of science collections at Bizzell Library on a small group basis. Reservations for these tours can be made at the registration desk during the meeting.

## CALL FOR PAPERS

**Abstract Deadline: 6 December 2005**

Papers are invited for symposia, theme sessions, and general sessions, in oral and/or poster formats. Abstracts not included in symposia will be scheduled for appropriate theme or general sessions. All abstracts must be submitted online to [www.geosociety.org](http://www.geosociety.org). There is an abstract submission fee of US\$10.

## SYMPOSIA AND THEME SESSIONS

For more information, or to propose additional symposia or theme sessions, contact Neil Suneson, nsuneson@ou.edu, +1-405-325-3031.

### SYMPOSIA

1. **Sequence Stratigraphy and Paleontology of Carboniferous and Permian Strata of the Northern and Southern Mid-Continent.** Darwin Boardman, Oklahoma State University, amm0001@okstate.edu, +1-405-744-6358, fax +1-405-744-7841.
2. **Geological and Environmental Issues of the Tar Creek Superfund Site, Picher Mining District, Northeastern Oklahoma.** Ken Luza, OGS kluza@ou.edu, +1-405-325-3031, fax +1-405-325-7069.

### THEME SESSIONS

1. **Drivers of Regional Water Management: Who's Stopping to Ask Directions?** Todd Halihan, Oklahoma State University, halihan@okstate.edu, +1-405-744-6358, fax +1-405-744-7841.
2. **Geology and Public Policy.** Melanie Barnes, Texas Tech University, melanie.barnes@ttu.edu, +1-806-742-3204, fax +1-806-742-0100.
3. **Undergraduate Research Poster Session.** Wendi Williams, University of Arkansas, Little Rock, wjwilliams@ualr.edu, +1-501-569-3546, fax +1-501-569-3271.
4. **Addressing the Pseudoscience of Intelligent Design in the K–16 Classroom.** Iris Totten, Kansas State University, itotten@ksu.edu, +1-785-532-6724, fax +1-785-532-5159.

### WORKSHOPS

1. **The Role of Trace Fossils in Interpreting Depositional Sequences.** Sun., 5 Mar., in Norman. This workshop is designed for anyone interested in learning how to use trace fossils in paleontology, sedimentology, stratigraphy, and reservoir characterization. Limit: 25. Cost: TBD. Enrollment preference given to graduate students before 15 Oct.; open enrollment after 15 Oct. James R. Chaplin, OGS, jchaplin@ou.edu, +1-405-325-3031, fax +1-405-325-7069.
2. **Basics of the Petroleum Geology of Deepwater Depositional Systems.** Sun., 5 Mar., in Norman. This workshop will focus on deepwater depositional systems, including recent deepwater exploration and production history, architectural elements, and related reservoir performance. A written text will be provided for follow-on with lecture material. Cost: TBD. Roger M. Slatt, SGGOU, rslatt@ou.edu, +1-405-325-3253, fax +1-405-325-3140.
3. **Hands-on Geology Projects for Group Learning.** Sat. morning, 4 Mar., in Norman. Teachers will participate in a series of short (5–10 min) projects that illustrate important geological processes, generally involving materials and devices that are readily available. The workshop will show the participants how to reproduce these projects for individual classroom use. Cost: TBD. Vince Cronin, vince\_cronin@baylor.edu, assisted by Rena Bonem,

rena\_bonem@baylor.edu, Baylor University, +1-254-710-2361, fax +1-254-710-2673.

4. **Earth and Space at Your Fingertips: Infusing Technology-Rich Resources into Your Lessons.** Sat. afternoon, 4 Mar., in Norman. Participants will explore technology-rich resources aligned to meet National Science Education Standards, as well as begin mapping participants' state standards. Example resources of products included are from GSA, NASA, American Geological Institute, IRIS Consortium, DLESE, NSTA, and NSF-funded resources. Earth and Mars will be emphasized. Cost: TBD. Wendi Williams, wjwilliams@ualr.edu, and Keith Harris krharris@ualr.edu, University of Arkansas–Little Rock, +1-501-569-3546, fax +1-501-569-3271.

### FIELD TRIPS

#### Premeeting

1. **Hydrogeology and Water Management of the Arbuckle-Simpson Aquifer, South-Central Oklahoma.** Sat., 4 Mar. Cost: TBD. Noel Osborn, Oklahoma Water Resources Board, niosborn@owrb.state.ok.us, +1-405-530-8800, fax +1-405-530-8900.
2. **Environmental Stratigraphy of Permian Garber-Wellington Red Beds: Context for Groundwater and Land-Use Issues.** Sun., 5 Mar. Cost: TBD. Stan Paxton, Oklahoma State University, pstanle@okstate.edu, +1-405-744-6358, fax +1-405-744-7841.
3. **Geological and Environmental Issues of the Tar Creek Superfund Site, Picher Mining District, Northeastern Oklahoma.** Sat.–Sun., 4–5 Mar. (2 day field trip). Cost: TBD. Ken Luza, OGS, kluza@ou.edu, +1-405-325-3031, fax +1-405-325-7069.
4. **Interpreting Textures of Granitic and Gabbroic Rocks, Wichita Mountains, Oklahoma.** Sun., 5 Mar. Cost: TBD. Charles Gilbert, SGGOU, mcgilbert@ou.edu, and David London, SGGOU, dlondon@ou.edu, +1-405-325-4501, fax +1-405-325-3140.
5. **Stratigraphy and Paleontology of the Upper Mississippian Barnett Shale of Texas and the Caney Shale of Southern Oklahoma.** Fri.–Sun., 3–5 Mar. (3 day field trip). Cost: TBD. Darwin Boardman, Oklahoma State University, amm0001@okstate.edu, +1-405-744-6358, fax +1-405-744-7841.
6. **Facies Architecture of a Middle Pennsylvanian Incised Valley Fill: The Bluejacket–Bartlesville of Eastern Oklahoma.** Sat.–Sun., 4–5 Mar. (2 day field trip). Cost: TBD. Dennis Kerr, University of Tulsa, dennis-kerr@utulsa.edu, +1-918-631-3020, fax +1-918-631-2091.

#### During the Meeting

7. **Building Stones of the OU Campus.** Mon., 6 Mar., around 4:30 p.m. Free. Stan Krukowski, OGS, skrukowski@ou.edu, +1-405-325-3031, fax +1-405-325-7069.

### STUDENT ACTIVITIES

**Roy J. Shlemon Mentor Programs in Applied Geoscience.** Sponsored by GSA Foundation. Mon., 6 Mar., 11:30 a.m.–1 p.m.; location information will be available at GSA's registration desk. Karlon Blythe, GSA,

kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues including professional opportunities and challenges that await students after graduation. Students will receive a FREE LUNCH ticket to attend the Shlemon Program in their registration packet. However, space is limited. First come, first served.

#### **John Mann Mentors in Applied Hydrogeology**

**Program.** *Sponsored by GSA Foundation.* Mon., 6 Mar., 5–6:30 p.m. Meeting location available at GSA's registration desk. Karlon Blythe, GSA, kblythe@geosociety.org; Todd Halihan, OSU, halihan@okstate.edu. This early evening event presents mentoring opportunities for students and recent graduates who are interested in hydrogeology or hydrology as a career to interact and network with practicing hydrogeological professionals. This program is a focused, small-scale event that features FREE PIZZA for participants. Students will receive a free pizza supper ticket to attend the Mann Program in their registration packet. However, space is limited. First come, first served.

#### **STUDENT SUPPORT**

Travel grants are available from the South-Central Section in cooperation with the GSA Foundation for students who are presenting oral or poster papers. To be eligible, students must be GSA Student Members or Student Associates. Please visit [www.geosociety.org](http://www.geosociety.org), South-Central Section, for details regarding application instructions. For more information, contact Matthew W. Totten, Sr., mtotten@ksu.edu.

#### **SOCIAL ACTIVITIES**

**Welcoming Party.** Sun., 5 Mar., 5:30–7 p.m. East Atrium, Sarkeys Energy Center, OU Campus.

**Banquet.** Mon., 6 Mar., 7 p.m. East Atrium, Sarkeys Energy Center, OU Campus. Ticket required; limited seating.

**Sam Noble Oklahoma Museum of Natural History** "behind-the-scenes" tours. Limited numbers; small groups; sign-up required at registration desk.

**Bizzell Library History of Science Collections** tours. Limited numbers; small groups; sign-up required at registration desk.

#### **EXHIBITORS**

Exhibit booths will be available for universities, government agencies, and companies at the meeting. Those providing information on graduate school or employment opportunities are especially encouraged to exhibit and/or attend.

#### **BUSINESS MEETINGS**

**South-Central Section Management Board Meeting.** Mon., 6 Mar., 5 p.m. Location TBA.

**South-Central Section GSA Business Meeting.** Mon., 6 Mar., 6:30 p.m. Location TBA.

#### **CONTACT INFORMATION**

GSA is committed to making all events at the 2006 South-Central Section meeting accessible to all people interested in attending. Special requirements (wheelchair accessibility, dietary concerns, etc.) can be indicated on the registration form. If you have any additional questions, contact the general meeting chair, Neil Suneson, nsuneson@ou.edu.

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# NORTHEASTERN

**41st Annual Meeting  
Northeastern Section, GSA  
Camp Hill/Harrisburg, Pennsylvania**

**20–22 March 2006**

The 2006 meeting of the Northeastern Section of the Geological Society of America will be hosted by geoscientists from Dickinson College, Bloomsburg University, Franklin and Marshall College, Harrisburg Area Community College, the Harrisburg Area Geological Society, the Pennsylvania Geological Survey, and Susquehanna University. The meeting will be at the Radisson Penn Harris Hotel and Convention Center in Camp Hill, Pennsylvania, just across the Susquehanna River from downtown Harrisburg. We will meet in the heart of the classic Appalachian Ridge and Valley Province, in proximity to the Mesozoic Basins and Piedmont in Pennsylvania.

### CALL FOR PAPERS

**Abstract Deadline: 13 December 2005**

Papers are invited for theme and general discipline sessions in both oral and poster format. Volunteered papers will be considered for any general discipline session as listed on the GSA abstracts form. Authors interested in submitting papers for symposia should contact the appropriate symposium conveners before submission. An individual may be presenter for only one volunteered paper (except symposia papers), but may be co-author on any number of abstracts. Those invited for symposia may present an additional paper. For further information, please contact Technical Program co-chairs Jennifer Elick, [elick@susqu.edu](mailto:elick@susqu.edu), or Peter Sak, [sakp@dickinson.edu](mailto:sakp@dickinson.edu). Abstracts of papers must be submitted using the electronic submission form at [www.geosociety.org](http://www.geosociety.org). If you have questions regarding abstract submission, please contact Nancy Carlson, [ncarlson@geosociety.org](mailto:ncarlson@geosociety.org).

### REGISTRATION

**Standard Registration Deadline: 13 February 2006**

**Cancellation Deadline: 20 February 2006**

GSA Headquarters will handle registration, and details will be published in the December issue of *GSA Today*. Registration will be available online at [www.geosociety.org](http://www.geosociety.org). On-site registration: Radisson Penn Harris Hotel and Convention Center during the meeting.

### TECHNICAL PROGRAM

The following symposia and theme sessions are planned for the Camp Hill 2006 meeting. We encourage undergraduate students to consider presenting their research in oral as

well as poster sessions. Undergraduate research posters will be merged with other poster sessions, arranged by topic. Anyone interested in proposing additional symposia or theme sessions should contact technical program co-chairs Jennifer Elick, [elick@susqu.edu](mailto:elick@susqu.edu), or Peter Sak, [sakp@dickinson.edu](mailto:sakp@dickinson.edu). The deadline for new session proposals is 15 September. Presentations for symposia are generally by invitation only, so if you are interested in participating, please contact session coordinators.

### SYMPOSIA

1. **Pander Society Symposium. Conodonts in Sequence Stratigraphy, Evolution, Deposition, and Correlation.** D. Jeffrey Over, State University of New York at Geneseo, [over@geneseo.edu](mailto:over@geneseo.edu), +1-585-245-5291.

### THEME SESSIONS

1. **Advances in Mineralogy: From Field Association to Phase Equilibria.** David Bailey, Hamilton College, [dbailey@hamilton.edu](mailto:dbailey@hamilton.edu), +1-315-859-4142; Marian Lupulescu, New York State Museum, [mlupulescu@mail.nysed.gov](mailto:mlupulescu@mail.nysed.gov), +1-518-474-1432.
2. **Coastal Change: Natural and Anthropogenic Process-Response Systems.** Allen Gontz, University of Massachusetts–Boston, [allen.gontz@umb.edu](mailto:allen.gontz@umb.edu), +1-781-812-1684; Dan Belknap, University of Maine–Orono, [belknap@maine.edu](mailto:belknap@maine.edu), +1-207-581-2159.
3. **Meltwater Discharge Events from Proglacial and Subglacial Environments: Landforms, Deposits, and Processes.** Andrew Kozlowski, Susquehanna University, [kozlowski@susqu.edu](mailto:kozlowski@susqu.edu), +1-570-372-4215.
4. **History of Geology: Evolution of Thought Regarding the Appalachians.** Sarah E. Newcomb, [senewcomb@earthlink.net](mailto:senewcomb@earthlink.net), +1-301-622-0177; William R. Brice, University of Pittsburgh–Johnstown, [wbrice@pitt.edu](mailto:wbrice@pitt.edu), +1-814-269-2942.
5. **Forensic Geology: Practical Geologic Experiences that Helped CSIs.** Susan D. Halsey, Admiral Coastal Consulting, [DrDuneNJ@aol.com](mailto:DrDuneNJ@aol.com), +1-609-731-6380.
6. **Paleosol Environments from across the Landscape.** Jennifer Elick, Susquehanna University, [elick@susqu.edu](mailto:elick@susqu.edu), +1-570-372-4214.
7. **From Pleistocene to Present: Landscape Dynamics of the Susquehanna River Basin and Chesapeake Bay.** Chris Williams, Franklin and Marshall College, [Chris.Williams@fandm.edu](mailto:Chris.Williams@fandm.edu), +1-717-291-3814.
8. **Seismology of the Northeastern United States and Eastern Canada.** John E. Ebel, Weston Observatory, Boston College, [ebel@bc.edu](mailto:ebel@bc.edu), +1-617-552-3399; Frank A. Revetta, State University of New York at Potsdam, [revettfa@potdams.edu](mailto:revettfa@potdams.edu), +1-315-267-2289.
9. **Bringing Geoscience to the Community.** Laura Guertin, Pennsylvania State University–Delaware County, [uxg3@psu.edu](mailto:uxg3@psu.edu), +1-610-892-1427.

10. **New Developments in the Late Quaternary History and Climate of the Northeastern United States and Eastern Canada.** Robert Dineen, Pennsylvania Department of Transportation, eskers@aol.com, +1-610-286-2888.
11. **Time Slices across the Appalachians: Tectonic and Depositional Settings of Cambro-Ordovician Rocks in the Appalachian Orogen.** Craig Dietsch, University of Cincinnati, craig.dietsch@uc.edu, +1-513-556-2547.
12. **Time Slices across the Appalachians: Tectonic Settings of Silurian-Devonian Igneous Rocks in the Appalachian Orogen.** Sandra Barr, Acadia University, sandra.barr@acadiau.ca, +1-902-585-1340; Cees van Staal, Geological Survey of Canada, Ottawa, cvansta@nrcan.gc.ca, +1-613-995-4333; David Gibson, University of Maine–Farmington, dgibson@maine.edu, +1-207-778-7402; John Hogan, University of Missouri–Rolla, jhogan@umr.edu, +1-573-341-6935; David West, Jr., Middlebury College, dwest@middlebury.edu, +1-802-443-3476.
13. **Time Slices across the Appalachians: Role of the Rheic Ocean in the Development of the Appalachian Orogen.** Damian Nance, Ohio University, nance@ohio.edu, +1-740-593-1107.
14. **Time Slices across the Appalachians: Tectonic and Depositional Settings of Alleghanian-Aged Rocks.** Rodger Faill, Pennsylvania Geological Survey, rfaill@state.pa.us, +1-717-702-2041.
15. **Rates and Processes of Appalachian Erosion.** Milan Pavich, U.S. Geological Survey, mpavich@usgs.gov, +1-703-648-6963.
16. **Applied Hydrogeology and Environmental Geology for the 21st Century.** Martin Helmke, West Chester University, mhelmke@wcupa.edu, +1-610-436-2727.
17. **Successes in K–16 Geoscience Education (POSTERS ONLY).** Jeb Baxter, Harrisburg Area Community College, jebaxter@hacc.edu, +1-717-780-2395; Ron Dowey, Harrisburg Area Community College, radowey@hacc.edu, +1-717-780-2393.
18. **Oil and Gas in the Appalachian Basin.** Langhorn “Taury” Smith, New York State Museum, lsmith@mail.nysed.gov, +1-518-474-2469; Rich Nyahay, New York State Museum, rnyahay@mail.nysed.gov, +1-518-486-2161; John Harper, Pennsylvania Geological Survey, jharper@state.pa.us, +1-412-442-4230.
19. **Metamorphic Rocks and Shear Zones: Stitching together Appalachian Terranes.** Gary Solar, Buffalo State University, solargs@bscmail.buffalostate.edu, +1-716-878-4900; David Valentino, State University of New York at Oswego, +1-315-312-2798.
20. **Issues with Acid Mine Drainage in the Appalachians.** Ryan Mathur, Juniata College, mathur@juniata.edu, +1-814-641-3725; Duff Gold, Pennsylvania State University, gold@ems.psu.edu, +1-814-865-7261.
21. **Failing Ground: Landslides, Sinkholes, and other Collapse Processes.** Robert Fakundiny, New York State Geologic Survey, rfakundi@mail.nysed.gov, +1-518-486-2002.
22. **Contaminants in Groundwater and Surface Water of the Northeast: From Arsenic to Xylene.** Steve Peters, Lehigh University, scp2@Lehigh.edu, +1-610-758-3957.

## FIELD TRIPS

Field trip details will be available in the December issue of *GSA Today* and at [www.geosociety.org](http://www.geosociety.org). Anyone interested in proposing additional field trips should contact field trip coordinators Andy de Wet, [Andy.deWet@fandm.edu](mailto:Andy.deWet@fandm.edu), or Zeshan Ismat, [Zeshan.Ismat@fandm.edu](mailto:Zeshan.Ismat@fandm.edu), by 15 September. For additional field trip information, contact Andy DeWet or the individual field trip leaders.

1. **Cambrian Microbial Reefs, LWB Quarry, York County, Pennsylvania.** Carol de Wet, Franklin and Marshall College, [cdewet@fandm.edu](mailto:cdewet@fandm.edu), +1-717-291-4388.
2. **Pleistocene to Present Landscape and Stream Evolution in Lancaster County, Pennsylvania, and Implications for Restoring Streams.** Dorothy Merritts, Bob Walter, Chris Williams, and Andy de Wet, Franklin and Marshall College, [Andy.DeWet@fandm.edu](mailto:Andy.DeWet@fandm.edu), +1-717-291-3815.
3. **Nappe Mechanics and Changing Tectonic Patterns in Lancaster County, PA.** Don Wise, University of Massachusetts–Amherst, [dwise@geo.umass.edu](mailto:dwise@geo.umass.edu), +1-423-253-5342; G. Robert Ganis, consultant, [bobganis@aol.com](mailto:bobganis@aol.com), +1-717-566-9668.
4. **Karst Subsidence Problems along the Bushkill Creek, Northampton County, Pennsylvania.** William Kochanov, Pennsylvania Geological Survey, [wkochanov@state.pa.us](mailto:wkochanov@state.pa.us), +1-717-702-2033.
5. **From Rocks to Roads: The Geology of a Mineral Aggregates Quarry, Rohrer’s Quarry, Lancaster County, Pennsylvania (for K–12 Teachers).** Ron Dowey, Harrisburg Area Community College, [radowey@hacc.edu](mailto:radowey@hacc.edu), +1-717-780-2393.
6. **Lower Paleozoic Conodonts in the Appalachians.** John Repetski, U.S. Geological Survey, [jrepetski@usgs.gov](mailto:jrepetski@usgs.gov), +1-703-648-5486. *Sponsored by the Pander Society.*

## SHORT COURSES

Descriptions of short courses will be available in the December issue of *GSA Today* and at [www.geosociety.org](http://www.geosociety.org). A series of workshops for K–12 teachers centered on GIS and Web-based activities will be offered Sat., 18 March, and workshops for college teachers will be offered Sat.–Sun., 18–19 March. Anyone interested in proposing short courses or other K–12 teacher activities should contact short course coordinator Noel Potter, [pottern@dickinson.edu](mailto:pottern@dickinson.edu).

## ACCOMODATIONS

A large block of rooms at special rates has been reserved until 17 Feb. 2006 at the Radisson Penn Harris Hotel and Convention Center. Room cost is low, and up to four persons per room will be charged the same room rate. Reservations may be made directly by calling +1-717-763-7117 or +1-800-333-3333. You MUST identify yourself as attending the Northeast Section GSA Meeting when making reservations to get the special rate.

# SESAR SOLID EARTH SAMPLE REGISTRY



The Solid Earth Sample Registry SESAR is an NSF-funded project to develop and operate a system that provides unique identifiers for solid earth samples to allow global sharing, linking, and integration of information and data about these samples.

Visit us at booth # 1138 in the exhibit hall to learn about the importance of unique sample identification in the Earth Sciences.



**International Geo Sample Number**  
<http://www.geosamples.org/>

Contact: Kerstin Lehnert, Lamont-Doherty Earth Observatory of Columbia University [lehnert@ideo.columbia.edu](mailto:lehnert@ideo.columbia.edu)

## GSA TODAY

### IS ALSO ONLINE

To view *GSA Today* online, go to [www.gsjournals.org](http://www.gsjournals.org) and click on "Online Journals" then on the cover of **GSA Today**. You can also view back issues through the "Archives" button. Access to *GSA Today* online is free.

## EXHIBITS

Exhibits will be located in the Radisson Penn Harris Hotel and Convention Center. Exhibit rates will be \$100 for non-profit organizations and \$200 for others. Booth space will include 8' x 10' space with draped framing and one table. Electrical access for the duration of the meeting will be an additional \$60. For further information, to reserve booth space, or to make other arrangements, contact exhibits coordinators Michelle Curry, [meshale13@netzero.net](mailto:meshale13@netzero.net), or Anne Lutz, [anlutz@state.pa.us](mailto:anlutz@state.pa.us).

## SPECIAL EVENTS

Special events planned for NEGSA include the famous Map Blast, conference banquet, Eastern Section SEPM social and business meeting, AWG Breakfast, and Pander Society business meeting. Other society and committee business meetings, breakfasts, and lunches may be scheduled by contacting business meeting coordinator Noel Potter, [pottorn@dickinson.edu](mailto:pottorn@dickinson.edu).

## GUEST ACTIVITIES

The Harrisburg area has a wide array of museums, parks, and other sites of historic and cultural interest. Information on the spouse and guest programs will be available in the December issue of *GSA Today*.

## STUDENT ACTIVITIES

**Roy J. Shlemon Mentor Program in Applied Geoscience.** Sponsored by GSA Foundation. Mon.–Tues., 20–21 March, 11:30 a.m.–1 p.m.; location information will be available at GSA's registration desk. Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org). This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues including professional opportunities and challenges that await students after graduation. Plan to attend both free luncheons to hear different presenters each day. Students will receive FREE LUNCH tickets in their registration packet to attend both Shlemon Programs. However, space is limited. First come, first served.

**The John Mann Mentors in Applied Hydrogeology Program.** Sponsored by GSA Foundation. Mon., 20 March, 5–6:30 p.m.; location information will be available at GSA's registration desk. Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org).

This early evening event presents mentoring opportunities for students and recent graduates who are interested in hydrogeology or hydrology as a career to interact and network with practicing hydrogeology professionals. This program is a focused, small-scale event that features FREE PIZZA for participants. Students will receive a free pizza supper ticket to attend the Mann Program in their registration packet. However, space is limited. First come, first served.

## SPONSORSHIP

Corporate sponsors for this meeting will have their names published in the final meeting announcement and in the meeting program. Interested parties may contact the meeting sponsorship coordinator, G. Robert Ganis, [bobganis@aol.com](mailto:bobganis@aol.com).

## STUDENT TRAVEL GRANTS

Travel grants are available from the Northeastern Section of GSA in cooperation with the GSA Foundation. Grants are available to both undergraduate and graduate students who are GSA members, currently enrolled in Northeastern Section schools, and are presenting oral or poster papers at this meeting. Applications are available online at [www.geosociety.org](http://www.geosociety.org) or through Stephen Pollock, Secretary-Treasurer, GSA Northeastern Section, [pollock@usm.maine.edu](mailto:pollock@usm.maine.edu).

## ACCESSIBILITY

GSA is committed to ensuring full participation for conference attendees with disabilities at all events at the 2006 meeting. Every attempt is made for full compliance with the Americans with Disabilities Act. You may indicate special requirements on your registration form, and you should inform the local organizing committee of these requirements at least one month prior to the meeting. Accessible hotel rooms are available and can be reserved when making your reservation, but this is best done early.

## DETAILED INFORMATION

Detailed information will be published in the December issue of *GSA Today*. Additional information on times, location, directions, accommodations, and contact information may be obtained by contacting the meeting general chair, Noel Potter, [pottorn@dickinson.edu](mailto:pottorn@dickinson.edu). Information on the GSA Northeastern Section Meeting will be posted at [www.geosociety.org](http://www.geosociety.org) and at [www.dickinson.edu/departments/geol/NEGSA2006.htm](http://www.dickinson.edu/departments/geol/NEGSA2006.htm).



# Join Us in Pennsylvania for the GSA Northeastern Section Meeting

20–22 March 2006

Noel Potter, Jr., General Chair, GSA Northeastern  
Section Meeting

With a nod of thanks to GSA's North-Central Section for letting us copy their idea, we have created a poster of a digital elevation map (see [www.nced.umn.edu/maps](http://www.nced.umn.edu/maps) if this copy of *GSA Today* does not include a map) to promote our meeting because it exemplifies the wonderfully diverse geology within GSA's Northeastern Section and adjacent areas and the diverse topics to be discussed at our meeting. We are grateful for the wizardry of Paul Morin, University of Minnesota, who created the poster.

From Hudson Bay, Quebec, and Labrador in the north to the Carolinas in the south, and from Ontario and Ohio to the Atlantic Coast, there is a tremendous diversity of geomorphology reflecting the bedrock and the geologic processes that have shaped this landscape. From the Precambrian terrains to the young glacial and coastal features, the terrain symbolizes the diverse geology of our section and the interests of its members.

This spectacular digital elevation model shows in exquisite detail the effects of rock type, tectonic history, and erosional history in defining both large and small geologic features. At the young end of the geologic spectrum, the eastern part of the great Laurentide Ice Sheet shaped the area southward roughly to Ohio, Pennsylvania, New Jersey, and southern New England as it flowed from Canada into the northeastern United States and the Atlantic Ocean. Prominent features left by the ice include drumlin fields, the troughs occupied by the Great Lakes basins and St. Lawrence Lowlands, where less-resistant Paleozoic sedimentary rocks occur, moraines south and west of the Great Lakes, and Cape Cod and Long Island. Fluted terrains in different parts of the Canadian Shield and in the northernmost United States attest to different directions of ice flow. Terrains south of the glacial border have a different texture because streams have had a longer time to dissect the landscape there, as seen, for example, in upstate New York versus central Pennsylvania. Coastal processes have shaped the barrier islands of New Jersey and further south.

In some of the oldest terrains in Ontario, Quebec, and Labrador, Precambrian provinces of different ages are reflected by diverse topography and structural trends. For example, the more rugged terrain north of the St. Lawrence River and Gulf, plus the Adirondack Mountains in New York, are part of the late Precambrian Grenville province, whereas the somewhat less rugged areas to the north in Quebec and northern Labrador are parts of the much older provinces, such as the Superior and Churchill Provinces.

From Ohio, across Pennsylvania, to New Jersey, one can cross from the glacier-smoothed and moraine-covered Interior Lowlands on the stable craton underlain by Paleozoic sedimentary rocks to the Appalachian Plateau in western Pennsylvania, which is underlain by thicker layers of sedimentary rocks. Going eastward from the Allegheny Front, one encounters the distinctive zig-zag ridges of the Appalachian Valley and Ridge Province, the Great Valley, the Blue Ridge, the Appalachian Piedmont, and finally the Atlantic Coastal Plain. In the southern Connecticut Valley and in SE Pennsylvania, Mesozoic basins and associated topography on diabase intrusions are distinct. The field trips at our meeting will visit a small but spectacular part of south-central Pennsylvania.

You will find marvelous detail in your favorite area. Some special features to look for include (1) the Manicouagan Impact Structure with its ring lake in eastern Quebec and the elliptical Sudbury impact structure north of Lake Huron, (2) the Monteregian Hills in Quebec, north of Lake Champlain, (3) morainal ridges on Cape Cod and Long Island and recessional moraines SW of Lake Erie, and (4) the "fall line" between the Coastal Plain and Appalachian Piedmont from New Jersey southward.

To learn more about geology in GSA's Northeastern Section, plan to join us in Camp Hill, Pennsylvania, 20–22 March 2006.

## Call for Geological Papers

### 2006 GSA Section Meetings

#### SOUTH-CENTRAL SECTION

6–7 March 2006

University of Oklahoma, Norman, Oklahoma

**Abstract Deadline: 6 December 2005**

**Information:** Neil Suneson, Oklahoma Geological Survey,  
University of Oklahoma, 100 E Boyd St., Rm N131,  
Norman, OK 73019-0628, +1-405-325-3031, nsuneson@ou.edu

#### NORTHEASTERN SECTION

20–22 March 2006

Radisson Penn Harris Hotel and Convention Center  
Camp Hill/Harrisburg, Pennsylvania

**Abstract Deadline: 13 December 2005**

**Information:** Noel Potter, Dickinson College, Dept. of  
Geology, Carlisle, PA 17013-2896, +1-717-245-1340,  
pottern@dickinson.edu

#### SOUTHEASTERN SECTION

23–24 March 2006

Marriott Hotel, Knoxville, Tennessee

**Abstract Deadline: 5 January 2006**

**Information:** Claudia Mora, University of Tennessee, Dept. of  
Earth and Planetary Sciences, 1412 Circle Drive,  
Knoxville, TN 37996-1410, +1-865-974-5499, cmora@utk.edu

#### NORTH-CENTRAL SECTION

20–21 April 2006

Student Center, University of Akron, Akron, Ohio

**Abstract Deadline: 25 January 2006**

**Information:** John Szabo, Dept. of Geology, University  
of Akron, Akron, OH 44325-4101, +1-330-972-8039,  
jpszabo@uakron.edu

#### CORDILLERAN SECTION

(Joint Meeting with PSAAPG and SPE-A)

8–10 May 2006

University of Alaska, Anchorage, Alaska

**Abstract Deadline: 2 February 2006**

Check future issues of *GSA Today* for more information.

#### ROCKY MOUNTAIN SECTION

17–19 May 2006

Western State College, Gunnison, Colorado

**Abstract Deadline: 21 February 2006**

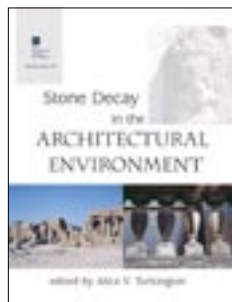
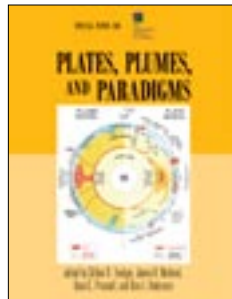
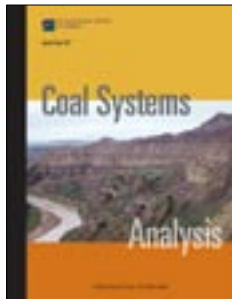
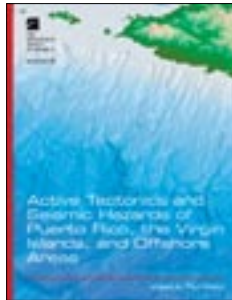
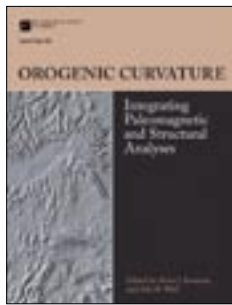
**Information:** Rob Fillmore, Western State College, Dept. of  
Natural and Environmental Sciences, Gunnison, CO 81231-  
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## GSA Special Papers



### Orogenic Curvature: Integrating Paleomagnetic and Structural Analyses

*edited by Aviva J. Sussman and Arlo B. Weil*

Most active and ancient orogenic systems display salients and recesses with varying degrees of curvature in map view. Within these arcuate orogens, many observations (e.g., out-of-plane strains, oblique slip, earthquake swarms, vertical-axis rotations) indicate that material is transported (or flows) in three dimensions, such that no single cross section can fully describe the motion. Although our conceptualization of the architecture of curved mountain belts has become increasingly sophisticated, many questions as to the kinematics and mechanics of forming arcuate orogenic systems still need to be answered. To this end, GSA Special Paper 383 brings together several investigations that integrate structural and paleomagnetic techniques. Examples of the multidisciplinary research presented in the volume include: the impact that vertical-axis rotations have on shortening estimates; magnetic anisotropy and strain distribution as a function of basement/cover decoupling; remagnetization and structural growth; mantle-lithosphere delamination caused by plate bending; and the relationship between shear zones and vertical-axis rotations.

SPE383, 258 p. plus index, ISBN 0-8137-2383-3  
\$80.00, **member price \$64.00**

### Large Meteorite Impacts III

*edited by Thomas Kenkmann, Friedrich Hörz, and Alex Deutsch*

The third volume of the series "Large Meteorite Impacts" provides an updated and comprehensive overview of modern impact crater research. In 26 chapters, more than 90 authors from Europe, the United States, Russia, Canada, and South Africa give a balanced, firsthand account of the multidisciplinary field of cratering science, with reports on field studies, geophysical analyses, and experimental and numerical simulations. Nine chapters focus on structure, geophysics, and cratering motions of terrestrial craters. Recent advances in impact ejecta studies and shock metamorphism are assembled, each with seven chapters, and three chapters extend the scope from a terrestrial to a planetary perspective.

SPE384, 457 p. plus index, ISBN 0-8137-2384-1  
\$95.00, **member price \$76.00**

### Active Tectonics and Seismic Hazards of Puerto Rico, the Virgin Islands, and Offshore Areas

*edited by Paul Mann*

Puerto Rico and the Virgin Islands occupy a 450-km-long and 300-km-wide segment of the seismically active North America–Caribbean plate boundary zone. Geologic and seismological information on both onland and offshore plate boundary faults are critical for understanding the earthquake and tsunami hazards that these structures pose to a rapidly urbanizing island population of about 4 million inhabitants. This volume presents an integrated set of 15 chapters on the geological, geophysical, and seismological nature of late Quaternary plate boundary zone faults revealed by both onland and offshore studies. The volume chapters are grouped into four sections: (1) three introductory chapters establishing the regional tectonic setting of Puerto Rico and the Virgin Islands and its offshore area using GPS-based geodesy and regional geologic information; (2) three chapters on the instrumental and historical seismicity of the region; (3) five chapters on the identification of late Quaternary faults in Puerto Rico and its shallow coastal areas using onland mapping, fault trenching, and offshore geophysical mapping; and (4) four chapters on seismic sources, ground amplification, and paleoliquefaction.

SPE385, 287 p. plus index, ISBN 0-8137-2385-X  
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### Reconstruction of Pleistocene Ice-Dammed Lake Outburst Floods in the Altai Mountains, Siberia

*by Jürgen Herget*

In the Altai Mountains, located in southern Siberia, some of the largest floods in Earth's history occurred in Pleistocene times. The floods were caused by ice-dammed lake outburst floods comparable with glacial Lake

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Missoula events. In this volume, the remnants of the repeated jökulhlaups and key features of the local Pleistocene environment are described in review. The volume also focuses on the paleohydraulic interpretation of the traces of the floods to reconstruct their magnitudes and characteristics. Herget applied several established methods in the study as well as developed and applied new approaches (e.g., hydraulic interpretation of run-up sediments, fluvial gravel dunes and local scour around obstacles).

SPE386, 117 p., ISBN 0-8137-2386-8  
\$65.00, **member price \$52.00**

#### **Coal Systems Analysis**

*edited by Peter D. Warwick*

Coal is an important and required energy source for today's world. Current rates of world coal consumption are projected to continue at approximately the same (or greater) levels well into the twenty-first century. This collection of papers provides an introduction to the concept of coal systems analysis and contains examples of how coal systems analysis can be used to understand, characterize, and evaluate coal and coal gas resources. Coal systems analysis incorporates the various disciplines of coal geology to provide a complete characterization of the resource.

SPE387, 111 p., ISBN 0-8137-2387-6  
\$60.00, **member price \$48.00**

#### **Fifth Hutton Symposium: The Origin of Granites and Related Rocks**

*edited by S. Ishihara, W.E. Stephens, S.L. Harley, M. Arima,  
and T. Nakajima*

Granitic rocks are the most important component of Earth's upper continent crust, but their origin remains a topic of considerable debate. Recent developments have underscored the importance of modeling physical and chemical processes as well as the application of field techniques. The Fifth Hutton Symposium on the Origin of Granites and Related Rocks was held in Toyohashi, Japan, in September 2003 to review current thinking on this age-old debate. Some 27 invited papers are collected in this volume and represent all principal areas of research activity. The volume includes papers describing unifying models and new paradigms consistent with recent research, and contributions span the range from anatexis to emplacement and late-stage mineralization. A significant feature of this particular volume is the major contribution by scientists from the Far East both to generic aspects of granite magmatism and to studies of regional importance.

SPE389, 392 p., ISBN 0-8137-2389-2  
\$95.00, **member price \$76.00**

#### **Stone Decay in the Architectural Environment**

*edited by Alice V. Turkington*

Some structures are constantly under threat from natural and human-induced decay processes, yet stone buildings, structures, and works of art remain a permanent feature in our cultural heritage. This volume presents recent research by an international group of geologists and geomorphologists on stone decay in the architectural environment, and it updates the latest theoretical and methodological advances in this field. The volume will be informative to earth scientists concerned with rock weathering in natural and urban locales, and it will be of benefit to those conservators, practitioners, scientists, and students whose interest lies at the interface between research and its application.

SPE390, 61 p., ISBN 0-8137-2390-6  
\$45.00, **member price \$36.00**

#### **Net Dextral Slip, Neogene San Gregorio–Hosgri Fault Zone, Coastal California: Geologic Evidence and Tectonic Implications**

*by William R. Dickinson, Mihai Ducea, Lewis I. Rosenberg,*

*H. Gary Greene, Stephan A. Graham, Joseph C. Clark, Gerald E. Weber,  
Steven Kidder, W. Gary Ernst, and Earl E. Brabb*

The San Gregorio–Hosgri fault is the major subsidiary strand of the San Andreas fault system in coastal California, where its course is partly onshore and partly offshore. Understanding the path and amount of San Gregorio–Hosgri fault displacements is important for understanding the geologic history of California and seismic hazard along the California coast. This Special Paper summarizes evidence for 156 km of net San Gregorio–Hosgri fault slip

based on an analysis of onshore and offshore geologic mapping supplemented by reappraisal of key geologic features offset by San Gregorio–Hosgri fault movements.

SPE391, 43 p., ISBN 0-8137-2391-4  
\$40.00, **member price \$32.00**

#### **A Typology of Sculpted Forms in Open Bedrock Channels**

*by Keith Richardson and Paul Anthony Carling*

Bedrock channels are important agents of erosion in mountainous areas, and understanding them is vital to the development of models of landscape evolution. Despite this, erosional sculpted forms in bedrock channels are a neglected area of research and are at present poorly described. This heavily illustrated book provides a comprehensive description and classification of bedforms in bedrock channels over a range of spatial scales and develops a consistent terminology, placing the study of sculpted forms in bedrock on a more rational footing alongside that of depositional bedforms. The authors then use the descriptions to define general principles governing the development of sculpted forms. They also show that erosional features in bedrock provide a wealth of information regarding flow structures, erosion processes and the origins of bedforms.

SPE392, 108 p., ISBN 0-8137-2392-2  
\$55.00, **member price \$44.00**

## In Press

#### **Plates, Plumes, and Paradigms**

*edited by Gillian R. Foulger, James H. Natland, Dean C. Presnall,  
and Don L. Anderson*

This beautiful compendium of work on hotspot volcanism documents the development, current state-of-play, and future prospects of all branches of the subject. It contains extensive and indispensable reference resources in the form of hotspot, tectonic, volcano and tomographic maps and cross sections of Earth. Some chapters outline the history of the plume hypothesis and other theories for the genesis of hotspots, and several provide tutorials that will be valuable to students and cross-disciplinary scientists. Other chapters present innovative models and theories for individual localities, volcano genesis processes, and related global observations. Many of these include subject reviews, making them doubly valuable to specialists and non-specialists alike. The book is fully interdisciplinary, encompassing geophysics, geochemistry, noble gases, heat, temperature, tectonics, petrology, mantle dynamics, impacts, and syntheses reconciling several branches of earth science. Included are chapters that advocate the plume model and ones that advocate alternative models. The book will enjoy a long lifetime of usefulness and functions as a reference work for students, scholars, and informed lay people. It is equally valuable for supporting advanced undergraduate or post-graduate courses and research scientists working at the forefront of hotspot science. It is an essential addition to the bookshelves of every science library, earth science teacher, and research scientist who aspires to understand the frontiers of this exciting subject. With over 150 color plates, it makes a beautiful addition to the library of anyone fascinated by volcanoes—one of nature's most exciting and extraordinary phenomena.

SPE 388, plus index, ISBN 0-8137-2388-4, in press



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In addition to the Foundation's annual Silent Auction ...

A New Event!

Heidi Horten, Chair, Silent Auction

Committee

A GeoMystery Challenge is being developed by renowned mystery writer Sarah Andrews for the GSA Foundation, to be held during the 2005 Annual Meeting in Salt Lake City. This fundraising event will test the geologic knowledge and insights of participants who are challenged to find clues hidden throughout the convention center and solve the murder mystery.

To participate, you need to obtain a ticket at the Foundation booth during the Exhibits Opening & Welcoming Reception (Sun., 16 Oct., 5:30-7:30 p.m.) for a donation of US\$20 for members, US\$10 for students. Clue packets will be distributed to ticket-holders on Monday morning. Prizes will be awarded at high noon on Wed., 19 Oct., to the three most successful geologic detectives in this event. The number of participants for this premier event will be limited, so arrive early at the Foundation booth Sunday evening!

Proceeds from the GeoMystery Challenge will go to the Foundation's Greatest Needs Fund, which supports student research grants, student travel grants, GSA's Education & Outreach Programs, and international travel grants. To learn more about this new event go to www.geosociety.org/gsaf.geomystery.htm.

### The GSA Foundation's Silent Auction

The Foundation's sixth silent auction will be held again this year in the Foundation booth, Headquarters Services area, in the Salt Palace Convention Center. We have expanded the auction space and have a large variety of items for you to choose from, such as books, software, apparel, rock specimens, art work, jewelry, and vacation trips.

Please take a moment to stop by the booth and place a bid. The auction opens on Sunday evening, 16 Oct., and will close at 10 a.m. Wed., 19 Oct. Remember, if you see something you just can't live without and don't want to take a chance on being outbid, there is a "take it now" price.

See you there!

### Did You Know?

Did you know that the Foundation has 81 funds?

29 of these funds are research funds, 46 funds are restricted for various purposes, 5 are some form of planned giving, and then there is the Greatest Needs Fund, which is unrestricted and supports a large variety of programs and projects for GSA.

To receive a complete listing of the Foundation funds, please contact Donna Russell, drussell@geosociety.org, +1-303-357-1054.



Most memorable early geologic experience:

Walking in a tunnel in the Black Hills looking for a fault mapped on surface. Finding it by flashlight, we photographed it by flashbulb.

—Charles F. Berkstresser Jr.



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# ANNOUNCEMENTS

## MEETINGS CALENDAR

### 2005

- |                 |   |
|-----------------|---|
| 19–23 September | 14th Meeting of the Association of the European Geological Societies, Torino, Italy. <b>Information:</b> <a href="http://www.maegs14.com">www.maegs14.com</a> .   |
| 8–13 October    | American Institute of Professional Geologists 42nd Annual National Meeting, Lexington, Kentucky, USA. <b>Information:</b> Tom Spalding, +1.502.458.1209, <a href="mailto:aipg2005@yahoo.com">aipg2005@yahoo.com</a> , <a href="http://www.professionalgeologist.org">www.professionalgeologist.org</a> .  |
| 12–15 October   | National Association of Black Geologists and Geophysicists (NABGG) 24th Annual Technology Conference, “Geosciences—Bridging the Gap,” Raleigh, North Carolina, USA. <b>Information:</b> <a href="http://www.nabgg.org">www.nabgg.org</a> .  |
| 2–3 November    | Groundwater under the Pacific Northwest: Integrating Research, Policy, & Education 2005 Conference, Stevenson, Washington, USA. <b>Information:</b> State of Washington Water Research Center, <a href="mailto:watercenter@wsu.edu">watercenter@wsu.edu</a> , +1-509-335-5531, <a href="http://www.swwrc.wsu.edu/conference2005/">www.swwrc.wsu.edu/conference2005/</a> . |

### 2006

- |              |   |
|--------------|---|
| 5–8 March    | Earth & Space 2006, 10th International Conference on Engineering, Construction and Operations in Challenging Environments, League City, Texas, USA. American Society of Civil Engineers, Aerospace Division. <b>Information:</b> <a href="http://www.asce.org/conferences/space06">www.asce.org/conferences/space06</a> .                                     |
| 2–7 April    | EGU 2006, General Assembly of the European Geosciences Union, Vienna, Austria. <b>Information:</b> <a href="http://meetings.copernicus.org/egu2006/">http://meetings.copernicus.org/egu2006/</a> .  |
| 3–7 April    | Backbone of the Americas—Patagonia to Alaska, Mendoza, Argentina. Co-convened by Asociación Geológica Argentina and GSA. <b>Information:</b> Deborah Nelson, <a href="mailto:dnelson@geosociety.org">dnelson@geosociety.org</a> , +1.303.357.1014, <a href="http://www.geosociety.org/meetings/06boa/">www.geosociety.org/meetings/06boa/</a> .               |
| 13–15 June   | 5th European Congress on Regional Geoscientific Cartography and Information Systems—Earth and Water, Barcelona, Spain. <b>Information:</b> <a href="http://www.icc.es/econgeo2006/home.html">www.icc.es/econgeo2006/home.html</a> .   |
| 2–7 July     | Australian Earth Sciences Convention 2006, Geological Society of Australia 18th Australian Geological Convention and Australian Society of Exploration Geophysicists 18th International Geophysical Conference and Exhibit, Melbourne, Australia. <b>Information:</b> <a href="http://www.earth2006.org.au">www.earth2006.org.au</a> .                        |
| 16–21 July   | Zeolite'06: The 7th International Conference on the Occurrence, Properties, and Utilization of Natural Zeolites, Socorro, New Mexico, USA. <b>Information:</b> Robert S. Bowman, New Mexico Institute of Mining & Technology, <a href="mailto:bowman@nmt.edu">bowman@nmt.edu</a> , <a href="http://www.ees.nmt.edu/Zeolite06">www.ees.nmt.edu/Zeolite06</a> . |
| 26–27 August | 4th International Gemological Symposium, GIA Gemological Research Conference, San Diego, California, USA. <b>Information:</b> James E. Shigley, +1.760.603.4019, <a href="mailto:gemconference@gia.edu">gemconference@gia.edu</a> , <a href="http://www.symposium.gia.edu/">www.symposium.gia.edu/</a> .  |

Visit [www.geosociety.org/calendar/](http://www.geosociety.org/calendar/) for a complete list of upcoming geoscience meetings.

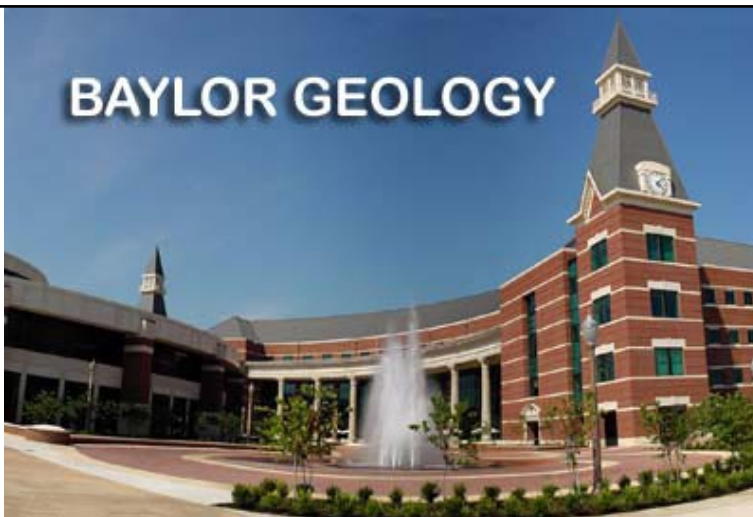
## About People

GSA Fellow **Eileen Poeter** of the Colorado School of Mines has been selected to present the 2006 Henry Darcy Distinguished Lecture Series. As the Darcy lecturer, Poeter will present the talk, *All Models Are Wrong: How Do We Know Which Are Useful?*, at colleges and universities throughout the world. The series is sponsored by the National Ground Water Research and Educational Foundation and honors outstanding groundwater professionals.

## Attention Students!

When you make your plans to attend your Section's 2006 meeting, be sure to include the Shlemon Mentor Program and the Mann Mentor Program in your schedule. If you have career questions, we have the answers. You will have opportunities to chat one-on-one with practicing geoscientists over FREE MEALS. All Section Meetings will feature the Shlemon and Mann Mentor Programs in their proceedings. For more information, contact Karlon Blythe, [kblythe@geosociety.org](mailto:kblythe@geosociety.org).

## BAYLOR GEOLOGY



Our new facilities provide excellent research opportunities in the geosciences and demonstrate Baylor's commitment to increased research scholarship. We are seeking interested graduate and undergraduate students to join our Department. Areas of emphasis include paleoclimate-paleoenvironment analysis, hydrogeology-hydrology, low temperature geochemistry, volcanology, geophysics, structural geology, and paleontology. **We are interviewing at the 2005 GSA meeting for a tenure-track Assistant Professor in physical or biogeography, to start in fall, 2006.** Contact: [Steven\\_Driese@baylor.edu](mailto:Steven_Driese@baylor.edu) (chair), 254-710-2361.

For more information, please visit our **Booth #933** in the exhibits area at the **2005 GSA Annual Meeting** in Salt Lake City or see our web site:

<http://www.baylor.edu/Geology/>

The New Book by Dr. Jules R. DuBar

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-BookReview.com

**J**ules DuBar grew up during the Great Depression, on the streets of a tough, industrial town where witnessing police brutality, gang violence and mafia hit jobs were regular occurrences.

As it turned out, life as a field geologist was not so different. Encounters with homicidal hillbillies, cut-throat conmen and mafia leaders were as much a part of a day's work as televised fossil digs, eccentric professors, and departmental politics.

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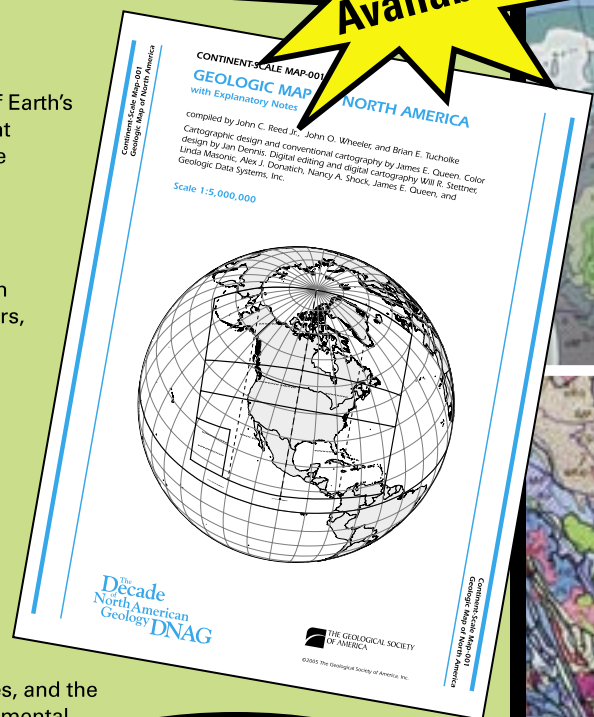
# Geologic Map of North America

Compiled by John C. Reed Jr., John O. Wheeler, and Brian E. Tucholke

The new *Geologic Map of North America* covers ~15% of Earth's surface and differs from previous maps in several important respects: It is the *first* such map to depict the geology of the seafloor, the first compiled since the general acceptance of plate-tectonic theory, and the first since radiometric dates for plutonic and volcanic rocks became widely available. It also reflects enormous advances in conventional geologic mapping, advances that have led to a significant increase in the complexity of the map. The new map, printed in 11 colors, distinguishes more than 900 rock units, 110 of which are offshore. It depicts more than seven times the number of on-land units as are shown on its immediate predecessor, as well as many more faults and additional features such as volcanoes, calderas, impact structures, small bodies of unusual igneous rocks, and diapirs.

When displayed at earth science institutions and libraries, this map is sure to impress viewers with the grand design of the continent and may inspire some to pursue the science of geology. The new *Geologic Map of North America* is also a "thinking map," a source for new interpretations of the geology of North America, insights into the evolution of the continent, new exploration strategies for the discovery of mineral and energy resources, and the development of better ways to assess and mitigate environmental risks and geologic hazards.

3 sheets (74" x 39"), scale 1:5,000,000, 28 p. text



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## Positions Open

### GEOLOGY TENURE TRACK FACULTY UNIVERSITY OF ST. THOMAS

The University of St. Thomas Geology Department, St. Paul, MN, invites applicants for a new tenure track faculty position to begin Fall 2006. Ph.D. in geology required, with expertise in environmental geology, oceanography, earth system science, environmental geochemistry, paleoclimatology/paleoecology, or any field that would complement our existing strengths. The successful candidate will be expected to teach introductory and upper-level geoscience courses and develop an undergraduate research program. A proven track record or demonstration of undergraduate research and teaching capabilities is strongly desired. The University seeks individuals committed to working with diverse students and colleagues, or who have experience with a variety of teaching methods and perspectives. For department information, visit [www.stthomas.edu/geology](http://www.stthomas.edu/geology).

The University of St. Thomas seeks to develop morally responsible individuals who combine career competency with cultural awareness and intellectual curiosity. A Catholic and urban university, St. Thomas continues to develop outstanding regionally and nationally recognized academic programs and support services as it strengthens its ties to the local community, particularly the vibrant and ethnically diverse cities of Minneapolis and St. Paul.

Send letter of interest (refer to position #200082), vita, evidence of teaching, writing sample, three letters of reference, curriculum vita electronically to: [www.stthomas.edu/hr](http://www.stthomas.edu/hr), or mail to: UST, Chair of Search Committee, Mail #AQU217, 2115 Summit Avenue, St. Paul, MN 55105.

The University of St. Thomas is an affirmative action and equal opportunity employer. Women, persons of color, and persons with disabilities are encouraged to apply.

### DICKINSON COLLEGE ASSISTANT PROFESSOR

The Dickinson College Geology Department invites applications for two one year positions at the Assistant Professor level to begin Fall 2006. We envision one to be in the general area of "hard rock" geology and the other "soft rock" geology. The successful candidates will be committed to teaching excellence in the liberal arts tradition and will be field-oriented with broad interests in geosciences beyond their specialty. Demonstrated success in student-faculty undergraduate research is highly desirable. Teaching responsibilities include a topical introductory course each semester and an upper level required course or elective. Completion or near completion of the Ph.D. is required. Applications, including a cover letter describing research interests, a teaching statement, curriculum-vitae, and addresses for three referees, should be sent to Dr. Marcus Key, Department of Geology, Dickinson College, P.O. Box 1773, Carlisle, PA 17013-2896. Review of applications will begin on 23 January 2006. Preliminary interviews will be conducted through the employment services at the fall GSA and AGU meetings.

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**Colorado School of Mines**  
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## UPCOMING IGWMC SHORT COURSES

### 2005

#### MODFLOW: Introduction to Numerical Modeling

October 12 - 15

Fee: \$995 / \$1195 after Sept. 29

### 2006

#### Applied Environmental Statistics

March 20 - 24

Fee: \$1495 / \$1595 after March 6

#### Polishing Your Ground-Water Modeling Skills

May 19 - 21

Fee\*: \$995 / \$1195 after May 5

#### Introduction to ArcGIS

May 19 - 21

Fee\*: \$995 / \$1195 after May 5

#### Analysis of Surface Water/Groundwater Flow Using Integrated Codes

May 19 - 21

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#### Finite Element Groundwater Modeling Using FEFLOW

May 19 - 21

Fee\*: \$995 / \$1195 after May 5

#### MODFLOW-2000: Introduction to Numerical Modeling

May 19 - 21

Fee\*: \$995 / \$1195 after May 5

#### Modeling Water Flow/Contaminant Transport using HYDRUS Software

May 24 - 26

Fee\*: \$495 / \$595 after May 10

#### Subsurface Multiphase Fluid Flow and Remediation Modeling

May 24 - 26

Fee\*: \$795 / \$995 after May 10

#### Phreeqc Modeling: The Basics

May 24 - 26

Fee\*: \$795 / \$995 after May 10

#### GIS for Water Resources

May 24 - 26

Fee\*: \$795 / \$995 after May 10

#### UCODE-2005: Universal Inversion Code for Automated Calibration

May 24 - 26

Fee\*: \$795 / \$995 after May 10

\* \$100-\$150 discount available when registered for MODFLOW Conference

All IGMWC courses are held in Golden, CO, except Applied Environmental Statistics (Location TBA). For more information on any of these courses, or to register online, please visit our webpage:

<http://www.mines.edu/igwmc/short-course/>

## UPCOMING IGWMC CONFERENCE

### MODFLOW and More 2006:

#### Managing Ground-Water Systems

May 22-24, 2006, Ice-Breaker Evening of May 21

The MODFLOW and More 2006 conference will be held May 21-24, 2006 at the Colorado School of Mines campus in Golden, Colorado. The abstract deadline is December 5, 2005 and can be submitted on-line at:

[http://typhoon.mines.edu/events/modflow2006/abstract\\_form.html](http://typhoon.mines.edu/events/modflow2006/abstract_form.html).

For a complete description of conference activities and relevant abstract topics: <http://typhoon.mines.edu/events/modflow2006/modflow2006.shtml>

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Our curriculum emphasizes project-based learning with a strong field component centered in the folded Appalachians, Blue Ridge, and Mesozoic lowlands of PA. The department has excellent analytical (AAS, SEM-EDS, XRD, XRF, TOC, digital 3-component seismometer, a 5-well well field for hydrogeologic investigations) and computing facilities including a GIS lab. More information can be found on the college and department web pages at [www.dickinson.edu/departments/geol](http://www.dickinson.edu/departments/geol). Dickinson College is a highly selective private liberal arts college in south-central PA within easy drive of the New York-Washington D.C. metro corridor. Dickinson College is an equal opportunity/affirmative action employer and strongly encourages minorities and women to apply.

#### COASTAL SEDIMENTOLOGY BROOKLYN COLLEGE

The Department of Geology seeks to fill a new tenure track position in Coastal Sedimentology. The successful candidate will be expected to expand upon initiatives to integrate GIS into the curriculum, and teach courses related to sedimentology, oceanography, and GIS. The successful candidate will also be expected to maintain an active research program (a portion of which should focus upon aspects of the New York City region), contribute to collaborative research within the department, college, and the CUNY Earth and Environmental Sciences doctoral program, and supervise student research.

The successful candidate must have a Ph.D. Experience with ArcGIS is essential. The candidate should be able to demonstrate teaching and research ability in the areas listed. Teaching experience, professional recognition in his/her field, a balance of field and laboratory experience, and a history of collaborative research would enhance an application.

Salary is competitive and commensurate with qualifications and experience. Send curriculum vitae, three letters of recommendation, and writing sample or research plan to: Michael Hewitt, Assistant Vice President for Human Resource Services, Brooklyn College, 2900 Bedford Avenue, Brooklyn, NY 11210-2889. Review of applications will begin on November 1 and continue until position is filled.

#### SURFACE HYDROLOGY MONTCLAIR STATE UNIVERSITY

The Department of Earth and Environmental Studies at Montclair State University invites applications for a full-time, tenure-track faculty position in surface hydrology, with an emphasis on water resource management. This appointment will be at the assistant rank starting September 1, 2006. Expertise in hydrodynamics, hydroclimatology, or water quality issues, and research and teaching capability in applied GISciences would be highly desirable. A Ph.D. is required at the time of appointment. Additional information about the position and the department is available at [www.csam.montclair.edu/earth/eesweb](http://www.csam.montclair.edu/earth/eesweb). Applicants should send cover letter, CV, three letters of recommendation, and a statement of professional goals, research interests, and teaching philosophy to: Dr. Duke Ophori (ophori@mail.montclair.edu), Hydrology Search Committee Chair, Dept. of Earth & Environmental Studies, Montclair State University, Montclair, NJ 07043. Review of applications will begin immediately. Montclair State University is an Equal Opportunity/Affirmative Action Employer. Qualified women, minorities, and individuals with disabilities are encouraged to apply.

#### REFLECTION SEISMOLOGY THE UNIVERSITY OF TULSA

The Department of Geosciences invites applications for a tenure-track faculty position at the Assistant Professor level in Reflection Seismology to begin August 2006. A Ph.D. degree in geophysics or related field with demonstrated experience in quantitative reflection seismology is required. We seek an individual who shows the potential for outstanding achievement in both teaching and research. The successful candidate will be expected to develop and teach courses at the undergraduate and graduate levels, supervise and foster research at both the undergraduate and graduate level, and establish an externally funded research program. Interdisciplinary research with existing petroleum and environmental programs is strongly encouraged. The University of Tulsa is a private, comprehensive university committed to excellence in teaching, research, creative scholarship, and service to the University and community. The nominal teaching load at the University is 2 courses per semester. Minorities and women are encouraged to apply. Send a letter of application stating research and teaching interests, curriculum vita, and name and

contact information for three references to Dr. Bryan Tapp, Chair, Department of Geosciences, The University of Tulsa, 600 South College Ave. Tulsa, OK 74104-3189. Electronic applications will be accepted. Application review will begin November 1, 2005 and continue until position is filled. The University of Tulsa does not discriminate on the basis of personal status or group characteristics including but not limited to the classes protected under federal and state law. The University of Tulsa is an EEO/AA employer.

#### MULTIPLE APPLIED GEOSCIENCE POSITIONS EDINBURGH COLLABORATIVE IN SUBSURFACE SCIENCE AND ENGINEERING (ECOSSE) EDINBURGH UNIVERSITY AND HERIOT-WATT UNIVERSITY

As a consequence of major new Government funding, Heriot-Watt and Edinburgh Universities have formed the "Edinburgh Research Partnership" in Engineering and Mathematics, which consists of several Joint Research Institutes. ECOSSE is one of the new JRIs, and six new research positions have been created:

- \* Professor of Carbonate Geoscience (at HW)
  - \* Lecturer in Geoscience/Geoengineering (at HW)
  - \* Lecturer in Petroleum Engineering (at HW)
  - \* Lecturer in Reactive Flow Geochemistry (at UoE)
  - \* Lecturer in Carbonate GeoScience (at UoE)
  - \* Research Fellow in Experimental GeoScience (at UoE)
- Information concerning these posts, an overview of ECOSSE research areas, and application procedures, can be found at [www.erp.ac.uk/ecosse](http://www.erp.ac.uk/ecosse). The closing date for all posts is 30 September 2005.

#### THREE FACULTY POSITIONS DEPARTMENT OF GEOLOGY UNIVERSITY AT BUFFALO, SUNY

The Department of Geology at the University at Buffalo is building on sustained growth in research productivity and teaching in its core areas of environmental geology, volcanology, and integrated tectonics and stratigraphy. We invite applications for three tenure-track faculty positions:

1. Nanogeochemistry, Biogeochemistry, or Geomicrobiology (Rank: Assistant Professor). We seek a scientist who studies aqueous/microbial/rock interactions at the nano-scale and who will integrate with our existing strength in hydrogeology. Research topics might include identification, characterization, and study of the reactivity of nanoparticles or nanostructures in the environment, or examining the interactions and biogeochemical processes associated with microbes and minerals. Researchers interested in applying nano-scale geochemistry to environmental problems are particularly encouraged to apply. Search Committee Chair: Dr. Richelle Allen-King. Application target date: Oct. 15, 2005.

2. Remote Sensing (Rank: Assistant or Associate Professor). We seek a broadly trained geoscientist who employs an array of airborne and space-based remote sensing tools to address geological questions that complement and integrate with one or more of our existing research strengths. Areas of particular interest include geohazard evaluation, assessment of water or petroleum resources, and climate change. Search Committee Chair: Dr. Marcus Bursik. Application target date: Nov. 1, 2005.

3. Hydrogeophysics or Environmental Geophysics (Rank: Assistant Professor). We seek a scientist with demonstrated ability to apply geophysical techniques to the shallow subsurface and who will integrate with our existing strength in hydrogeology. Researchers with expertise in GPR, ER, or seismic, and an interest in extracting geologic and hydrologic data from complex datasets for the purpose of characterizing or remediating contaminated geologic systems are of particular interest. Search Committee Chair Dr. Richelle Allen-King. Application target date: Nov. 15, 2005.

We expect faculty to develop and maintain innovative, extramurally funded research groups. Successful applicants for these positions must have a Ph.D. degree at the time of appointment and a demonstrated potential to publish or otherwise disseminate results of research and a commitment to effective teaching. Teaching duties will involve undergraduate and graduate level courses in the candidates' specialties. More information about our department can be found at [www.geology.buffalo.edu](http://www.geology.buffalo.edu). The University at Buffalo is an Equal Opportunity Employer/Recruiter. We committed to the importance of a diverse faculty. Women and minorities are particularly encouraged to apply.

Send applications to Robyn Wagner by email to [rwagner@buffalo.edu](mailto:rwagner@buffalo.edu) or post to Department of Geology, 876 Natural Sciences Complex, University at Buffalo, Buffalo, NY 14260.

Applications should state clearly the position applied to and include (1) a curriculum vitae, including published research and grant support, (2) a statement of research goals, (3) a statement of teaching experience and interests, (4) selected reprints, and (5) the names and contact information of at least three references. Applications should be complete by the target dates given above, when we will begin our review of candidates, which will continue until the positions are filled.

#### TENURE-TRACK BIO- OR PHYSICAL GEOGRAPHER DEPARTMENT OF GEOLOGY, BAYLOR UNIVERSITY

The Department of Geology at Baylor University invites applications for a tenure-track Assistant Professor position in Bio- or Physical Geography, beginning August 2006. A Ph.D. in geography or in a related field is required at the time of appointment. The Department currently consists of 12 geoscientists, including both geologists and geographers (please see the Department Web site at [www.baylor.edu/Geology/](http://www.baylor.edu/Geology/) for further information). We seek an individual with a strong research agenda that includes interpreting Quaternary records. We also encourage collaboration with a subset of Baylor University Geology faculty members currently engaged in investigations of Earth surface processes, including research on Quaternary paleoclimate and paleo-landscape records, as well as hydrological (surface water) and reservoir sedimentation studies, and we require the candidate to develop a vigorous research program that involves both undergraduate and graduate students. Research space for geography is available in the new, 500,000-square-foot "state-of-the-art" Baylor Sciences Building. We seek an individual with a strong commitment to excellence in teaching, and require that he/she contribute significantly to both the undergraduate B.A. Geography program by teaching freshman physical geography, and possibly geomorphology, geographic information systems (GIS), and field-type physical geography courses, as well contribute to the graduate (M.S. and Ph.D.) programs in Geology by teaching graduate courses in his/her areas of specialization. Potential graduate courses might include (but are not limited to): biogeography, Quaternary paleoecology, and process geomorphology. A GIS laboratory that includes computers and software, as well as two large plotters, is available for both instruction and research. Ancillary research support is provided by CAGSR (Center for Applied Geographic and Spatial Research).

Send letter of application, including statement of teaching and research interests, curriculum vitae, copies of transcripts, and the names and contact information for three references to: Dr. Steven G. Driese, Chair, Search Committee, Department of Geology, Baylor University, One Bear Place #97354, Waco, TX 76798-7354 (Tel: 254-710-2361; e-mail: [Steven\\_Driese@baylor.edu](mailto:Steven_Driese@baylor.edu)). The review of applications will begin January 15, 2006, and will be accepted until the position is filled. To ensure full consideration, application must be completed by January 31, 2006. Baylor is a Baptist university affiliated with the Baptist General Convention of Texas. As an Affirmative Action/Equal Opportunity employer, Baylor encourages minorities, women, veterans, and persons with disabilities to apply.

#### VISITING ASSISTANT PROFESSOR PHYSICAL GEOLOGY AND MINERALOGY/PETROLOGY

The Department of Geosciences at Denison University invites applications for a one-year appointment at the visiting assistant professor level, to begin in August 2006. Applicants should be broadly trained in the geosciences, with expertise in physical geology and mineralogy/petrology or closely related fields. A completed Ph.D. at the time of appointment is desirable but ABD will be considered. Primary teaching responsibilities will be introductory courses in geology and mineralogy/petrology. Our department stresses a balance of classroom, field and laboratory experiences for our majors, and we seek a colleague who will contribute to all of these components of our undergraduate curriculum. Denison is a highly selective liberal arts college strongly committed to and supportive of excellence in teaching and active faculty research that involves undergraduate students.

Please submit a letter of application and a discussion of your approach to teaching and research in a liberal arts setting, along with a vitae, academic transcripts, and contact information for three references to: David C. Greene, Department of Geosciences, Denison University, Granville OH 43023; (740) 587-6476; [greened@denison.edu](mailto:greened@denison.edu). Application materials should arrive by September 23, 2005, for full consideration. Preliminary interviews will be conducted at the GSA meeting in Salt Lake City. Denison is an affirmative

action/equal opportunity employer. Women and minorities are especially encouraged to apply.

**DEPARTMENT OF EARTH SCIENCES  
ASSISTANT PROFESSORSHIP  
IN ENVIRONMENTAL GEOCHEMISTRY  
SIMON FRASER UNIVERSITY**

The Department of Earth Sciences at Simon Fraser University invites applications for a tenure track Assistant Professorship in environmental geochemistry commencing as early as May 1, 2006. A Ph.D. is required, and post-doctoral research, teaching or industry experience is desirable. It is expected that the research activities of the successful candidate will complement the existing environmental research interests within the Department, while contributing to geochemistry expertise within the department as a whole. Candidates with expertise in aqueous geochemistry and/or stable isotope geochemistry are encouraged to apply.

The successful candidate will develop a strong research program, and supervise both graduate and undergraduate students. Teaching responsibilities may include introductory geochemistry, aqueous geochemistry, stable isotope geochemistry (graduate level or upper undergraduate level). Breadth in course offerings will be considered an asset.

For additional information about this position, see [www.sfu.ca/earth-sciences/](http://www.sfu.ca/earth-sciences/).

All qualified candidates are encouraged to apply; however Canadians and permanent residents will be given priority. Simon Fraser University is committed to employment equity and encourages applications from all qualified women and men, including visible minorities, aboriginal people and persons with disabilities.

Applicants are requested to submit curriculum vitae, a statement of research and teaching interests, and the names, addresses, phone numbers and/or fax number, and email addresses of three referees. Applications or requests for further information should be directed to: Dr. Diana Allen, Chair, Department of Earth Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, phone: 604-291-4657, fax: 604-291-5481, e-mail: [easechair@sfu.ca](mailto:easechair@sfu.ca).

Review of applications will begin October 1, 2005. The search will remain open until the position is filled.

**STABLE ISOTOPE GEOCHEMISTRY  
SOUTHERN ILLINOIS UNIVERSITY**

The Department of Geology at Southern Illinois University-Carbondale invites applications for a tenure-track position in stable isotope geochemistry at the assistant professor level with a start date of Aug. 16, 2006. Post-doctoral experience is preferred. The applicant should demonstrate the existence of, or potential for developing, an internationally recognized, externally funded research program. We prefer a stable isotope geochemist who can contribute to our existing strengths in energy and environmental geology with the potential to collaborate with faculty in other departments, such as an ecologist currently being sought by the Department of Zoology, or with the Coal Research Center or the Mining and Mineral Resources Program. The successful applicant is expected to teach courses in introductory geology and undergraduate and graduate courses in their area of expertise. Normal teaching load is three to four courses per academic year. Applicants must hold a Ph.D. or show that they will complete all degree requirements by the time of appointment.

Review of applications will begin October 30, 2005, and continue until the position is filled. Applicants should submit curriculum vitae, a statement of teaching and research interests, and the names and addresses of at least three referees to: Dr. Scott Ishman, Search Committee Chair, Department of Geology, 1259 Lincoln Drive, Mailcode 4324, Southern Illinois University Carbondale, Carbondale, IL 62901. Fax: (618) 453-7393. E-mail: [sishman@geo.siu.edu](mailto:sishman@geo.siu.edu).

Southern Illinois University Carbondale is a large, research-oriented institution situated in a pleasant small-town setting southeast of St. Louis. SIUC is seeking to enhance interdisciplinary research as it strives to be a top 75 public research university (<http://news.siu.edu/si150/>). The Geology Department has a full-time faculty of 10 with about 40 undergraduate and 30 graduate students and offers Bachelor and Master degree programs in geology and participates in the Interdisciplinary Environmental Resources and Policy Ph.D. program.

For further information, please visit our comprehensive website [www.science.siu.edu/geology](http://www.science.siu.edu/geology). SIUC is an affirmative action/equal opportunity employer that strives to enhance its ability to develop a diverse faculty and staff and to increase its potential to serve a diverse student population. All applications are welcomed and encouraged and will receive consideration.



UNIVERSITY OF  
CALGARY

**Canada Research Chair (Tier II)**

**Solid Earth Geochemistry**

The **Department of Geology and Geophysics** at the University of Calgary invites applications for a Tier II Canada Research Chair in Solid Earth Geochemistry. The successful candidate will have a PhD and an outstanding track record in research and teaching.

The Chair will engage in research in solid earth geochemistry, geochronology and/or igneous petrology, with an emphasis on field-based studies of orogenic belts. The Chair will contribute to teaching at the undergraduate and graduate levels, including supervision of graduate students and post-doctoral fellows. It is anticipated that the appointment will be made at the Assistant or Associate Professor level to an emerging scholar who has received his/her PhD within the last 10 years.

The Department of Geology and Geophysics provides an outstanding research environment, bringing in Can\$4.5 million in external research funding. It has an internationally recognized record of excellence in petrology and tectonics research and hosts the Lithoprobe Seismic Processing Facility and University of Calgary Laboratory for Electron Beam Microanalysis. The University of Calgary is situated within an hour of the Front Ranges of the Canadian Cordillera. Additional information on the Department is available at our website (<http://www.geo.ucalgary.ca>).

The Canada Research Chairs Program has been established by the Canadian government to enable Canadian universities to foster research excellence and enhance their role as world class centres of research. Information on the Canada Research Chairs Program is available at the CRC website (<http://www.chairs.gc.ca>).

Applicants should submit a curriculum vitae, a statement explaining the applicant's vision for the evolution of the chair (including a research plan), statement of teaching philosophy, and the names of three referees to:

**Dr. Larry Lines**, Head

Department of Geology and Geophysics  
University of Calgary

2500 University Drive N.W., Calgary, Alberta, Canada T2N 1N4

Telephone: (403) 220-2796, Fax: (403) 284-0074, Email: [lrlines@ucalgary.ca](mailto:lrlines@ucalgary.ca)

The deadline for applications is **September 30, 2005** or until a suitable candidate is found.

Nomination to the Canada Research Chairs Program will occur after a candidate has been selected. The anticipated start date for the position is **January 1, 2007**.

*All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.*

*The University of Calgary respects, appreciates, and encourages diversity.*

*To see all University of Calgary academic positions, please visit [www.ucalgary.ca/hr/career](http://www.ucalgary.ca/hr/career)*

**FACULTY POSITION AT BRYN MAWR COLLEGE  
PETROLOGY/MINERALOGY**

Bryn Mawr College seeks to fill a full-time, tenure-track position at either the beginning Assistant Professor or Associate Professor level in petrology/mineralogy. The applicant should be able to contribute substantially to igneous and/or metamorphic petrology plus one or more of the following: geochemistry, geodynamics, environmental geology, earth system science, remote sensing or geochronology. This individual will direct undergraduate research projects and conduct an active research program. In the case of mid-career applicants, we are seeking an individual who could contribute to leadership of the Department. Demonstrated teaching ability and a Ph.D. at the time of appointment are required. Applicants should submit a CV, description of research interests, a list of possible courses that could be offered,

and three references to: Geology Search, Department of Geology, Bryn Mawr College, 101 N. Merion Ave., Bryn Mawr, PA 19010 (email contact: [kocconel@brynmawr.edu](mailto:kocconel@brynmawr.edu)). Members of the Department will be available for preliminary interviews at the Geological Society of America meetings in October, and formal review of applications will begin in December 2005. Details about the Department are available at [www.brynmawr.edu/geology/](http://www.brynmawr.edu/geology/).

Located in suburban Philadelphia, Bryn Mawr College is a highly selective liberal arts college for women, who share an intense intellectual commitment, a self-directed and purposeful vision of their lives, and a desire to make meaningful contributions to the world. Bryn Mawr comprises an undergraduate college with 1,200 undergraduate students, as well as coeducational graduate schools in some humanities, sciences, and social work. The College supports faculty excellence in both teaching

[www.ucalgary.ca](http://www.ucalgary.ca)

and research. Bryn Mawr College is an equal-opportunity, affirmative action employer. Minority candidates and women are especially encouraged to apply.

#### SEARCH REOPENED SEDIMENTARY GEOLOGY UNIVERSITY OF WYOMING

The Department of Geology and Geophysics (<http://home.gg.uwyo.edu>) invites applications for a tenure-track, assistant professor position in sedimentology/stratigraphy. Higher rank (associate professor) is possible with appropriate qualifications. Ph.D. is required at time of appointment, August 2006. We seek an individual who shows the potential to develop an internationally recognized, externally funded research program, will be involved in the undergraduate and graduate teaching mission of the department, and will build on departmental strengths in sedimentation, energy research, seismology and structural geology. Specialty is open, but may include such diverse fields as quantitative basin analysis, seismic stratigraphy, carbonate sedimentation, paleoclimate reconstruction, physical sedimentology and sediment transport. The Department is home to the Institute for Energy Research ([www.ironline.org/](http://www.ironline.org/)) and the University has a strong and long-standing commitment to energy-related research in the geosciences.

Applications should include a statement of research and teaching interests and accomplishments, curriculum vitae, and the names and contact information of three references. Review of completed applications will begin November 1, 2005. Send an electronic copy of your application to Ms. Carol Pribyl at [cpribyl@uwyo.edu](mailto:cpribyl@uwyo.edu); if you have additional application materials to send, please direct them to Sedimentary Search Committee, Dept. of Geology & Geophysics, University of Wyoming, 1000 E. University Ave., Dept. 3006, Laramie, WY 82071.

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

#### WELLESLEY COLLEGE ASSISTANT PROFESSOR GEOSCIENCES/SURFACE PROCESSES

The Department of Geosciences at Wellesley College invites applications for a tenure-track faculty position at the rank of first-level assistant professor beginning September 2006. We seek an exceptional scientist who can integrate classroom, field and laboratory approaches to teaching undergraduates in a liberal arts environment. This individual will have broad expertise in surface processes and be expected to develop courses at all levels of our curriculum, particularly including sedimentation and earth history. The ideal candidate will also be active in research that can include students in the department. Completion of the Ph.D. is required, and previous post-doctoral and/or teaching experience would be beneficial.

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, Department of Geosciences, Wellesley College, 106 Central Street, Wellesley, MA 02481-8203. Applications will be accepted until October 15, 2005.

Wellesley College is an Affirmative Action/Equal Opportunity educational institution and employer. The College is committed to increasing the diversity of the college community and the curriculum. Candidates who believe they can contribute to that goal are encouraged to apply.

#### STRUCTURE/NEOTECTONICS

**CALIFORNIA STATE UNIVERSITY AT BAKERSFIELD**  
The Department of Physics and Geology at California State University at Bakersfield (CSUB) announces a tenure track position in **structure/neotectonics** beginning in the 2006-07 school year. The successful candidate would demonstrate a strong commitment to sharing in department responsibilities toward the education of K-12 teachers-in-training as well as general education, major and graduate courses.

The small, high-quality geology department at CSUB is very active in peer-reviewed research involving both undergraduates and M.S.-level graduate students. The department is well equipped with aqueous chemistry and hydrology labs including field hydrology equipment, an automated XRD, an ICP-MS with laser ablation system, an SEM-EDX, a research petrography lab, and a wide variety of field geophysics equipment including gravimeter, refraction seismograph, electrical resistivity system, magnetometers, sedigraph, rock crushing equipment and a ground conductivity meter. The California Well Sample Repository, located on campus, houses the largest public collection of oil and water well

cores and cuttings in California. The Geotechnology Training Center is also located within the department. It includes six SGI Octane workstations, 12 PCs, and extensive software including Landmark, Geographix, Seismic Microtechnology's Kingdom Suite, Petra, and ArcGIS.

The San Joaquin Valley is located in an active tectonic environment and is one of the world's great centers of both the agricultural and petroleum industries. Thus, local research opportunities are readily available and connections are easily made with local industry and government agencies.

California State University at Bakersfield is a regional comprehensive university which prides itself in a liberal arts approach to undergraduate education and small, high-quality graduate programs. It has an enrollment of approximately 7,000 students and resides in a rapidly growing community of over 400,000 people in the southern San Joaquin Valley of central California. The campus is conveniently located near popular beach, mountain, and desert attractions and is a two-hour drive from Los Angeles.

Review of applications will begin after **November 14, 2005**. Candidates should submit a letter of application, a current curriculum vitae, and names of at least three references to: Chair of the Geology Search Committee, Department of Physics and Geology, California State University, 9001 Stockdale Highway, Bakersfield, CA 93311-1099 USA, Web site: [www.cs.csubak.edu/Geology/](http://www.cs.csubak.edu/Geology/).

#### LAURENTIAN UNIVERSITY DEPARTMENT OF EARTH SCIENCES MINERAL EXPLORATION RESEARCH CENTRE ECONOMIC GEOLOGY

The Department of Earth Sciences and Mineral Exploration Research Centre at Laurentian University invite applications for a tenure-track faculty position in **Economic Geology** to be filled in July 2006. We are particularly interested in candidates who have strong field and theoretical backgrounds in magmatic and/or hydrothermal ore deposits in Precambrian rocks. Applicants should have strong research records and be committed to excellence in teaching at the undergraduate and graduate levels. Supervision of graduate students within a vigorous, externally-funded research program is expected. Applicants must hold a Ph.D. degree by the time of appointment.

The successful candidate will work and interact with faculty, undergraduate and graduate students, and post-doctoral fellows in the Department of Earth Sciences and Mineral Exploration Research Centre. The Department currently offers BSc degrees in Geology and Environmental Earth Sciences, thesis-based and applied MSc degrees in Geology, and Ph.D. degrees in Ore Deposits and Precambrian Geology. Faculty and students have access to excellent light optical, electron optical, and geochemical analytical equipment, including FLINC, SEM, EPMA, WD-XRF, ICP-OES, ICP-MS, LA-ICP-MS, and EBSD. Additional information about the Department and MERC can be found at [www.laurentian.ca/geology](http://www.laurentian.ca/geology).

Send curriculum vitae, including a complete list of publications, a statement of teaching interests, long- and short-term research goals, and the names and mail/e-mail addresses of at least (4) academic references to: Faculty Search Committee, Department of Earth Sciences, Laurentian University, Sudbury, Ontario P3E 2C6, Canada, e-mail: [DES@laurentian.ca](mailto:DES@laurentian.ca), Fax: (705) 675-4898. Screening of applications will begin 01 November 2005, but applications will be accepted until the position is filled.

Laurentian University is a bilingual institution and an equal opportunity employer. It has a policy of passive bilingualism (English/French) as a condition of tenure. The university is committed to equity in employment and encourages applications from women, aboriginal peoples, members of visible minorities, and persons with disabilities.

#### U.S. GEOLOGICAL SURVEY MENDENHALL POSTDOCTORAL RESEARCH FELLOWSHIP PROGRAM

The U.S. Geological Survey (USGS) invites applications for the Mendenhall Postdoctoral Research Fellowship Program for Fiscal Year 2007. The Mendenhall Program provides opportunities to conduct research in association with selected members of the USGS professional staff. Through this Program the USGS will acquire current expertise in science to assist in implementation of the science strategy of its programs. Fiscal Year 2007 begins in October 2006.

Opportunities for research are available in a wide range of topics. The postdoctoral fellowships are 2-

year appointments. The closing date for applications is December 1, 2005. Appointments will start October 2006 or later, depending on availability of funds. A description of the program, research opportunities, and the application process are available at <http://geology.usgs.gov/postdoc>. The U.S. Geological Survey is an equal opportunity employer.

#### SEDIMENTARY GEOLOGY AND STRUCTURAL GEOLOGY/IGNEOUS & METAMORPHIC PETROLOGY/MINERALOGY THE UNIVERSITY OF TENNESSEE AT MARTIN

The Department of Geology, Geography, and Physics invites applications for two tenure-track positions at the assistant professor level starting August 1, 2006.

**Sedimentary Geology**—Candidate must have the ability to teach undergraduate Sedimentology and Stratigraphy. Ability to teach Geohydrology is beneficial.

**Structural Geology/Igneous & Metamorphic Petrology/Mineralogy**—Candidate must have the ability to teach undergraduate Structural Geology, Igneous/Metamorphic Petrology, and Mineralogy.

Candidates for both positions will be expected to teach introductory level Geology courses, advanced undergraduate courses depending upon their field of specialty, develop a research program involving undergraduates, and participate in K-16 Geoscience education outreach. UTM is a regional university with an enrollment over 6,100. The department offers a B.S. degree in Geoscience with concentrations in Geology, Geography, and Travel and Tourism and a minor in Physics.

Candidate must have a Ph.D. in Geology; however, candidates with coursework completed toward their doctorate and significant progress in their dissertation may also be considered.

Review of applicants will begin December 5, 2005, and continue until the position is filled. Send letter of application, resume, transcripts, statements of teaching and research philosophy, and three letters of recommendation to: Chair Geology Search, Department of Geology, Geography, and Physics, 215 Johnson EPS Building, University of Tennessee at Martin, Martin, Tennessee 38238. UT Martin is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA employer. The University seeks to diversify its work force. Therefore, all qualified applicants, regardless of race, color, national origin, religion, gender, age, disability or Vietnam Veteran status, are strongly encouraged to apply.

## Opportunities for Students

**Graduate Research Assistantship:** Paleoclimatology, stratigraphy, stable isotopes at the University of New Mexico (Earth & Planetary Sciences). Applications sought for MS or Ph.D. students researching the origins of 3rd-order (m.y.-scale) Paleozoic sea-level fluctuations using oxygen isotopes from apatitic conodonts. Field and lab work. Contact Dr. Maya Elrick, [dolomite@unm.edu](mailto:dolomite@unm.edu), (505) 277-5077.

**Attention, Students!** Looking for a job or an internship? Then join us in Houston for the 8th Annual National AAPG/SEG Student Expo on October 6-8, 2005! The Expo is a great opportunity for students to meet representatives from oil and gas and environmental companies, some of which recruit only at the Expo. Students will have the chance to showcase their research in a poster session and network with potential employers. Successful job searches result from the Expo every year. And use this occasion to explore Houston, a vibrant city, an oil capital, and home to the largest geoscientist population in the world! For registration and more information, please visit [www.studentexpo.info/](http://www.studentexpo.info/).

# VIRTUAL STUDENT EXPO

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The Virtual Student Expo is a joint venture among GSA, the American Association of Petroleum Geologists, the Society of Exploration Geophysicists, and the Society of Petroleum Engineers.

# BACKBONE OF THE AMERICAS

## PATAGONIA TO ALASKA

3–7 April 2006 • Mendoza, Argentina

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

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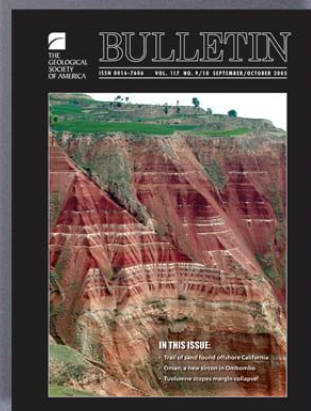
# Journal Highlights

### IN SEPTEMBER *GEOLOGY*

Packrat pellets paleoclimatic proxies  
 Taphonomic trade-offs in tropics  
 Karoo basalt not at fault;  
 Extinction goes without the flows  
 Conifers gotta lotta stomata

### IN SEPTEMBER/OCTOBER *GSA BULLETIN*

Trail of sand found offshore California  
 Oman, a new zircon in Ombombo  
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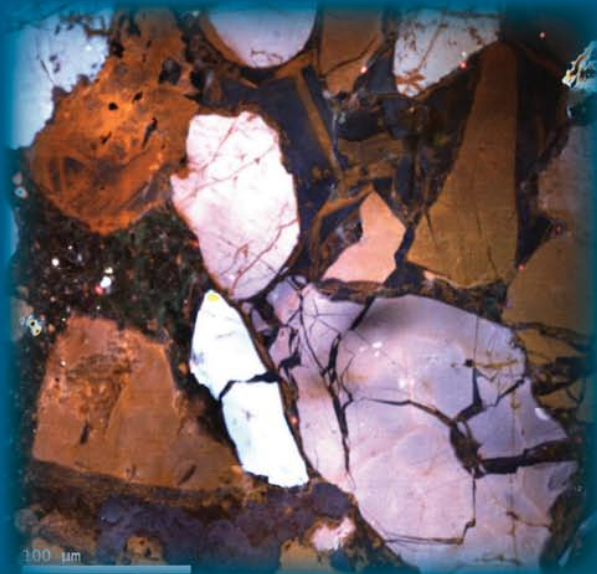
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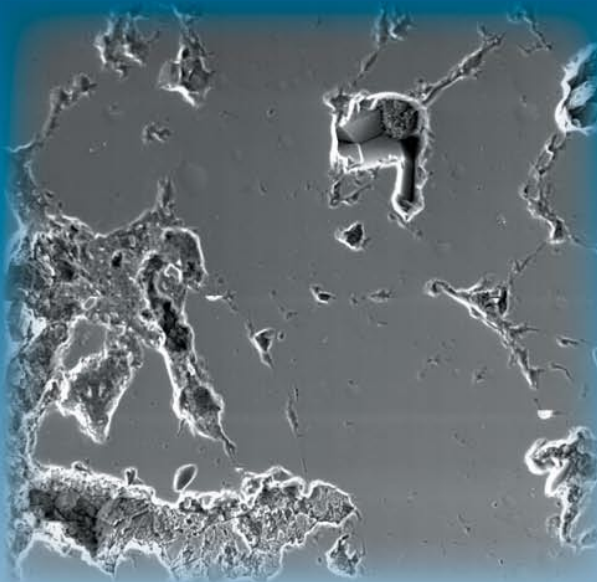
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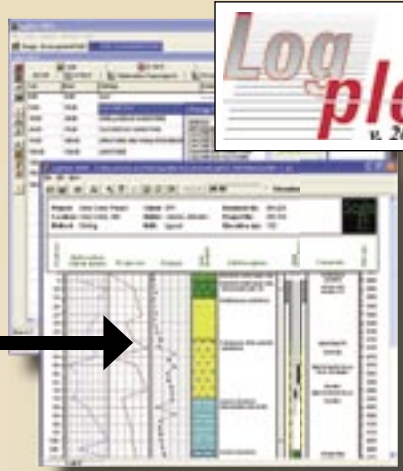
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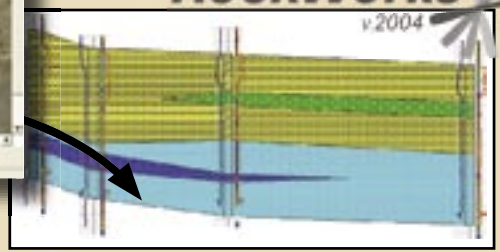
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